TULALIP TRIBES

UTILITY BUILDING

3015 MISSION BEACH ROAD

TULALIP, WASHINGTON 98271

BID ISSUE SPECIFICATIONS

MARCH 21, 2024

FREIHEIT ARCHITECTURE
505 106th Ave NE, Suite 302
Bellevue, WA 98004

SECTION 000110 - TABLE OF CONTENTS

SECTION 000110 - TABLE OF CONTENTS

SECTION 000110 - TABLE OF CONTENTS

END OF TABLE OF CONTENTS

Notice to Bidders

Sealed bid proposals will be received by The Tulalip Tribes of Washington, at 3015 Mission Beach Road, Tulalip, WA 98271, for the following Project:

Tulalip Tribes Project No.: 2021-003

Utility Building in accordance with the Drawings and Specifications prepared by: Freiheit Architecture, 777 108th Ave NE Suite 1650, Bellevue, Washington 98004; 425-827-2100; Attention Joel Riehl (jriehl@freiheitarch.com). The Manager for the Project is Jason Crain of the Wenaha Group. jasonc@wenahagroup.com. Mobile number is 253-374-0693.

The **Utility Building** project will include the construction of a 2-story wood-framed building of approximately 7,800 sq. ft. The program includes wastewater testing laboratory, vehicle maintenance bays, materials (pipe) storage, office space, conference rooms, restrooms, employee break room and kitchenette. The Project also includes associated site and utilities work, mechanical, electrical and plumbing work. The project is located on the Tulalip Reservation.

Native American Preference related to contracting, subcontracting, and suppliers in the project is required and must meet The Tulalip Code, Chapter 9.05. The project will be bid according to section 9.05.340 of the TERO code.

Dates of Publication: March 21, 2024

Sealed bids will be received for the Utility Building until 3:00 PM April 23, 2024, at which time, all bids will be opened and read aloud at 3015 Mission Beach Road, Tulalip, WA 98271. All required bid documentation shall be submitted to 3015 Mission Beach Road, Tulalip, WA 98271, by the scheduled bid date and times. ORAL, TELEPHONIC, FAXED, OR TELEGRAPHIC BIDS WILL NOT BE ACCEPTED.

Plans, specifications, addenda, bidders list, and plan holders list for this project are available Free-of-charge access to project bid documents (plans, specifications, addenda, and Bidders List) is provided to Prime Bidders, Subcontractors, and Vendors by going to the Tulalip TERO Site: https://www.tulaliptero.com/InvitationToBid/TheTulalipTribes or the Builders Exchange Site: www.bxwa.com and clicking on "Posted Projects", "Public Works", and "Tribal Agencies – Tulalip Tribes". This online plan room provides Bidders with fully usable online documents with the ability to: download, view, print, order full/partial plan sets from numerous reprographic sources, and a free online digitizer/take-off tool. It is recommended that Bidders "Register" in order to receive automatic e-mail notification of future addenda and to place themselves on the "Self-Registered Bidders List". Bidders that do not register will not be automatically notified of addenda and will need to periodically check the on-line plan room for addenda issued on this project. Contact Builders Exchange of Washington at (425) 258-1303 should you require assistance with access or registration. The content available through bxwa.com is the property of the Tulalip Tribes of Washington and/or the property of our licensors and is protected by copyright and other intellectual property laws. Access to project documents is intended for use by bidders (general contractors/prime bidders, subcontractors and suppliers), agency personnel and agency's consultants, as well as for personal, noncommercial, use by the public. You may display or print the content available for these uses only. "Harvesting" (downloading, copying, and transmitting) of any project information and/or project documents for purposes of reselling and/or redistributing information by any other party is strictly prohibited by BXWA.

CONFIDENTIALITY AGREEMENT

Upon award of a Contract the successful Bidder shall provide the Tulalip Tribes of Washington with a completed and signed Confidentiality Agreement as set forth herein. Successful Bidder shall also provide the Tulalip Tribes of Washington with a Confidentiality Agreement Completed and signed by all lower tier contractors and/or suppliers whom may perform Work on the Project.

I / we, the undersigned, have been provided certain confidential and proprietary information ("Confidential Information") regarding the Tulalip Tribes of Washington for the Project identified as Utility Building, Tulalip Tribes Project No.: 2021-003 ("Project)". "Confidential Information" shall include, without limitation, all financial information, data, materials, products, manuals, business plans, marketing plans, Project design documents, or other information disclosed or submitted orally, in writing, or by any other media.

The undersigned acknowledges that this Confidential Information is sensitive and confidential in nature, and that the disclosure of this information to anyone not part of this agreement would be damaging to the Tulalip Tribes of Washington.

In consideration of the premises herein contained, I / we understand and agree that I / we will not disclose any "*Confidential Information*" regarding this "*Project*" to any person(s) not privy to this agreement. Furthermore, I / we will not disclose any of this information directly or indirectly to any competitor of the Tulalip Tribes of Washington.

Agreed to and accepted:

Signature: _____

Title: _____

Printed Name: _____

DATE: _____

INSTRUCTIONS TO BIDDERS

The Tulalip Tribes of Washington hereby invite you to submit a Bid Proposal for this project.

ARTICLE 1 – CONTRACT INFORMATION

1.1 PROJECT BID REQUIREMENTS

1.1.1 The Tulalip Tribes of Washington's Board of Directors has the authority to require those employers subject to The Tulalip Code, Chapter 9.05 – TERO Code and applicable federal laws and guidelines, to give preference to Indians in hiring promotions, training and all other aspects of employment contracting and subcontracting, and to give preference to Indians in contracting goods and services. Bidders and must comply with The Tulalip Code, Chapter 9.05 – TERO Code and the rules, regulations and orders of the TERO Commission.

1.1.1.1 This Contract will be awarded upon a competitive "weight of award" bid process. As such, award shall be made to the most responsive bidder with the highest total points awarded to them after taking all bid items into consideration.

1.1.2 With respect to each Project / Contract of $10,000 or more, operating within the exterior boundaries of the Tulalip Reservation or on Tribal Projects off the Reservation, the Contractor shall pay a onetime Fee of 1.75% of the total Project / Contract cost, i.e., equipment labor, materials and operations and any increase of the Contract / Project or Subcontract amount. If the Contractor initially enters into a Contract of less the $10,000, but subsequent changes in the Work increases the total Contract / Project amount to $10,000 or more, the TERO Fee shall apply to the total amount including increases.

1.1.3 The General Contractor shall be responsible for paying all TERO fees, including those attributable to the subcontractors. The fee shall be due in full prior to commencement of any work under the Contract / Project. However, where good cause is shown, the TERO Representative may authorize the General Contractor to pay said fee in installments over the course of the contract, when:

1.1.3.1 The decision whether to authorize an alternative arrangement, which, if allowed, shall be in writing, shall rest solely with the discretion of the TERO Representative.

1.1.4 Whenever an employer or union would be required by any provision of The Tulalip Code, Chapter 9.05 – TERO Code to give preference in employment, such preference shall be given to the following persons in the following enumerated order:

a) Enrolled Tulalip Tribal Members

b) Spouses, Parent of a tribal member child, biological child born to an enrolled Tulalip Tribal Member, current legal guardian of a Tribal Member dependent child (with a proper letter of temporary or permanent legal guardianship from a court), or a tribal member in a domestic partner relationship (with documentation).

c) Other Natives/Indians shall mean any member of a federally recognized Indian tribe, nation or band, including members of federally recognized Alaskan Native villages or communities.

d) Spouse of federally recognized Native American

e) Regular current employees of the all Tulalip Tribal entities

f) Other

Where prohibited by applicable Federal law or contractual agreements, the above order of preference shall not apply. In such cases, preference shall be given in accordance with the applicable Federal law or contract.

1.1.5 The preference requirements contained in The Tulalip Code, Chapter 9.05 – TERO Code shall be binding on all contractors and subcontractors, regardless of tier, and shall be deemed a part of all resulting contract agreements.

1.1.6 For more information about The Tulalip Code, Chapter 9.05 – TERO Code, contact the Tulalip Tribes" TERO Department at 6406 Marine Drive, Tulalip, Washington 98271, Office (360) 716-4747 or Facsimile (360) 716-0249. The Tulalip TERO Code is available for review on the Tulalip TERO website: http://www.tulaliptero.com.

1.1.7 The following requirements apply to the Bid Award Criteria and Procedures for the Project:

1.1.7.1 The bidding is open to all contractors meeting the requirements of RCW.

1.1.7.2 The Contract will be awarded based on competitive bidding process detailed in these instructions and the Tulalip Code.

1.1.7.3 Minimum TERO Participation Requirements for Employment:

1.1.7.3.1 A minimum of fifteen percent (15%) of the entire project work force shall be “Preferred Employees” as defined in The Tulalip Code, Chapter 9.05 – TERO Code.

1.1.7.3.2 The total number of “Preferred Employees” employed by the Bidder, and those employed by its subcontractors shall be used to determine if Bidder satisfies the minimum requirement.

1.1.7.3.3 Bidders are encouraged to exceed the minimum requirement for employment.

1.1.7.4 Not Used.

1.1.7.5 Minimum TERO Participation Requirements in contracting with NAOB Subcontractors and Suppliers:

1.1.7.5.1 Bidders are encouraged to contract with NAOB Subcontractors and Suppliers.

1.1.7.5.2 Bidders shall list their NAOB Subcontractors and Suppliers on the Bid Form in Section IV B, pursuant to paragraph IB 3.5.6.

1.1.7.6 Bidder shall be considered nonresponsive if they do not meet the minimum requirements contained in this paragraph IB 1.1.7.

1.2 NOT USED.

1.3 GIVING NOTICE

1.3.1 Whenever any provision of the Contract Documents requires the giving of notice, such notice shall be deemed to have been validly given if delivered personally to the individual or to a member of the entity for whom the notice is intended, or if sent electronically (by email or other agreed-upon method), or if delivered at or sent by registered or certified mail, postage prepaid, to the last business address of such individual or entity known to the giver of the notice.

1.3.1.1 All notices provided to the Bidder from the Owner's Representative shall be copied to the Architect.

1.3.1.2 All notices provided to the Bidder from the Architect shall be copied to the Owner's Representative.

1.3.1.3 All notices provided to the Architect from the Bidder shall be copied to the Owner's Representative.

1.3.1.4 All notices provided to the Owner's Representative from the Bidder shall be copied to the Architect.

1.3.2 When any period of time is referred to in the Contract Documents by days, it shall be computed to exclude the first, and include the last, day of such period. If the last day of any such period falls on a Saturday, Sunday, or a legal holiday, such day will be omitted from the computation and such period shall be deemed to end on the next succeeding day which is not a Saturday, Sunday, or legal holiday.

1.3.3 The effective date of any and all notices, regardless of the method of delivery, shall be the date of receipt.

1.4 USE OF FACSIMILE TRANSMISSION

1.4.1 Any notice required to be given by the Contract Documents may be given by facsimile transmission, provided the original signed notice is delivered pursuant to paragraph IB 1.3.1.

1.4.2 Notice of withdrawal of a bid may be given by facsimile transmission provided an original signed document is received within three (3) business days of the facsimile transmission.

ARTICLE 2 - BIDDING PROCEDURES

2.1 EXAMINATION OF CONTRACT DOCUMENTS AND PROJECT SITE

2.1.1 The Bidder shall examine all Contract Documents, including without limitation the Drawings and Specifications for all divisions of Work for the Project, noting particularly all requirements which will affect the Bidder's Work in any way. In addition, the Bidder must carefully examine all Contract Documents because laws and rules applicable to other Tribal projects are not necessarily applicable to this Project.

2.1.2 Failure of a Bidder to be acquainted with the extent and nature of Work required to complete any applicable portion of the Work, in conformity with all requirements of the Project as a whole wherever set forth in the Contract Documents, will not be considered as a basis for additional compensation.

2.1.3 The Bidder shall evaluate the Project site and related Project conditions where the Work will be performed, including without limitation the following:

2.1.3.1 The condition, layout and nature of the Project site and surrounding area;

2.1.3.2 The availability and cost of labor;

2.1.3.3 The availability and cost of materials, supplies and equipment;

2.1.3.4 The cost of temporary utilities required in the bid;

2.1.3.5 The cost of any permit or license required by a local or regional authority having jurisdiction over the Project;

2.1.3.6 The generally prevailing climatic conditions;

2.1.3.7 Conditions bearing upon transportation, disposal, handling, and storage of materials.

2.1.4 Unless otherwise specified in the Contract Documents, borings, test excavations and other subsurface information, if any, are provided solely to share information available to the Tulalip Tribes of Washington and any use of, or reliance upon, such items by the Bidder is at the risk of the Bidder. The Bidder shall be afforded access to the Project site to obtain the Bidder's own borings, test excavations and other subsurface information upon request made to the Owner's Representative not less than ten (10) days prior to the opening of the bids.

2.2 NOT USED

2.3 INTERPRETATION

2.3.1 If the Bidder finds any perceived ambiguity, conflict, error, omission or discrepancy on or between any of the Contract Documents, including without limitation the Drawings and Specifications, or between any of the Contract Documents and any applicable provision of law, including without limitation, the current International Building Code, the Bidder shall submit a written request to the Architect, through the Owner's Representative, for an interpretation or clarification.

2.3.1.1 The Bidder shall be responsible for prompt delivery of such request.

2.3.1.2 In order to prevent an extension of the bid opening, the Bidder is required to make all requests for interpretation or clarification a minimum of seven (7) days before the bid opening.

2.3.1.3 Use "Request for Information" form at Section 006313.

2.3.2 If the Architect determines that an interpretation or clarification is warranted, the Architect shall issue an Addendum and the Owner's Representative shall provide a copy to each person of record holding Contract Documents in accordance with paragraph IB 1.3. Any Addendum shall be deemed to have been validly given if it is delivered via facsimile, issued and mailed, or otherwise furnished to each person of record holding the Contract Documents. If any Addendum is issued within 72 hours prior to the published time for the bid opening, excluding Saturdays, Sundays and legal holidays, the bid opening shall automatically be extended one (1) week, with no further advertising required.

2.3.3 Any interpretation or clarification of the Contract Documents made by any person other than the Architect, or in any manner other than a written Addendum, shall not be binding and the Bidder shall not rely upon any such interpretation or clarification.

2.3.4 The Bidder shall not, at any time after the execution of the Contract, be compensated for a claim alleging insufficient data, incomplete, ambiguous, conflicting or erroneous Contract Documents, any discrepancy on or between Contract Documents, or incorrectly assumed conditions regarding the nature or character of the Work, if no request for interpretation or clarification regarding such matter was made by the Bidder prior to the bid opening.

2.4 STANDARDS

2.4.1 The articles, devices, materials, equipment, forms of construction, fixtures and other items named in the Specifications to denote kind quality or performance requirement shall be known as Standards and all bids shall be based upon those Standards.

2.4.2 Where two or more Standards are named, the Bidder may furnish any one of those Standards.

2.5 NOT USED.

2.6 BID FORM

2.6.1 Each bid shall be submitted on the Bid Form and sealed in an envelope clearly marked as containing a bid, indicating the Project name, the Contractor scope of work, and the date of the bid opening on the envelope.

2.6.1.1 Any change, alteration or addition in the wording of the Bid Form by a Bidder may cause the Bidder to be rejected as not responsible for award of a Contract.

2.6.1.2 Unless the Bidder withdraws the bid as provided in IB Article 4, the Bidder will be required to comply with all requirements of the Contract Documents, regardless of whether the Bidder had actual knowledge of the requirements and regardless of any statement or omission made by the Bidder which might indicate a contrary intention.

2.6.2 The Bidder shall fill in all relevant blank spaces in the Bid Form in ink or by typewriting and not in pencil.

2.6.2.1 The Bidder shall show bid amounts for the Total Base Bid and any Alternate(s) in both words and figures. In the case of a conflict between the words and figures, the amount shown in words shall govern, where such words are not ambiguous. When the Bidder's intention and the meaning of the words are clear, omissions or misspellings of words will not render the words ambiguous.

2.6.2.2 Any alteration or erasure of items filled in on the Bid Form shall be initialed by the Bidder in ink.

2.6.3 When an Alternate is listed on the Bid Form, the Bidder shall fill in the applicable blank with an increased or decreased bid amount. The Tulalip Tribes of Washington reserves the right to accept or reject any or all bids on Alternates, in whole or in part, and in any order. Voluntary Alternates submitted by a Bidder are prohibited from becoming the basis of the Contract award.

2.6.3.1 If no change in the bid amount is required, indicate "No Change" or "$0 dollars".

2.6.3.2 Failure to make an entry or an entry of "No Bid," "N/A," or similar entry for any Alternate by a Bidder may cause the Bidder to be rejected as nonresponsive only if that Alternate is selected.

2.6.3.3 If an Alternate is not selected, an entry by a Bidder as listed in paragraph IB 2.6.3.2 on that Alternate will not, by itself, render a Bidder nonresponsive.

2.6.3.4 In a combined bid, a blank entry or an entry of "No Bid," "N/A," or similar entry on an Alternate will cause the bid to be rejected as nonresponsive only if that Alternate applies to the combined bid and that Alternate is selected.

2.6.4 Each bid shall contain the name of every person interested therein. If the Bidder is a corporation, partnership, sole proprietorship, or limited liability company, an officer, partner or principal of the Bidder, as applicable, shall print or type the legal name of the Bidder on the line provided and sign the Bid Form. If the Bidder is a joint venture, an officer, partner or principal, as applicable, of each member of the joint venture shall print or type the legal name of the applicable member on the line provided and sign the Bid Form on behalf of that member. All signatures must be original.

2.6.5 Subject to the provisions of this paragraph IB 2.6, the completed Bid Form of the Bidder with whom the Tulalip Tribes of Washington executes a Contract Form shall be incorporated into the Contract Form as if fully rewritten therein.

2.7 REQUIRED SUBMITTALS WITH BID FORM

2.7.1 A Bidder shall be rejected as nonresponsive if the Bidder fails to submit the following submittals with the Bid Form in a sealed envelope:

2.7.1.1 A Bid Guaranty as provided in paragraph IB 6.1.

2.7.1.2 A Power of Attorney of the agent signing for a Surety which is licensed in Washington, when a Bid Guaranty and Contract Bond is submitted.

2.7.1.3 Native American Owned Business Written Confirmation Documentation for each Tulalip Tribal Member NAOB and NAOB firm listed on the Bidder's Bid Form.

2.7.1.4 Documentation substantiating Bidder's abilities to meet Bid Evaluation Criteria, as indicated in Paragraph 3.4.3.

2.8 NOT USED

2.9 CHANGE IN THE BID AMOUNT

2.9.1 Any change to a previously submitted bid shall be made in writing and must be received by the Tulalip Tribes of Washington before the time scheduled for the bid opening, as determined by the employee or agent of the Tulalip Tribes of Washington designated to open the bids.

2.9.2 Changes shall provide an amount to be added or subtracted from the bid amount, so that the final bid amount can be determined only after the sealed envelope is opened.

2.9.3 If the Bidder's written instruction reveals the bid amount in any way prior to the bid opening, the bid shall not be opened or considered for award of a Contract.

2.10 COPIES OF THE DRAWINGS AND SPECIFICATIONS

2.10.1 The Contractor shall maintain at the Project site the permits and one (1) complete set of Drawings and Specifications approved by the Tribes, city, local or state building department having lawful jurisdiction over the project.

2.10.2 Unless otherwise specified in the Contract Documents, the Architect, through the Owner's Representative, shall furnish to the Contractor, free of charge, four (4) sets of Drawings and Specifications if the Contract price is $500,000 or less, and seven (7) sets of Drawings and Specifications if the Contract price is in excess of $500,000.

ARTICLE 3 – BID OPENING AND CONSIDERATION OF BIDS

3.1 DELIVERY OF BIDS

3.1.1 It is the responsibility of the Bidder to submit the bid to the Tulalip Tribes of Washington at the location designated in the Notice to Bidders, prior to the time scheduled for bid opening.

3.1.2 If the bid envelope is enclosed in another envelope for the purpose of delivery, the exterior envelope shall be clearly marked as containing a bid with the Project name, the scope of Work or Contract and the date of the bid opening shown on the envelope.

3.1.3 No bid shall be considered if it arrives after the time set for the bid opening as indicated on the Notice to Bidders, or as otherwise amended by the Owner's Representative.

3.2 BID OPENING

3.2.1 Sealed bids will be received at the office designated in the Notice to Bidders until the time stated when all bids will be opened, read aloud and the tabulation made public.

3.2.2 The public opening and reading of bids is for informational purposes only and is not to be construed as an acceptance or rejection of any bid submitted.

3.2.3 The contents of the bid envelope shall be a public record and open for inspection, upon request, at any time after the bid opening.

3.3 BID OPENING EXTENSION

3.3.1 If any Addendum is issued within 72 hours prior to the published time for the bid opening, excluding Saturdays, Sundays and legal holidays, the bid opening shall automatically be extended one (1) week, with no further advertising required.

3.4 BID EVALUATION CRITERIA

3.4.1 The Tulalip Tribes of Washington reserves the right to accept or reject any bid or bids and to award the Contract to any remaining Bidder the Tulalip Tribes of Washington determines to be the lowest responsive and responsible Bidder pursuant to paragraph IB 3.5.1. The Tulalip Tribes of Washington reserves the right to accept or reject any or all Alternates, in whole or in part, and the right to reject any Alternate or Alternates and to accept any remaining Alternate or Alternates. Alternates may be accepted or rejected in any order.

3.4.2 The Tulalip Tribes of Washington may reject the bid of any Bidder who has engaged in collusive bidding.

3.4.3 In determining whether a Bidder is responsible, factors to be considered include, without limitation:

3.4.3.1 Whether the Bidder's bid responds to the Contract Documents in all material respects and contains no irregularities or deviations from the Contract Documents which would affect the amount of the bid or otherwise give the Bidder a competitive advantage (Mandatory – no points assigned).

3.4.3.2 Preference to Indians in hiring promotions, training and all other aspects of employment contracting and subcontracting (20 Points);

3.4.3.3 Statement of Qualifications: Documentation substantiating Bidders capabilities in meeting the Bid Evaluation Criteria in paragraphs 3.4.3.4 through 3.4.3.7 (Total 130 Points):

3.4.3.4 Management Experience (80 Points available in this category. A minimum of 50 points required in this category for prequalification approval.):

3.4.3.4.1 Business Owners: Provide the name, title, including a detailed description of the role and job responsibilities, scope of work and numbers of years with the firm for each of the business owner(s) of the firm. If the respondent General Contractor is a partnership, it is mandatory to provide the requested information for each general and limited partner. Similarly, if the respondent General Contractor is a corporation or a limited liability company, the requested information must be provided for each officer, director, and/or member (5 Points available).

3.4.3.4.2 Management Personnel: Provide the name, title, including a detailed description of the role and job responsibilities, scope of work, education, construction experience, years with the firm and list of all projects completed for all management personnel who will have any direct or indirect responsibility over the Project, including but not limited to project executives, project managers, field superintendents and field engineers (15 Points available).

3.4.3.4.3 Similar Project Experience: Provide the project name(s), description, scope of work, original contract sum, final contract sum with explanation, and year of completion for each similar project undertaken by the firm in the last five (5) years. For purposes of this RFQ, “similar projects” shall mean a building project of similar construction and projects that include instrumentation and controls integration for a wastewater treatment facility (30 Points available).

3.4.3.4.4 Terminations: Provide a list of any projects on which the firm was the General Contractor and was terminated, held in default, or failed to complete the work in the last ten (10) years. Include the name of the project, the timeframe of the project and circumstances surrounding the termination or default (10 Points available).

3.4.3.4.5 Legal Proceedings: Provide information about every legal proceeding, administrative proceeding, and arbitration that is currently pending against the General Contractor, this shall include but is not limited to legal proceedings commenced in tribal court(s) and or TERO commissions. Additionally, provide details about every legal proceeding, administrative proceeding, or arbitration that has concluded unfavorably for the General Contractor within the past five years. These should be related to the procurement or performance of any public or private construction contract (10 Points available).

3.4.3.4.6 Safety Record: Provide the three (3) year history of the General Contractor’s workers’ compensation experience modifier. In addition, provide documentation from the General Contractor’s insurance carrier supporting the rating history provided (10 Points available).

3.4.3.5 References (30 Points available in this category; minimum of 15 Points required in this category for prequalification approval).

3.4.3.5.1 Project References: Provide reference information for owners and architects for each and every project listed in your response to 3.5.6.3. The information provided shall at a minimum include project name and the names of the owners and architects, with current address, current telephone, and contact person for each (15 Points available).

3.4.3.5.2 Credit References: Provide a minimum of five (5) credit references, including the telephone and of a contact person from key suppliers, vendors, and banks (10 Points available).

3.4.3.5.3 Public Work Record: Provide a list of comparable completed public building construction Worked on during the past three (3) years with the project name, scope of work, contract value, start date, completion date, status of the project, owner’s name (including address, telephone number, and contact person) and architect’s name (including address, telephone number, and contact person). A public building shall be defined as any building owned and operated by a recognized government, such building is often used to carry out governmental duties

and may be occupied by a government agency (5 Points available).

3.4.3.6 Capacity to Complete Projects (20 Points available in this category; minimum of 10 points required in this category for qualification approval).

3.4.3.6.1 Statement of Financial Capacity: Provide a letter from the contractor's financial institution identifying the available line of credit and financial capacity to complete this project (10 Points)

3.4.3.6.2 Revenue: Submit a statement of revenue under contract for the next two (2) years (10 Points).

3.4.3.6.3 Financial information to be provided in a separate sealed envelope and marked confidential for Tulalip Tribe use only.

3.4.3.7 Mandatory Requirements - (no points assigned):

3.4.3.7.1 Bonding Capacity: Interested General Contractors must provide a commitment letter (from a surety company licensed to do business in the state of Washington and whose name appears on the United States Treasury Department Circular 570) for payment and performance bonds in an amount equal to or greater than one hundred percent (100%) of the estimated construction cost for Project.

3.4.3.7.2 Properly completed bid form.

3.4.3.7.3 Commercial General Liability insurance and Business Automobile Liability insurance policy to provide insurance coverage and limits as indicated. Automobile Liability insurance coverage shall include owned, non-owned and hired automobiles.

General Aggregate	$2,000,000
Product/Completed Operations Aggregate	$2,000,000
Occurrence Limit	$1,000,000
Personal & Advertising Injury Limit	$1,000,000
Fire Legal Liability Limit	$ 100,000
Medical Payments	$ 2,500
Employer's Liability	$1,000,000
Umbrella Liability	$5,000,000
Business Automobile Liability (Combined Single Limit)	$1,000,000
Workers' Compensation	Statutory Limits

3.4.4 The Tulalip Tribes of Washington reserves the right to waive, or to allow any Bidder a reasonable opportunity to cure, a minor irregularity or technical deficiency in a bid, provided the irregularity or deficiency does not affect the bid amount or otherwise give the Bidder a competitive advantage. Noncompliance with any requirement of the Contract Documents may cause a Bidder to be rejected.

3.4.5 The Tulalip Tribes of Washington may reject all bids for one or more bid packages, prior to, during or after evaluation of Bidders pursuant to paragraph IB 3.5.8, and may advertise for other bids, using the original estimate or an amended estimate, for such time, in such form and in such newspapers as the Tulalip Tribes of Washington may determine.

3.5 BID EVALUATION PROCEDURE

3.5.1 The Contract will be awarded to the lowest responsive and responsible Bidder as determined in the discretion of the Tulalip Tribes of Washington, unless Bidders are advised during the bidding process that all bids will be rejected in accordance with applicable Tribal Ordinances or Codes.

3.5.1.1 In determining which Bidder is lowest responsive and responsible, the Tulalip Tribes of Washington shall consider the Base Bid, the bids for any Alternate or Alternates which the Tulalip Tribes of Washington determines to accept, and documentation submitted with the Bid to substantiate Bidder's ability to meet Bid Evaluation Criteria listed in Paragraph 3.4.3.

3.5.1.2 If the Bid Proposal is not restricted bidding or limited competition to only qualified NAOB firms in accordance with TTC 9.05.270, then the NAOB shall be given a bid preference. Such preference "Y" shall be given to certified, qualified NAOBs provided their bid is no more than "X" higher than the bid prices of the lowest responsive bid from any qualified non-NAOB bidder. "X" and "Y" shall be determined as set forth in The Tulalip Code, Chapter 9.05 – TERO Code paragraph 9.05.340 (3).

3.5.1.3 The total of the bids for accepted Alternate(s) will be added to the Base Bid for the purpose of determining the lowest Bidder.

3.5.2 When listing "Preferred Employees" related to Section I – KEY EMPLOYEES OF BIDDER shall only list KEY "Preferred Employees" committed to be employed by Bidder in the performance of Bidder's self-performed scope of work.

3.5.2.1 Key Employees are employees who are in a top supervisory position or performs a critical function such that an employer would risk likely financial damage or loss if that task were assigned to a person unknown to the employer.

3.5.2.2 To be eligible for the award of points under this section Preferred Key Employees of Bidder shall be employed by the Bidder on the Project for 100% of the time the Bidder has crews on site performing work. Company owners are not eligible for the award of points under this section.

3.5.3 When listing "Preferred Employees" related to Section II – PREFERRED EMPLOYEES Bidder shall only list the number of "Preferred Employees" by each trade committed to be employed by Bidder in the performance of Bidder's self-performed scope of work.

3.5.3.1 To be eligible for the award of points under this section Preferred Employees shall be employed by the Bidder on the Project for a minimum of 80% of the time the Bidder has crews on site performing work. Company owners are not eligible for the award of points under this section.

3.5.4 Bidder shall not list the name of a "Preferred Employee" in more than one section. Should a "Preferred Employee" be listed in more than one section (i.e., Section I or II) the so named "Preferred Employee" will only be considered under Section I – KEY EMPLOYEES as a basis for award of points.

3.5.5 When listing lower tiered subcontractors and or suppliers related to Section IV – LIST OF LOWER TIERED SUBCONTRACTOR(S) AND OR SUPPLIER(S) Bidder shall identify the type of enterprise or organization Bidder intends to contract with in the columns titled “Type of Lower-Tier”. If Bidder intends to subcontract a certain portion of the work with a certified NAOB subcontractor, Bidder shall so designate by placing an “X” in the column titled “SUB” (abbreviated for subcontractor). If Bidder intends to purchase a certain portion of the work through a certified NAOB material supplier, Bidder shall so designate by placing an “X” in the column titled “SUP” (abbreviated for supplier). Bidder shall be awarded 100% of the value of the work subcontracted with a certified NAOB and ten-percent (10%) of the value of the work purchased through a certified NAOB material supplier in the determination of awarded points related to Section IV.

3.5.5.1 It is the expressed intent of paragraph IB 3.5.6 to encourage Bidders to contract with certified NAOB Firms in which the Bidder and enterprise or organization have no proprietary relationship (“Unrelated NAOB”). Points will only be awarded for contracting with Unrelated NAOB Firms.

3.5.5.2 In determining the award of points under paragraph IB 3.5.6, Lower tiered NAOB Firms shall have no proprietary relationship with other lower tiered NAOB Firms.

3.5.5.3 In determining the award of points under paragraph IB 3.5.6, equipment (unoperated) and tool rentals shall be considered as a supplier. Trucking (Dump, Low-boy, Long haul, etc.) and Operated Equipment Rental shall be considered as a subcontractor.

3.5.5.4 When Section IV – LIST OF LOWER TIERED SUBCONTRACTOR(S) AND OR SUPPLIER(S) is further defined by paragraph IB 1.1.7, which may include minimum requirements for contracting with Tulalip Tribal Member NAOB firms and NAOB firms, the provisions of paragraph IB 3.5.6 shall be applied to Tulalip Tribal Member NAOB and NAOB categories as defined by The Tulalip Code, Chapter 9.05 – TERO Code.

3.5.7 The Owner’s Representative may obtain from the lowest or most responsive and responsible Bidder, as applicable, and such other Bidders as the Owner’s Representative determines to be appropriate any additional information appropriate to the consideration of factors showing responsibility, including without limitation the following:

3.5.7.1 Further documentation for both TERO Preferred Employment and the Tulalip Tribal Member NAOB and NAOB Subcontractor and Suppliers utilization commitments listed on the Bidder’s Bid Form.

3.5.7.1.1 Supplemental Documentation to be submitted to for each TERO Preferred Employee listed on the Bid Proposal Forms includes, but is not limited to:

3.5.7.1.1.1 Proof of Enrollment issued by a Federally Recognized Indian Tribe or Alaska Native Corporation; or

3.5.7.1.1.2 A signed letter issued by the Tulalip TERO Office certifying that the listed individuals are Preferred Employees.

3.5.7.1.1.3 Bidders shall provide a project staffing plan or a manpowered loaded schedule for the project identifying when the Preferred Employees will be employed on the project and the duration thereof.

3.5.7.1.2 Additional information to be submitted to for each NAOB listed on the Bid Form includes, but is not limited to:

3.5.8.1.2.1 Correct business name, federal employee identification number (if available), and mailing address.

3.5.7.1.2.2 List of all bid items assigned to each successful Tulalip Tribal Member NAOB or NAOB firm, including Alternates (if applicable).

3.5.7.1.2.3 Description of partial items (if any) to be sublet to each successful Tulalip Tribal Member NAOB or NAOB firm specifying the distinct elements of work to be performed by the Tulalip Tribal Member NAOB or NAOB firm and including the dollar value of the Tulalip Tribal Member NAOB or NAOB firm's portion.

3.5.7.1.2.4 Submit evidence of certification for the Tulalip Tribal Member NAOB or NAOB.

3.5.7.2 Description of relevant facilities of the Bidder;

3.5.7.3 Complete list of subcontractors which the Bidder proposes to employ on the Project;

3.5.7.4 Current Washington Workers' Compensation Certificate or other similar type documentation supporting workers" compensation coverage;

3.5.7.5 If the Bidder is a foreign corporation, i.e., not incorporated under the laws of Washington, a Certificate of Good Standing from the Secretary of State showing the right of the Bidder to do business in the State; or, if the Bidder is a person or partnership, the Bidder has filed with the Secretary of State a Power of Attorney designating the Secretary of State as the Bidder's agent for the purpose of accepting service of summons in any action brought under this Contract.

3.5.8 Each such Bidder's information shall be considered separately and not comparatively. If the lowest or most responsive Bidder, as applicable, is responsible, the Contract shall be awarded to such Bidder or all bids are rejected.

3.5.9 If the lowest or most responsive Bidder, as applicable, is not responsible, and all bids are not rejected, the Tulalip Tribes of Washington shall follow the procedure set forth in paragraph IB 3.5.8 with each next lowest or most responsive Bidder, as applicable, until the Contract is awarded, all bids are rejected or all Bidders are determined to be not responsible.

3.6 REJECTION OF BID BY THE TULALIP TRIBES OF WASHINGTON

3.6.1 If the lowest or most responsive Bidder, as applicable, is not responsible, the Tulalip Tribes of Washington shall reject such Bidder and notify the Bidder in writing by certified mail of the finding and the reasons for the finding.

3.6.2 A Bidder who is notified in accordance with paragraph IB 3.6.1 may object to such Bidder's rejection by filing a written protest which must be received by the Tulalip Tribes of Washington, through the Owner's Representative, within five (5) days of the notification provided pursuant to paragraph IB 3.6.1.

3.6.3 Upon receipt of a timely protest, representatives of the Tulalip Tribes of Washington shall meet with the protesting Bidder to hear the Bidder's objections.

3.6.3.1 No award of the Contract shall become final until after the representatives of the Tulalip Tribes of Washington have met with all Bidders who have timely filed protests and the award of the Contract is affirmed by the Tulalip Tribes of Washington.

3.6.3.2 If all protests are rejected in the Tulalip Tribes of Washington's discretion the award of the Contract shall be affirmed by the Tulalip Tribes of Washington or all bids shall be rejected.

3.7 NOTICE OF INTENT TO AWARD

3.7.1 The Tulalip Tribes of Washington shall notify the apparent successful Bidder that upon satisfactory compliance with all conditions precedent for execution of the Contract Form, within the time specified, the Bidder will be awarded the Contract.

3.7.2 The Tulalip Tribes of Washington reserves the right to rescind any Notice of Intent to Award if the Tulalip Tribes of Washington determines the Notice of Intent to Award was issued in error.

ARTICLE 4 – WITHDRAWAL OF BID

4.1 WITHDRAWAL PRIOR TO BID OPENING

4.1.1 A Bidder may withdraw a bid after the bid has been received by the Tulalip Tribes of Washington, provided the Bidder makes a request in writing and the request is received by the Tulalip Tribes of Washington prior to the time of the bid opening, as determined by the employee or agent of the Tulalip Tribes of Washington designated to open bids.

4.2 WITHDRAWAL AFTER BID OPENING

4.2.1 All bids shall remain valid and open for acceptance for a period of at least, 90 days after the bid opening; provided, however, that within two (2) business days after the bid opening, a Bidder may withdraw a bid from consideration if the bid amount was substantially lower than the amounts of other bids, provided the bid was submitted in good faith, and the reason for the bid amount being substantially lower was a clerical mistake, as opposed to a judgment mistake, and was actually due to an unintentional and substantial arithmetic error or an unintentional omission of a substantial quantity of Work, labor or material made directly in the compilation of the bid amount.

4.2.1.1 Notice of a request to withdraw a bid must be made in writing filed with the Tulalip Tribes of Washington, through the Owner's Representative, within two (2) business days after the bid opening.

4.2.1.2 No bid may be withdrawn under paragraph IB 4.2.1 when the result would be the awarding of the Contract on another bid to the same Bidder.

4.2.2 If a bid is withdrawn under paragraph IB 4.2.1, the Tulalip Tribes of Washington may award the Contract to another Bidder the Tulalip Tribes of Washington determines

to be the next lowest or most responsive and responsible Bidder, as applicable, or reject all bids and advertise for other bids. If the Tulalip Tribes of Washington advertises for other bids, the withdrawing Bidder shall pay the costs, in connection with the rebidding, of printing new Contract Documents, required advertising and printing and mailing notices to prospective Bidders, if the Tulalip Tribes of Washington finds that such costs would not have been incurred but for such withdrawal.

4.2.3 A Bidder may withdraw the Bidder's bid at any time after the period described in paragraph IB 4.2.1 by written notice to the Tulalip Tribes of Washington.

4.3 REFUSAL BY TULALIP TRIBES OF WASHINGTON TO ACCEPT WITHDRAWAL

4.3.1 If the Tulalip Tribes of Washington intends to contest the right of a Bidder to withdraw a bid pursuant to paragraph IB 4.2.1, a hearing shall be held by one or more representatives of the Tulalip Tribes of Washington within ten (10) days after the bid opening and an order shall be issued by the Tulalip Tribes of Washington allowing or denying the claim of such right within five (5) days after such hearing is concluded. The Tulalip Tribes of Washington, through the Owner's Representative, shall give the withdrawing Bidder timely notice of the time and place of any such hearing.

4.3.1.1 The Tulalip Tribes of Washington shall make a stenographic record of all testimony, other evidence, and rulings on the admissibility of evidence presented at the hearing. The Bidder shall pay the costs of the hearing.

4.4 REFUSAL BY BIDDER TO PERFORM

4.4.1 If the Tulalip Tribes of Washington denies the claim for withdrawal and the Bidder elects to appeal or otherwise refuses to perform the Contract, the Tulalip Tribes of Washington may reject all bids or award the Contract to the next lowest or most responsive and responsible Bidder, as applicable.

4.5 EFFECT OF WITHDRAWAL

4.5.1 No Bidder who is permitted, pursuant to paragraph IB 4.2.1, to withdraw a bid, shall for compensation supply any material or labor to, or perform any subcontract or other work agreement for, the person to whom the Contract is awarded or otherwise benefit, directly or indirectly, from the performance of the Project for which the withdrawn bid was submitted, without the written approval of the Tulalip Tribes of Washington.

4.5.2 The person to whom the Contract is awarded and the withdrawing Bidder shall be jointly liable to the Tulalip Tribes of Washington in an amount equal to any compensation paid to or for the benefit of the withdrawing Bidder without such approval.

ARTICLE 5 – BID ESTIMATE

5.1 BID TOTALS

5.1.1 No Contract shall be entered into if the price of the Contract, or if the Project involves multiple Contracts where the total price of all Contracts for the Project, is in excess of ten (10) percent above the entire estimate.

5.2 SUBSTANTIALLY LOW BID

5.2.1 No Bidder shall be responsible if the Bidder's bid is more than twenty (20) percent below the median of all higher bids received for a Contract where the estimate is $100,000 or more, and no Bidder shall be responsible if the Bidder's bid is more

than twenty-five (25) percent below the median of all higher bids received for a Contract where the estimate is less than $100,000, unless the following procedures are followed.

5.2.1.1 The Owner's Representative and the Architect conduct an interview with the Bidder to determine what, if anything, has been overlooked in the bid, and to analyze the process planned by the Bidder to complete the Work. The Owner's Representative and the Architect shall submit a written summary of the interview to the Tulalip Tribes of Washington.

5.2.1.2 The Tulalip Tribes of Washington reviews and approves the Bidder's responsibility pursuant to paragraph IB 3.5.8.

5.2.1.3 The Owner's Representative notifies the Bidder's Surety, if applicable, in writing that the Bidder with whom the Tulalip Tribes of Washington intends to enter a Contract submitted a bid determined to be substantially lower than the median of all higher bids.

ARTICLE 6 – BID GUARANTY AND CONTRACT BOND

6.1 BID GUARANTY

6.1.1 The Bidder must file with the bid a Bid Guaranty, payable to the Tulalip Tribes of Washington, in the form of either:

6.1.1.1 The signed Bid Guaranty and Contract Bond contained in the Contract Documents for the amount of the Base Bid plus add Alternates; or

6.1.1.2 The signed Bid Proposal Bond contained in the Contract Documents for the amount of the Base Bid plus add Alternates; or

6.1.1.3 A cashier's check in the amount of five (5) percent of the Base Bid plus add Alternates.

6.1.1.4 If Bidder elects to file with the bid a Bid Guaranty under paragraph IB 6.1.1.3 Bidder shall also file with the bid a signed Statement of Intended Surety contained in the Contract Documents.

6.1.2 The Bid Guaranty shall be in form and substance satisfactory to the Tulalip Tribes of Washington and shall serve as an assurance that the Bidder will, upon acceptance of the bid, comply with all conditions precedent for execution of the Contract Form, within the time specified in the Contract Documents. Any Bid Guaranty must be payable to the Tulalip Tribes of Washington.

6.1.3 If the blank line on the Bid Guaranty and Contract Bond or Bid Proposal Bond is not filled in, the penal sum will automatically be the full amount of the Base Bid plus add Alternates. If the blank line is filled in, the amount must not be less than the full amount of the Base Bid plus add Alternates, stated in dollars and cents. A percentage is not acceptable.

6.1.4 The Bid Guaranty and Contract Bond or Bid Proposal Bond must be signed by an authorized agent, with Power of Attorney, from the Surety. The Bid Guaranty and Contract Bond or Bid Proposal Bond must be issued by a Surety licensed to transact business in the State of Washington.

6.1.5 Bid Guaranties will be returned to all unsuccessful Bidders 90 days after the bid opening. If used, the cashier's check will be returned to the successful Bidder upon compliance with all conditions precedent for execution of the Contract Form.

6.2 FORFEITURE

6.2.1 If for any reason, other than as authorized by paragraph IB 4.2.1 or paragraph IB 6.3, the Bidder fails to execute the Contract Form, and the Tulalip Tribes of Washington awards the Contract to another Bidder which the Tulalip Tribes of Washington determines is the next lowest or most responsive and responsible Bidder, as applicable, the Bidder who failed to enter into a Contract shall be liable to the Tulalip Tribes of Washington for the difference between such Bidder's bid and the bid of the next lowest or most responsible Bidder, as applicable, or for a penal sum not to exceed five (5) percent of the bid amount, whichever is less.

6.2.2 If the Tulalip Tribes of Washington then awards a Contract to another Bidder which the Tulalip Tribes of Washington determines is the next lowest or most responsive and responsible Bidder, as applicable, and such Bidder also fails or refuses to execute the Contract Form, the liability of such lowest or most responsive and responsible Bidder, as applicable, shall, except as provided in paragraph IB 6.3, be the amount of the difference between the bid amounts of such lowest or most responsible Bidder, as applicable, and another Bidder which the Tulalip Tribes of Washington determines is the next lowest or most responsive and responsible Bidder, as applicable, but not in excess of the liability specified in paragraph IB 6.2.1. Liability on account of an award to each succeeding lowest or most responsive and responsible Bidder, as applicable, shall be determined in like manner.

6.2.3 If the Tulalip Tribes of Washington does not award the Contract to another Bidder which the Tulalip Tribes of Washington determines is the next lowest or most responsive and responsible Bidder, as applicable, but resubmits the Project for bidding, the Bidder failing to execute the Contract Form shall, except as provided in paragraph IB 6.3, be liable to the Tulalip Tribes of Washington for a penal sum not to exceed five (5) percent of such Bidder's bid amount or the costs in connection with the resubmission, of printing new Contract Documents, required advertising and printing and mailing notices to prospective Bidders, whichever is less.

6.3 EXCEPTION TO FORFEITURE

6.3.1 A Bidder for a Contract costing less than $500,000 may withdraw a bid from consideration if the Bidder's bid for some other Contract costing less than $500,000 has already been accepted, if the Bidder certifies in good faith that the total price of all such Bidder's current contracts is less than $500,000, and if the Bidder's Surety, if applicable, certifies in good faith that the Bidder is unable to perform the subsequent contract because to perform such Contract would exceed the Bidder's bonding capacity.

6.3.2 If a bid is withdrawn pursuant to paragraph IB 6.3.1, the Tulalip Tribes of Washington may award the Contract to another Bidder which the Tulalip Tribes of Washington determines is the next lowest or most responsive and responsible Bidder, as applicable, or reject all bids and resubmit the Project for bidding, and neither the withdrawing Bidder nor such Bidder's Surety, as applicable, shall be liable for the difference between the Bidder's bid and that of another Bidder which the Tulalip Tribes of Washington determines is the next lowest or most responsive and responsible Bidder, as applicable, for a penal sum, or for the costs of printing new Contract Documents, required advertising and printing and mailing notices to prospective Bidders.

6.4 CONTRACT BOND

6.4.1 If the Bidder executes the Contract Form, the Bidder shall, at the same time, provide a Bond meeting the requirements of the Contract Documents, unless the Bidder provided an acceptable Bid Guaranty and Contract Bond at the time of the bid opening. A “A- VII” or better Best Rated Surety Company shall issue the required bond.

6.4.2 The Bond shall be in the full amount of the Contract to indemnify the Tulalip Tribes of Washington against all direct and consequential damages suffered by failure of the Contractor to perform according to the provisions of the Contract and in accordance with the plans, details, specifications and bills of material therefore and to pay all lawful claims of Subcontractors, Material Suppliers, and laborers for labor performed or materials furnished in carrying forward, performing or completing the Contract.

6.4.3 The Bond shall be supported by a Power of Attorney of the agent signing for a Surety. The Bond shall be supported by a current and signed Certificate of Compliance or Certificate of Authority showing the Surety is licensed to do business in Washington.

6.5 NOT USED

ARTICLE 7 – CONTRACT AWARD AND EXECUTION

7.1 NONCOMPLIANCE WITH CONDITIONS PRECEDENT

7.1.1 The award of the Contract and the execution of the Contract Form are based upon the expectation that the lowest or most responsive and responsible Bidder, as applicable, will comply with all conditions precedent for execution of the Contract Form within ten (10) days of the date of the Notice of Intent to Award.

7.1.1.1 Noncompliance with the conditions precedent for execution of the Contract Form within ten (10) days of the date of the Notice of Intent to Award shall be cause for the Tulalip Tribes of Washington to cancel the Notice of Intent to Award for the Bidder’s lack of responsibility and award the Contract to another Bidder which the Tulalip Tribes of Washington determines is the next lowest or most responsive and responsible Bidder, as applicable, or resubmit the Contract for bidding, at the discretion of the Tulalip Tribes of Washington.

7.1.1.2 The Tulalip Tribes of Washington may extend the time for submitting the conditions precedent for execution of the Contract Form for good cause shown. No extension shall operate as a waiver of the conditions precedent for execution of the Contract Form.

7.2 TIME LIMITS

7.2.1 The failure to award the Contract and to execute the Contract Form within 90 days of the bid opening invalidates the entire bid process and all bids submitted, unless the time is extended by written consent of the Bidder whose bid is accepted by the Tulalip Tribes of Washington and with respect to whom the Tulalip Tribes of Washington awards and executes a Contract.

7.2.1.1 If the Contract is awarded and the Contract Form is executed within 90 days of the bid opening, any increases in material, labor and

subcontract costs shall be borne by the Bidder without alteration of the amount of the bid.

7.2.1.2 If the cause of the failure to execute the Contract within 90 days of the bid opening is due to matters for which the Tulalip Tribes of Washington is solely responsible, the Contractor shall be entitled to a Change Order authorizing payment of verifiable increased costs in materials, labor or subcontracts.

7.2.1.3 If the cause of the failure to execute the Contract within 90 days of the bid opening is due to matters for which the Contractor is responsible, no request for increased costs will be granted.

7.3 CONDITIONS PRECEDENT FOR EXECUTION OF CONTRACT FORM

7.3.1 Bond, if required. To support the Bond, a current and signed Certificate of Compliance or Certificate of Authority showing the Surety is licensed to do business in Washington;

7.3.2 Current Washington Workers' Compensation Certificate or other similar type documentation supporting workers‟ compensation coverage;

7.3.3 Certificate of Insurance (ISO general liability form CG 2010 11/85 edition or equivalent form is acceptable) and copy of additional insured endorsement. The certificate shall clearly state The Tulalip Tribes of Washington, Consolidated Borough of Quil Ceda Village, and the State of Washington are named as "Additional Insureds‟ to the General Liability, Automobile Liability, and Excess Liability Policies. Workers Compensation coverage includes a waiver of subrogation against the Tulalip Tribes of Washington and Consolidated Borough of Quil Ceda Village." The wording "endeavor to" and "but failure to" under CANCELLATION shall be stricken from the certificate. The Tulalip Tribes of Washington reserves the right to request a certified copy of the Contractor's insurance policies meeting the requirements of GC Article 12;

7.3.4 If the Bidder is a foreign corporation, i.e., not incorporated under the laws of Washington, a Certificate of Good Standing from the Secretary of State showing the right of the Bidder to do business in the State; or, if the Bidder is a person or partnership, the Bidder has filed with the Secretary of State a Power of Attorney designating the Secretary of State as the Bidder's agent for the purpose of accepting service of summons in any action brought under this Contract;

7.3.5 Contractor signed Contract Form;

7.3.6 Completed and approved TERO Contracting and Subcontracting Compliance plan;

7.3.7 Current Tulalip Tribes Business License; and

7.3.8 Completed and signed Confidentiality Agreement.

7.4 NOTICE TO PROCEED AND SUBMITTALS

7.4.1 The Tulalip Tribes of Washington shall issue to the Contractor a Notice to Proceed, which shall establish the date for Contract Completion. The Contractor shall, within ten (10) days of the date of the Notice to Proceed, furnish the Owner's Representative with the following submittals:

7.4.1.1 Contract Cost Breakdown;

7.4.1.2 Preliminary schedule of Shop Drawings and Submittals;

7.4.1.3 Outline of qualifications of the proposed superintendent; and

7.4.1.4 Acknowledgement by a TERO Representative the Project related TERO fee has been paid or an agreement has been reached to pay the fee in installments over the course of the Contract.

ARTICLE 8 – APPLICABLE LAW AND FORUM

8.1 FORUM FOR EQUITABLE RELIEF

8.1.1 The Tribal Court of the Tulalip Tribes of Washington shall have exclusive jurisdiction over any action or proceeding for any injunction or declaratory judgment concerning any agreement or performance under the Contract Documents or in connection with the Project. Any such action or proceeding arising out of or related in any way to the Contract or performance thereunder shall be brought only in the Tribal Court of the Tulalip Tribes of Washington and the Contractor irrevocably consents to such jurisdiction and venue. The Contract shall be governed by the law of the State of Washington.

8.2 FORUM FOR MONEY DAMAGES

8.2.1 The Tribal Court of the Tulalip Tribes of Washington shall be the exclusive jurisdiction for any action or proceeding for any injunction or declaratory judgment concerning any agreement or performance under the Contract Documents or in connection with the Project. The Tribal Court of the Tulalip Tribes of Washington shall be the exclusive jurisdiction for any action or proceeding by the Contractor or the Contractor's Surety, if applicable, for any money damages concerning any agreement or performance under the Contract Documents or in connection with the Project.

END INSTRUCTIONS TO BIDDERS

BID PROPOSAL FORM

Project Name: Utility Building Date of Bid: _____

Location of Project: 3015 Mission Beach Road Tulalip, Washington 98271

COMPANY NAME OF BIDDER:

CERTIFIED NATIVE AMERICAN OWNED BUSINESS:

YES _____ If Yes, Percentage (%) of Indian Ownership: _____ **NO**

Having read and examined the Contract Documents, including without limitation the Drawings and Specifications, prepared by the Architect and the Tulalip Tribes of Washington for the above-referenced Project, and the following Addenda:

ADDENDA ACKNOWLEDGED (Enter Addenda Number and Date of Addenda below):

1. _____ 2. _____
3. _____ 4. _____

The undersigned Bidder proposes to perform all Work for the applicable Contract, in accordance with the Contract Documents, within 460 calendar days, for the following sum:

BASE BID AMOUNT **$** _____

TOTAL ALLOWANCES **$** _____87,250.00

TERO TAX (1.75%) AMOUNT **$** _____

BASE BID PLUS TERO TAX **$** _____

(In Words):

_____

Refer to Division 00, TERO Code for application of TERO and Taxes. Work within Tribal Reservation Boundary, Washington State Sales Tax Does Not Apply

TRENCH EXCAVATION SAFETY PROVISIONS: If contracted work contains any work that requires trenching exceeding a depth of four (4) feet, all costs for trench safety shall be included in the Base Bid amount for adequate trench safety systems in compliance with Chapter 39.04 RCW and WAC 296-155-650. The purpose of this provision is to ensure that the bidder agrees to comply with all the relevant trench safety requirements of Chapter 49.17 RCW. This bid amount shall be considered as part of the total Base Bid amount set forth above.

The following items shall also be considered in the review and award of this Contact. Bidder shall complete each section as applicable. By submission of this bid proposal, Bidder acknowledges their commitment to employ and or contract work to the parties identified below during the performance of Bidder's awarded Work.

SECTION I – KEY EMPLOYEES OF BIDDER (if required, attach additional sheets if needed)

		PREFERRED EMPLOYEE	
NAME	**POSITION**	**Yes**	**No**
1.	1.		
2.	2.		
3.	3.		
4.	4.		
5.	5.		

SECTION II – PREFERRED "TRADE" EMPLOYEES (if required, attach additional sheets if needed)

NUMBER OF PREFERRED "TRADE" EMPLOYEES	NUMBER OF PREFERRED "TRADE" EMPLOYEES
1.	2.
3.	4.
5.	6.
7.	8.
9.	10.

SECTION III – PEAK WORK FORCE OF ALL EMPLOYEES ANTICIPATED TO BE EMPLOYED BY BIDDER AT THE PROJECT SITE IN THE PERFORMANCE OF THE WORK:
(Insert Number of Employees)

SECTION IV – LIST OF LOWER TIERED SUBCONTRACTOR(S) AND OR SUPPLIER(S)
(Total of Sections IV.A and IV.B)

SECTION IV A – LIST OF TULALIP TRIBAL MEMBER NAOB SUBCONTRACTOR(S) AND OR SUPPLIER(S) (if required, attach additional sheets if needed)

			TYPE OF LOWER-TIER		TULALIP NAOB	
NAME OF SUBCONTRACTOR (SUB) OR SUPPLIER (SUP)	**TYPE OF WORK TO BE AWARDED**	**DOLLAR VALUE OF WORK**	**SUB**	**SUP**	**Yes**	**No**
1.	1.	$				
2.	2.	$				
2.	3.	$				
4.	4.	$				
5.	5.	$				
6.	6.	$				
7.	7.	$				
8.	8.	$				
9.	9.	$				
10.	10.	$				

SECTION IV B – LIST OF NAOB SUBCONTRACTOR(S) AND OR SUPPLIER(S) (if required, attach additional sheets if needed)

			TYPE OF LOWER-TIER		NAOB	
NAME OF SUBCONTRACTOR (SUB) OR SUPPLIER (SUP)	**TYPE OF WORK TO BE AWARDED**	**DOLLAR VALUE OF WORK**	**SUB**	**SUP**	**Yes**	**No**
1.	1.	$				
2.	2.	$				
3.	3.	$				
4.	4.	$				
5.	5.	$				
6.	6.	$				
7.	7.	$				
8.	8.	$				
9.	9.	$				
10.	10.	$				

SECTION IV C – LIST OF MAJOR SUBCONTRACTORS

(List each subcontractor whose Work comprises 10% or greater of the total Contract Price

NAME OF SUBCONTRACTOR	TYPE OF WORK TO BE AWARDED	DOLLAR VALUE OF WORK
1.	1.	$
2.	2.	$
3.	3.	$
4.	4.	$
5.	5.	$
6.	6.	$
7.	7.	$
8.	8.	$
9.	9.	$
10.	10.	$

Should Contractor fail to comply, to the fullest extent possible, with provisions for employment and or contracting as defined in The Tulalip Code, Chapter 9.05 – TERO Code, Contractor may be found to be in breach of Contract. If it is determined that a breach has occurred, Contractor acknowledges that said breach will be grounds to terminate Contractor's Contract agreement without claim against The Tulalip Tribes of Washington or the Project for any additional compensation and or consideration.

SECTION V – BID EVALUATION DOCUMENTATION

On separate sheets, provide documentation to demonstrate Bidder's ability to meet Bid Evaluation Criteria as listed in the Instructions to Bidders, Paragraph 3.4.3.

(REMAINDER OF PAGE INTENTIONALLY LEFT BLANK)

The Tulalip Tribes of Washington

BIDDER'S CERTIFICATION

The Bidder hereby acknowledges that the following representations in this bid are material and not mere recitals:

1. The Bidder has read and understands the Contract Documents and agrees to comply with all requirements of the Contract Documents, regardless of whether the Bidder has actual knowledge of the requirements and regardless of any statement or omission made by the Bidder which might indicate a contrary intention.
2. The Bidder represents that the bid is based upon the Standards specified by the Contract Documents.
3. The Bidder acknowledges that all Work shall be completed within the time established in the Contract Documents, and that each applicable portion of the Work shall be completed upon the respective milestone completion dates, unless an extension of time is granted in accordance with the Contract Documents. The Bidder understands that the award of separate contracts for the Project will require sequential, coordinated and interrelated operations which may involve interference, disruption, hindrance or delay in the progress of the Bidder's Work. The Bidder agrees that the Contract price, as amended from time to time by Change Order, shall cover all amounts due from the Tulalip Tribes of Washington resulting from interference, disruption, hindrance or delay caused by or between Contractors or their agents and employees.
4. The Bidder has visited the Project site, become familiar with local conditions and has correlated personal observations with the requirements of the Contract Documents. The Bidder has no outstanding questions regarding the interpretation or clarification of the Contract Documents.
5. The Bidder agrees to comply with The Tulalip Code, Chapter 9.05 – TERO Code and give preference to Indians in hiring promotions, training and all other aspects of employment contracting and subcontracting.
6. The Bidder agrees to comply with The Tulalip Code, Chapter 9.05 – TERO Code and give preference to certified Indian-owned enterprises and organizations in the award of contracts and subcontracts.
7. The Bidder and each person signing on behalf of the Bidder certifies, and in the case of a joint or combined bid, each party thereto certifies as to such party's entity, under penalty of perjury, that to the best of the undersigned's knowledge and belief: (a) the Base Bid, any Unit Prices and any Alternate Bid in the bid have been arrived at independently without collusion, consultation, communication or agreement, for the purpose of restricting competition as to any matter relating to such Base Bid, Unit Prices or Alternate bid with any other Bidder; (b) unless otherwise required by law, the Base Bid, any Unit Prices and any Alternate bid in the bid have not been knowingly disclosed by the Bidder and will not knowingly be disclosed by the Bidder prior to the bid opening, directly or indirectly, to any other Bidder who would have any interest in the Base Bid, Unit Prices or Alternate bid; (c) no attempt has been made or will be made by the Bidder to induce any other individual, partnership or corporation to submit or not to submit a bid for the purpose of restricting competition.

8. The Bidder will execute the Contract Form with the Tulalip Tribes of Washington, if a Contract is awarded on the basis of this bid, and if the Bidder does not execute the Contract Form for Tulalip any reason, other than as authorized by law, the Bidder and the Bidder's Surety are liable to the Tulalip Tribes of Washington as provided in Article 6 of the Instructions to Bidders.
9. Bidder agrees to furnish any information requested by the Tulalip Tribes of Washington to evaluate the responsibility of the Bidder.

(REMAINDER OF PAGE INTENTIONALLY LEFT BLANK)

NON - COLLUSION DECLARATION

Failure to return this Declaration as part of the bid proposal package will make the bid nonresponsive and ineligible for award.

NON-COLLUSION DECLARATION

I, by signing the proposal, hereby declare, under penalty of perjury under the laws of the United States that the following statements are true and correct:

1. That the undersigned person(s), firm, association or corporation has (have) not, either directly or indirectly, entered into any agreement, participated in any collusion, or otherwise taken any action in restraint of free competitive bidding in connection with the project for which this proposal is submitted.
2. **That by signing the signature page of this proposal, I am deemed to have signed and to have agreed to the provisions of this declaration.**

NOTICE TO ALL BIDDERS

To report rigging activities call:

1-800-424-9071

The U.S. Department of Transportation (USDOT) operates the above toll-free "hotline" Monday through Friday, 8:00 a.m. to 5:00 p.m., eastern time. Anyone with knowledge of possible bid rigging, bidder collusion, or other fraudulent activities should use the "hotline" to report such activities.

The "hotline" is part of USDOT's continuing effort to identify and investigate highway construction contract fraud and abuse and is operated under the direction of the USDOT Inspector General. All information will be treated confidentially and caller anonymity will be respected.

The Tulalip Tribes of Washington

Any modification made to either the bid form or exception taken to the defined scope of work outlined in this bid package may result in the bid proposal being considered non-responsive.

Each bid shall contain the name of every person interested therein. If the Bidder is a corporation, partnership, sole proprietorship, or limited liability corporation, an officer, partner or principal of the Bidder, as applicable, shall print or type the legal name of the Bidder on the line provided and sign the Bid Form. If the Bidder is a joint venture, an officer, partner or principal, as applicable, of each member of the joint venture shall print or type the legal name of the applicable member on the line provided and signs the Bid Form. An unsigned Bid Form will render the Bid as non-responsive.

BIDDER'S NAME (PRINT): _____

Authorized Signature: _____

Title: _____

Company Name: _____

Mailing Address: _____

_____

Telephone Number: (_____) _____ Facsimile Number (____) _____

Where Incorporated: _____

Type of Business (circle one): corporation partnership sole proprietorship limited liability corporation

The Tulalip Tribes Business License Number: _____

State of Washington Contractor's License Number: _____

Federal ID Number: _____

Contact Person for Contract processing: _____

BIDDER'S NAME (PRINT): _____

Authorized Signature: _____

Title: _____

Company Name: _____

Mailing Address: _____

_____

Telephone Number: (_____) _____ Facsimile Number (____) _____

Where Incorporated: _____

Type of Business (circle one): corporation partnership sole proprietorship limited liability corporation

The Tulalip Tribes Business License Number: _____

State of Washington Contractor's License Number: _____

Federal ID Number: _____

Contact Person for Contract processing: _____

The Tulalip Tribes of Washington

SUB-CONTRACTORS OR SUPPLIERS

Native American TERO Certified Businesses that are qualified and come within 10% of the low bid. will be provided negotiated preference.

IN DATE ORDER, ALL SUB-CONTRACTORS WILL NEED A COMPLIANCE PLAN

Company	Contact Person	Phone	Native	Sub or Supplier

JOB ORDER

If the TERO jobs skills bank has qualified persons, they are required to receive preference in hiring to comply with the TERO law.

Job Title	Number of Positions	Rate of Pay	Date from Ito

Foreman to contact cell:

I declare that all the answers and statements are true, correct and complete to the best of my knowledge. I understand that untruthful or misleading answers are cause for denial of my application and/or revocation of any certification granted.

Print Name	Signature	Title	Date

Office use only

				Yes	NO
Recommended by	Date	Managers Signature	Date	Approved	
Notes:					

NAOB Written Confirmation

Native American Owned Business (NAOB) Written Confirmation Document

As an authorized representative of the Native American Owned Business (NAOB), I confirm that we have been contacted by the referenced bidder with regard to the referenced project and if the bidder is awarded the contract we will enter into an agreement with the bidder to participate in the project consistent with the information provided on the bidder's Bid Proposal Form, Section IV.

Contract Title: _____

Bidder's Business Name: _____

NAOB's Business Name: _____

NAOB Signature: _____

NAOB's Representative _____

Name and Title: _____

Date: _____

The entries must be consistent with what is shown on the bidder's Bid Proposal Form, Section IV. Failure to do so will result in bid rejection. See Instructions to Bidders Section 1.1.7; *Minimum TERO Participation for Subcontractors.*

Description of Work:_____

Amount to be Awarded to NAOB:_____

FORM OF BID GUARANTY & CONTRACT BOND

KNOW ALL PERSONS BY THESE PRESENTS, that we, the undersigned _____as Principal at , (Address) _____ and _____ as Surety, are hereby held and firmly bound unto the Tulalip Tribes of Washington, herein referred to as Tulalip Tribes, in the penal sum of the dollar amount of the bid submitted by the Principal to the Tulalip Tribes on (date) _____ , ____ to undertake the Project known as: .

The penal sum, referred to herein, shall be the dollar amount of the Principal's bid to the Tulalip Tribes, incorporating any additive or deductive alternate bids or any additive or deductive allowance bids made by the Principal on the date referred to above to the Tulalip Tribes, which are accepted by the Tulalip Tribes. In no case shall the penal sum exceed the amount of dollars ($_____). (If the above line is left blank, the penal sum will be the full amount of the Principal's bid, including alternates and unit prices. Alternatively, if completed, the amount stated must not be less than the full amount of the bid, including alternates and allowances, in dollars and cents. A percentage is not acceptable.) For the payment of the penal sum well and truly to be made, we hereby jointly and severally bind ourselves, our heirs, executors, administrators, successors and assigns.

THE CONDITION OF THE ABOVE OBLIGATION IS SUCH, that whereas the above-named Principal has submitted a bid on the above-referred to project;

NOW, THEREFORE, if the Tulalip Tribes accept the bid of the Principal, and the Principal fails to enter into a proper contract in accordance with the bid, plans, details, specifications and bills of material; and in the event the Principal pays to the Tulalip Tribes the difference not to exceed five percent of the penalty hereof between the amount specified in the bid and such larger amount for which the Tulalip Tribes may in good faith contract with the next lowest bidder to perform the work covered by the bid; or resubmits the project for bidding, the Principal will pay the Tulalip Tribes the difference not to exceed five percent of the penalty hereof between the amount specified in the bid, or the costs, in connection with the resubmission, of printing new contract documents, required advertising and printing and mailing notices to prospective bidders, whichever is less, then this obligation shall be null and void, otherwise to remain in full force and effect. If the Tulalip Tribes accept the bid of the Principal, and the Principal, within ten days after the awarding of the contract, enters into a proper contract in accordance with the bid, plans, details, specifications and bills of material, which said contract is made a part of this bond the same as though set forth herein; and

IF THE SAID Principal shall well and faithfully perform each and every condition of such contract; and indemnify the Tulalip Tribes against all damage suffered by failure to perform such contract according to the provisions thereof and in accordance with the plans, details, specifications and bills of material therefore; and shall pay all lawful claims of subcontractors, material suppliers and laborers for labor performed and materials furnished in the carrying forward, performing or completing of said contract; we, agreeing and assenting to, at this undertaking shall be for the benefit of any material supplier or laborer having a just claim, as well as for the Tulalip Tribes herein; then this obligation shall be void; otherwise the same shall remain in full force and effect; it being expressly understood and agreed that the liability of the

Surety for any and all claims hereunder shall in no event exceed the penal amount of this obligation as herein stated.

THE SAID Surety hereby stipulates and agrees that no modifications, omissions or additions, in or to the terms of said contract or in or to the plans and specifications, therefore, shall in any wise affect the obligations of said Surety on its bond, and it does hereby waive notice of any such modifications, omissions or additions to the terms of the contract or to the work or to the specifications.

SIGNED this _____ day of ,

PRINCIPAL:

_____

By: _____

Title: _____

SURETY:

_____

Address: _____

_____

Phone: ( ) _____

By: _____

Attorney-in-Fact

SURETY AGENT:

_____

Address: _____

_____

Phone: ( ) _____

The Tulalip Tribes of Washington

STATEMENT OF INTENDED SURETY

(Required if Bid Deposit is NOT a Surety Bond)

FURNISH WITH BIDDER'S SEALED BID a written statement prepared and signed by Bidder's intended sureties or surety company, to the effect that: _____ (Name of Surety), who meets the requirements of Chapter 48.28 RCW, will promptly provide a surety bond in the amount of 100% of the base bid in the event _____ (Bidder's Name) is awarded a Contract for _____ (Project Description) and that the proposed Construction Contract is acceptable to the Surety.

Surety:

Signature of Authorized Representative

Printed Name / Title of Authorized Representative

This statement, if required, must be included in Bidder's sealed bid for Bidder's Bid to be considered.

_____

By: _____

Title: _____

SURETY:

_____

Address: _____

_____

Phone: (___) _____

By: _____

Attorney-in-Fact

SURETY AGENT:

_____

Address: _____

Phone: (____) _____

The Tulalip Tribes of Washington

BID PROPOSAL BOND

KNOW ALL BY THESE PRESENTS, that (Name of Bidder) _____ a corporation, partnership, or individual) duly organized under the laws of the State of _____ as principal, and (Name of Surety) _____ a corporation duly organized under the laws of the State of _____ and authorized to do business in the State of Washington, as surety, are held and firmly bound unto The Tulalip Tribes of Washington in the full and penal sum of five (5) percent of the total amount of the bid proposal of said principal for the work hereinafter described for the payment of which, well and truly to be made, we bind our heirs, executors, administrators and assigns, and successors and assigns, firmly by these presents.

_____

_____

Said bid and proposal, by reference hereto, being made a part hereof.

NOW, THEREFORE, if the said proposal bid by said principal be accepted, and the contract be awarded to said principal, and if said principal shall duly make and enter into and execute said contract and shall furnish a performance, payment and warranty bond as required by The Tulalip Tribes of Washington within a period of ten (10) days from and after said award, exclusive of the day of such award, then this obligation shall be null and void, otherwise it shall remain and be in full force and effect.

IN TESTIMONY WHEREOF, the principal and surety have caused these presents to be signed and sealed this _____ day of _____ , 20_____.

Principal _____

(Name)

(Address) _____

_____

By _____

(Signature of Authorized Rep)

_____

(Typed Name of Authorized Rep)

Title _____

SURETY

Name

By _____

_____

(Attorney-in-fact for Surety)

_____

(Name & Address of local Office or Agent)

_____

*This bond must be accompanied by a fully executed Power of Attorney appointing the attorney-in-fact.

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
Company: *(Corporate Seal)*

Signature: _____
Name and Title: « »« »

SURETY
Company: *(Corporate Seal)*

Signature: _____
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.

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

Addendum No. 1

§ 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, including all TERO obligations, then the Surety and the Contractor shall have no obligation under this Bond.

§ 3 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, including any TERO liabilities, and tendered defense of such claims, demands, liens or suits to the Contractor and the Surety.

§ 4 Upon notice as set forth 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 completion of the Work under the Construction Contract; 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 thirty (30) 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 and costs 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 two years 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 Substantial Completion of the Work under the Construction Contract, whichever of (1) or (2) first occurs. Notwithstanding the foregoing, any proceeding, legal or equitable, under this Bond and involving the Owner shall be governed by the choice of law and venue provisions set forth in the Construction Contract and Surety agrees to be bound thereto and consents to jurisdiction as set forth therein

§ 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, including any TERO obligations. 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 erm Claimant also includes the Tulalip Tribal Employment Rights Office (TERO). 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, TERO obligations, 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 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 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:

«Surety agrees that electronic signatures (whether digital or encrypted) and/or and scanned copies of original signatures on this document is intended to authenticate this bond and shall have the same force and effect as manual signatures and original copies. Such electronically signed or scanned/PDF versions of this AIA Document A312, Performance Bond shall be fully enforceable against the Surety »

(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:	« »

DRAFT

AIA® Document A312™ – 2010

Performance 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 16

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 Performance 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.

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

Addendum No. 1

§ 1 The Contractor and Surety, jointly and severally, bind themselves, their heirs, executors, administrators, successors and assigns to the Owner for the performance of the Construction Contract, which is incorporated herein by reference.

§ 2 If the Contractor performs the Construction Contract, including all warranty obligations, the Surety and the Contractor shall have no obligation under this Bond, except when applicable to participate in a conference as provided in Section 3.

§ 3 The Surety's obligation under this Bond shall arise after

.1 the Owner first provides notice to the Contractor and the Surety that the Owner is considering declaring a Contractor Default. Such notice shall indicate whether the Owner is requesting a conference among the Owner, Contractor and Surety to discuss the Contractor's performance. If the Owner does not request a conference, the Surety may, within five (5) business days after receipt of the Owner's notice, request such a conference. If the Surety timely requests a conference, the Owner shall attend. Unless the Owner agrees otherwise, any conference requested under this Section 3.1 shall be held within ten (10) business days of the Surety's receipt of the Owner's notice. If the Owner, the Contractor and the Surety agree, the Contractor shall be allowed complete the performance of the Construction Contract, but such an agreement shall not waive the Owner's right, if any, subsequently to declare a Contractor Default; or

.2 the Owner declares a Contractor Default, terminates the Construction Contract and notifies the Surety and the Owner has agreed to pay the Balance of the Contract Price in accordance with the terms of the Construction Contract to the Surety or to a contractor selected to perform the Construction Contract.

§ 4 Upon notice of default under Section 3.2 above, the Surety shall promptly and at the Surety's expense take one of the following actions:

§ 4.1 Undertake to perform and complete the Construction Contract itself, including all warranty obligations, through its agents or independent contractors, which shall not include the Contractor without prior written consent of the Owner;

§ 4.2 Obtain bids or negotiated proposals from qualified contractors acceptable to the Owner for a contract for performance and completion of the Construction Contract, arrange for a contract to be prepared for execution by the Owner and a contractor selected with the Owner's concurrence, to be secured with performance and payment bonds executed by a qualified surety equivalent to the bonds issued on the Construction Contract, and pay to the Owner the amount of damages as described in Section 6 in excess of the Balance of the Contract Price incurred by the Owner as a result of the Contractor Default; or

§ 4.3 Waive its right to perform and complete, arrange for completion, or obtain a new contractor and with reasonable promptness under the circumstances, but in no less than thirty (30) days from receipt of Owner's notice in Section 3:

.1 Determine the amount for which it may be liable to the Owner and, as soon as practicable after the amount is determined, make payment to the Owner; or

.2 Deny liability in whole or in part and notify the Owner, citing the reasons for denial.

§ 5 If the Surety does not proceed as provided in Section 4 within the time period set forth in Section 4.3, the Surety shall be deemed to be in default on this Bond seven days after receipt of an additional written notice from the Owner to the Surety demanding that the Surety perform its obligations under this Bond, and the Owner shall be entitled to enforce any remedy available to the Owner. If the Surety proceeds as provided in Section 4.3, and the Owner refuses the payment or the Surety has denied liability, in whole or in part, without further notice the Owner shall be entitled to enforce any remedy available to the Owner.

§ 6 If the Surety elects to act under Section 4.1 or 4.2, then the responsibilities of the Surety to the Owner shall not be greater than those of the Contractor under the Construction Contract, and the responsibilities of the Owner to the Surety shall not be greater than those of the Owner under the Construction Contract. Subject to the commitment by the Owner to pay the Balance of the Contract Price in accordance with the Construction Contract, the Surety is obligated, without duplication, for

.1 the responsibilities of the Contractor for correction of defective work and completion of the Construction Contract, including all warranty work;

.2 additional legal, design professional and delay costs resulting from the Contractor's Default, and resulting from the actions or failure to act of the Surety under Section 4; and

.3 liquidated damages, or if no liquidated damages are specified in the Construction Contract, actual damages caused by delayed performance or non-performance of the Contractor.

§ 7.1 If the Surety elects to act under Section 4.3.1, the Surety's liability is limited to the amount of this Bond. In such instance, the Owner shall inform the Surety of the estimate of its actual costs to complete the Project, including the additional legal, design professional and delay costs resulting from the Contractor's Default, and liquidated damages, or if no liquidated damages are specified in the Construction Contract, actual damages caused by delayed performance or non-performance, which shall be remitted to the Owner within fourteen (14) days. At the completion of the Construction Contract, including the warranty period, the Owner shall return, without interest, any overpayment made by the Surety and the Surety shall pay to the Owner any actual costs which exceed the Owner's estimate, limited to the bond amount.

§ 7.2 If the Surety elects to act under Section 4.3.2, the Surety's liability is limited to the amount of this Bond, but Surety shall also be responsible for the attorneys' fees and costs incurred by the Owner related to any dispute over the Surety's obligations. If the Surety denies liability in whole or in part, the parties shall promptly proceed to the dispute resolution process as set forth in the Construction Contract.

§ 8 The Surety shall not be liable to the Owner or others for obligations of the Contractor that are unrelated to the Construction Contract, and the Balance of the Contract Price shall not be reduced or set off on account of any such unrelated obligations, except as allowed under applicable law. No right of action shall accrue on this Bond to any person or entity other than the Owner or its heirs, executors, administrators, successors and assigns.

§ 9 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.

§ 10 Any proceeding, legal or equitable, under this Bond may shall be governed by the choice of law and venue provisions set forth in the Construction Contract and Surety agrees to be bound thereto and consents to jurisdiction as set forth therein. Such proceeding shall be instituted within two years after a declaration of Contractor Default or within two years after the Contractor ceased working or within two years after the Surety refuses or fails to perform its obligations under this Bond, whichever occurs first. 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.

§ 11 Notice 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.

§ 12 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.

§ 13 Surety agrees that electronic signatures (whether digital or encrypted) and/or and scanned copies of original signatures on this document is intended to authenticate this bond and shall have the same force and effect as manual signatures and original copies. Such electronically signed or scanned/PDF versions of this AIA Document A312, Performance Bond shall be fully enforceable against the Surety.

§ 14 Definitions

§ 14.1 Balance of the Contract Price. The total amount payable by the Owner to the Contractor under the Construction Contract after all proper adjustments have been made, including allowance to the Contractor of any amounts received or to be received by the Owner in settlement of insurance or other claims for damages to which the Contractor is entitled, reduced by all valid and proper payments made to or on behalf of the Contractor under the Construction Contract.

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

§ 14.3 Contractor Default. Failure of the Contractor, which has not been remedied in accordance with the Construction Contract, to perform or otherwise to comply with a material term of the Construction Contract.

§ 14.4Contract Documents. All the documents that comprise the agreement between the Owner and Contractor.

§ 15 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.

§ 16 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:	« »

TRIBAL EMPLOYMENT RIGHTS OFFICE (TERO)

TULALIP TERO MISSION STATEMENT

The Tulalip TERO has a mission to help improve the quality of life for Tulalip Tribal members and other Native American families through opportunities that can assist them in pursuing quality jobs or careers with decent wages and by protecting their rights of preferential employment, training, business and economic opportunities on and near the Tulalip Reservation. Also, to assist business in achieving compliance with hiring Native American qualified workers.

Information
6404 Marine Drive, Tulalip, WA 98271
Office: (360) 716-4747
Fax: (360) 716-0612
Alternate Fax: (360) 716-0249

Driving Direction From Seattle:
Go North on highway I-5. At exit 199, turn RIGHT onto Ramp and turn LEFT (West) onto SR-528 [4th St]. Road name changes to Marine Dr. NE. Turn RIGHT (North-East) onto 64th Street NW.

Driving Direction From Mount Vernon:
Go South on highway I-5. At exit 199, turn RIGHT onto Ramp and bear RIGHT (West) onto Marine Dr. NE. Turn RIGHT (North-East) onto 64th Street NW.

On June 20, 2012, the Tulalip Tribes board of Directors enacted the Tribal Employment Rights Office Code which is the preferential employment and contracting laws of the land within the boundaries of the Tulalip Reservation.

Tulalip TERO office requires businesses to:

- Hire TERO qualified and certified workers;
- Give Native owned businesses the opportunity to bid;
- Fill out and negotiate a compliance plan prior to commencing work; and
- Pay 1.75% TERO fee on all construction projects over $10,000

FREQUENTLY ASKED QUESTIONS

The following presents a list of the most frequently asked questions and inquiries about Native American Preference and Tribal Employment Rights Office (TERO).

1. *WHAT IS THE PURPOSE OF TERO?*

   To access more employment & training opportunities for Native Americans and their families. To provide more business & economic opportunities for businesses owned by Native Americans.

2. *WHY IS THERE A NEED FOR TERO?*

   Since unemployment rate in Native communities remains high, Tribes must take strong actions to protect the employment rights of Native American people.

3. WHAT ARE THE BASIC REQUIREMENTS OF TERO?

All employers operating within tribal jurisdiction are required to provide Indian preference in employment, training, contracting, and subcontracting. Following are the major provisions and requirements found in most TERO Codes that employers must adhere too:

A. To ensure Native preference, employers need to submit and negotiate a detailed compliance plan of employer workforce needs with a TERO Compliance Officer.

B. To utilize the TERO skills banks for all referrals and consider Native applicants before interviewing or hiring any Non-Native worker.

C. To negotiate with the TERO Compliance Officer(s) the specific number of Natives in each job classification and to cooperate with tribal training programs to hire a certain number of trainees.

D. To eliminate all extraneous job qualification criteria or personnel requirements which may act as a barrier to Native employment. TEROs are guided by EEOC guidelines for verifying legitimate Bona-fide Occupational Qualifications (BFOQ's).

E. To keep in contact with the TERO office in order to resolve any employee problems and issues.

F. To acknowledge and respect tribal religious beliefs and cultural difference and to cooperate with TERO to provide reasonable accommodations.

G. All employers who have collective bargaining agreements with one or more unions must secure a written agreement from their unions indicating that they will comply with TERO.

H. The TERO certified worker shall be treated the same as the other employees. There will be a Zero tolerance to discrimination within the boundaries of the Tulalip Reservation.

The success of TERO programs can be directly attributed to the fact that these programs embody all of the critical elements listed above.

4. WHAT IS A COMPLIANCE PLAN?

A Compliance Plan is a written document that provides detailed descriptions of a construction project with all the pertinent information. This is where you list your key personnel and your work force needs. A Key employee is a permanent employee who is in a supervisory or specialized position and without this person an employer would face a financial loss. This document is then negotiated with a TERO Compliance Officer for approval.

5. WHAT TERO REQUIREMENTS ARE THERE IN CONTRACTING BIDS?

The TERO Office has a Native American Owned Business Registry (NAOB) in which TERO certifies that the companies are owned by Native Americans. The TERO Code requires that Contractors and or Subcontractors provide opportunities to every NAOB that is qualified to do the work.

6. *IS THERE A DIFFERENCE BETWEEN TRIBAL AND NATIVE AMERICAN PREFERENCE?*

   Yes, on Tribally funded projects TERO can require Tribal member preference. This is permissible under Federal law because tribes are exempt from Title VII of the Civil Rights Act, Executive Order 11246 and most other employment rights legislation. Native American preference is permissible under some federal laws i.e., Indian Self Determination Act, Buy Indian Act and under most federal laws.

7. *WHAT IS THE EXTENT OF TERO JURISDICTION?*

   A Tribe has the authority to enact and enforce any Indian employment preference law that is grounded in its inherent sovereign powers of self-government. This legal doctrine is the most basic principle of Indian law and is supported by a host of Supreme Court decisions. The jurisdiction is legally described or defined by treaty or legislation. The exterior boundaries of the reservation including cede territories and lands where jurisdiction has not been extinguished. TERO has a political preference, not a racial preference and does not violate Title VII or any other Federal Employment Law.

8. *ARE THERE ANY EXEMPTIONS TO TERO REQUIREMENTS?*

   Yes, there are several exemptions. Direct employment by Federal / State governments, schools, churches and some non-profits are not covered by TERO. Some Tribes also exempt themselves from TERO coverage. It is important to note however, that any contract or sub-contract let by any of these entities is covered by TERO.

9. *WILL TERO INTERRUPT MY DAILY BUSINESS OPERATIONS?*

   No. Since TERO is pro-active, the compliance plans are signed by TERO and the employer prior to the commencement of work prevents disputes. The Compliance Officers will monitor the TERO requirements by doing onsite compliance visits that would not be detrimental to business operations. TERO can sanction employers for violations which may shut down operations but only in severe disputes and in accordance with the applicable law.

10. *DOESN'T TERO DO AWAY WITH THE COMPETITIVE BIDDING PROCESS AND FAIR COMPETITION?*

    No. It provides preference to certified and qualified Native American businesses on projects on or near the Tulalip Reservation. As with employment contracting preference is permissible or required under Federal, Tribal, State or other Local laws. Preference is not provided to the exclusion of other businesses. Price and quality are still primary considerations.

11. *ARE EMPLOYERS PROTECTED AGAINST UNFAIR TERO VIOLATION CHARGES?*

    Yes. The first level of protection comes from the TERO Compliance Officer who handles the charge. These officers are trained to deal with facts and merits of the case before making determinations. Beyond the TERO Commission, grievant can seek relief in the Tribal and Federal Courts.

12. *WHAT SANCTIONS DO EMPLOYERS FACE FOR VIOLATIONS OF TERO?*

    Violation of TERO requirements may result in severe sanctions. If the TERO office determines that employers willfully and intentionally breached TERO requirements. TERO may:

    A. Deny such party the right to commence business on the reservation;

    B. Impose a civil fine on such party ranging on most reservations anywhere from $500.00 to $5,000.00 per violation;

C. Terminate or suspend party's operation and deny them the rights to conduct further business on the reservation; and or

D. Order any party to dismiss any illegally hired Non-Natives, take action to ensure future compliance and to make back payment of any lost wages be paid to the TERO certified Native Americans.

13. CAN SANCTIONS IMPOSED BY THE TERO COMMISSION BE APPEALED?

Yes. Sanctions imposed by the TERO Commission can be appealed in tribal court. Appeals of tribal court decisions can be made to the federal court system.

It is important to note that only one appeal to a TERO commission and tribal court decision has ever been appealed to the federal court. The case ended at the Ninth

Circuit Court of Appeals and Appellate that upheld the TERO complaint and the Tribal Courts decisions.

14. ARE TERO FEES LEGAL?

Yes. Tribal authority to access a fee is equal to that of any government. Taxation, licenses and fees are a valuable source for financing Tribal governmental operations. Tribes therefore consider their social and economic needs and priorities and set the TERO requirements to suit them just as National, State, and other units of government do.

Many contractors without complaint pay taxes and comply with the governmental requirements of states, counties, etc., but openly oppose doing so with Tribes. This "cultural discrimination" is indicative of the lack of knowledge and acceptance of the sovereign authority of the Tribes. Employers can realize a substantial savings since Tribal taxes or fees pre-empt state or other local taxation on the reservation projects often to the benefit of the employer.

The Tulalip Tribes' TERO fee is 1.75% of total cost on any project over $10,000.

TERO has the responsibility to ensure due process of the employer under the Tribal code and that only qualified and screened referrals are made to the employer.

15. HOW HAVE VARIOUS FEDERAL, STATE AND OTHER AGENCIES VIEWED TERO IN THEIR OPERATION?

When TERO first appeared in the late seventies there was opposition from some and difference from others. Over the past twenty years a great deal of progress has been made, some by direct legal action but most through pro-active, non-adversarial, synergistic effort. The results are Native American preference and TERO provisions, policies and procedures figure prominently in the following:

A. The Civil Rights Handbook.

B. The Job Training and Partnership Act.

C. The Small Business Administration 8(a) Program.

D. Public Law 93-638, The Indian Education Assistance and Self-Determination Act of 1974.

E. HUD Regulations.

F. BIA Acquisition Assistance Agreement 84-1.

G. EEOC / TERO Contracts.

H. OFCCP Indian Employment Initiative.

I. FHWA ISTEA "Indians in Highway Construction Initiative".

J. Indian Health Service Alaska Native Hiring Agreement.

K. US DOL/BAT Notice 84-1.

L. Indian Education Impact and Programs Under PL 81-815 (Construction) and PL 81-874 (OPS/Admin).

CONTRACTORS

The following outlines the TERO expectations and responsibilities placed on all contractors and subcontractors doing work on or near the Tulalip Reservation. This document should be read carefully, along with the TERO Code. If you have any questions or concerns contact a TERO Compliance Officer.

TERO ACKNOWLEDGMENT:

Requirement: The contractor / employer must comply with all rules and regulations as set forth in the TERO Code. This agreement will be affirmed in writing and will be signed and dated by the TERO Manager. Furthermore, if a project is expected to be of one month duration or more, the contractor must arrange a pre-construction meeting with the TERO Manager or TERO Compliance Officers prior to submitting a Compliance Plan to the TERO department.

TERO LIAISON:

Requirement: All contractors and employers must designate a responsible company official to coordinate all employment, training and contracting related activities with the TERO department to ensure that the company is in compliance with the TERO Code during all phases of the project.

NATIVE AMERICAN OWNED BUSINESS REGISTRY:

Requirement: The TERO Office maintains a certified Native American Owned Business Registry. All the businesses on the registry need to be given the opportunity to bid on any projects that they are qualified for. If they are within ten-percent (10%) of the lowest bid, you need to negotiate to see if they can reduce their price. But the fact remains that the bid will be awarded on: price, quality and capability unless other requirements are set forth in the bid documents.

TERO COMPLIANCE PLAN:

Requirement: All contractors, sub-contractors and or employers must have an approved written compliance agreement filed, negotiated and approved by the TERO Office prior to commencement of any construction activities on the Tulalip Reservation. There is a 1.75% TERO fee on any projects over $10,000 to be paid in full or negotiated with the TERO Compliance Officers.

COMPLIANCE PLAN WORKFORCE/ KEY EMPLOYEE:

Requirement: Contractors and or Employers shall be required to hire and maintain as many TERO / Native American preference employees as apply for and are qualified for each craft or skill.

Exception: Prior to commencing work on the Tulalip Reservation the prospective employer, contractor and subcontractors shall identify key and permanent employees.

Key employee: One who is in a top supervisory position or performs a critical function such that an employer would risk likely financial damage or loss if that task were assigned to a person unknown to the employer. An employee who is hired on a project by project basis may be considered a key employee so long as they are in a top supervisory position or perform a critical function.

Permanent employee: One who is and had been on the employers' or contractors' annual pay roll for a period of one year continuously, working in a regular position for the employer, or is an owner of the firm. An employee who is hired on a project by project basis shall not be considered a permanent employee.

Non-preferred Permanent and Key Employee(s) shall not exceed 20% of the workforce. Permanent and Key employees are subject to TERO approval and TERO may require a position to be opened up to all preference workers.

TERO HIRING HALL & RECRUITMENT EFFORTS:

Requirement: Contractor or employer is required to contact the TERO Office for recruiting and placement services on all non-key positions. The TERO Office shall be given a minimum of seventy-two (72) hours to furnish a qualified referral. Furthermore contractors and employers are required to provide TERO with a written list of their projected workforce needs, job classifications, openings, hiring policies, rate of pay, experience / skill requirements, employment screening procedures and anticipated duration of employment.

NATIVE PREFERENCE:

Requirement: All contractors, businesses and employers operating within the boundaries of the Reservation, or on Tribal projects off the reservation shall give preference in hiring, promotion, training, layoffs, recall, and all other aspects of employment, unless other contractual agreements or federal requirements restrict the preference specified below. The order of preference shall be given to the following persons in the following enumerated order:

1) Enrolled Tulalip Tribal Members
2) Spouses, Parent of a tribal member child, biological child born to an enrolled Tulalip Tribal Member, current legal guardian of a Tribal Member dependent child (with a proper letter of temporary or permanent legal guardianship from a court), or a tribal member in a domestic partner relationship (with documentation).
3) Other Natives/Indians shall mean any member of a federally recognized Indian tribe, nation or band, including members of federally recognized Alaskan Native villages or communities.
4) Spouse of federally recognized Native American
5) Regular current employees of the all Tulalip Tribal entities
6) Other

Exception: Where prohibited by contractual agreements or federal requirements, the above order of preference set out in subsection 1.8, shall not apply. In such cases preference shall be given in accordance with the applicable contractual agreement, federal requirement, or Federal Law.

Requirement: If the TERO Office is unable to refer an adequate number of qualified, preferred employees for a Contractor, TERO will notify the Contractor who may fill the remaining positions with non-TERO workers. When this occurs, TERO work permits may be valid for one month from the date of issuance and may be renewed. Work permits are non-transferable.

Requirement: When work permits are issued, the contractor is still required to notify the TERO Office of all future job openings on the project so that qualified, preferred employees have an opportunity to be dispatched.

JOB QUALIFICATIONS, PERSONNEL REQUIREMENTS & RELIGIOUS ACCOMMODATIONS:

Requirement: An employer may not use any job qualification criteria or personnel requirements which serve as barriers to the employment of Natives which are not required by business necessity. The TERO department will review the job duties and may require the employer to eliminate the personnel requirements at issue. Employers shall also make reasonable accommodation to the religious beliefs and cultural traditions of Native workers.

TRAINING:

Requirement: Contractors and or Employers may be required to develop on the job training opportunities and or participate in Tribal or local training programs, including upgrading programs, and apprenticeship or other trainee programs relevant to the employer's needs.

LAY-OFFS:

Requirement: TERO preference employees shall not be laid off where non-TERO preference employees are still working. If the employer lays-off employees by crews, classifications or other categories, qualified TERO preference employees shall be transferred to crews or positions that will be retained. This section does not apply to key or permanent employees.

NOTE: The TERO Office is here to help in any way we can. Communication with the TERO Compliance Officers is very important in that it will help ensure the job to run smoothly.

(REMAINDER OF PAGE INTENTIONALLY LEFT BLANK)

AIA® Document A101® – 2017

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

AGREEMENT made as of the _____ day of _____ in the year _____
(In words, indicate day, month and year.)

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

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

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

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

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

The parties should complete A101®–2017, Exhibit A, Insurance and Bonds, contemporaneously with this Agreement.

AIA Document A201®–2017, General Conditions of the Contract for Construction, is adopted in this document by reference. Do not use with other general conditions unless this document is modified.

The Owner and Contractor agree as follows.

INTERIM WAIVER AND RELEASE OF CLAIMS

TO THE TULALIP TRIBES OF WASHINGTON ("OWNER"):

_____ (the "Releasing Party") has furnished labor or services, or supplied materials or equipment (collectively, the "Work") for construction on The Tulalip Utilities Project (the "Project"), located at 3015 Mission Beach Road, Tulalip, WA 98271.

Upon receipt of payment by the Releasing Party of **$** _____ , whether in cash, by check or by joint check, the Releasing Party represents and certifies to Owner that: (i) Releasing Party and all of its subcontractors are in compliance with the terms of their respective contracts; (ii) all due and payable bills with respect to the Work have been paid to date or are included in the amount requested in the current Application for Payment and there is no known basis for the filing of any claim in respect of the Work except for (a) any claim that the Releasing Party has previously provided written notice to Owner about such claim, and (b) amounts owed to Releasing Party and/or any subcontractor or supplier that are considered Cost of the Work but have been withheld by the Owner; and (iii) waivers and releases from all Subcontractors and/or Suppliers being billed under a Releasing Party Subcontract Agreement or Purchase Agreement have been obtained in form substantially similar hereto as to constitute an effective waiver and release of all known claims. Notwithstanding the foregoing, this Interim Waiver and Release of Claims shall not apply to any amounts owed for Work which has been provided to the Project during a billing period prior to the date hereof where Releasing Party and/or any subcontractor or supplier has not yet requested reimbursement for the cost of the Work provided to the Project.

If any claim covered by this Interim Waiver and Release of Claims is made or filed by the Releasing Party or any of its lower tier consultants, subcontractors, suppliers, vendors or materialmen at any tier against or with respect to Owner or the Project then the Releasing Party (1) shall immediately release and discharge, or secure the release or discharge of, such claim and (2) shall indemnify, defend and hold harmless Owner and the Project from and against any and all costs, damages, expenses, court costs and attorney fees arising from such claim or any litigation resulting from such claim.

_____
(the Releasing Party)

DATED: _____ By: _____
Printed Name: _____
Its: _____

[Notary Seal]

State of: _____ County of: _____

Subscribed and sworn to before me this _____ day of _____

Notary Public: _____

My Commission expires: _____

FINAL WAIVER AND RELEASE OF CLAIMS

TO THE TULALIP TRIBES OF WASHINGTON ("OWNER"):

Upon receipt of payment of $_____, whether in cash, by check or by joint check, (the "Releasing Party") has furnished labor or services, or supplied materials or equipment for construction on Tulalip Utilities Project (the "Project"), located at located at 3015 Mission Beach Road, Tulalip, WA 98271.

The Releasing Party hereby unconditionally waives and releases any and all claims, stop notices, rights to submit stop notices, suits, demands, protests, damages, losses and expenses of any nature whatsoever (whether under statute, in equity or otherwise and whether received through assignment or otherwise) (each, individually, a "Claim") against or with respect to The Tulalip Tribes of Washington, which is referred to as the Owner in the Contract Documents, or any other party holding an interest in the Property (collectively, the "Released Parties"), or against or with respect to the Project, the Property, improvements to the Property and materials, fixtures, apparatus and machinery furnished for the Property (collectively, the "Released Properties").

Upon the receipt of the aforesaid amount, the Releasing Party expressly acknowledges that it has been paid all amounts due and owing to it for work, services, material or equipment in connection with the Work and the Releasing Party represents and warrants that all amounts due and owing to consultants, subcontractors and suppliers below the Releasing Party in connection with this Project have been paid, unless noted herewith as approved by Owner.

If any Claim is made or filed by the Releasing Party or any of its lower tier consultants, subcontractors, suppliers or laborers at any tier against or with respect to any of the Released Parties or any of the Released Properties, then the Releasing Party (1) shall immediately release and discharge, or secure the release or discharge of such Claim and (2) shall indemnify, defend and hold harmless the Released Parties from and against any and all costs, damages, expenses, court costs and attorney fees arising from such Claim or any litigation resulting from such Claim.

_____
(the Releasing Party)

DATED: _____ By: _____

Printed Name: _____

Its: _____

[Notary Seal]

State of: _____ County of: _____

Subscribed and sworn to before me this _____ day of _____

Notary Public: _____

My Commission expires: _____

Department of Revenue
Washington State

Form 27 0032

Buyer's Retail Sales Tax Exemption Certificate

Do not use this form for resale purchases

Reset form

This certificate is for:

☐ **Single use**
You need to show this certificate each time you buy an exempt item.

☐ **Blanket certificate**

You can use this certificate anytime, as long as you and the seller/marketplace facilitator have a recurring business relationship. A recurring business relationship means you have at least one sale transaction within 12 months (RCW 82.08.050(7)(c)).

Name: Date:

Mailing address:

City: State: Zip:

I, the undersigned buyer, certify I am making an exempt purchase for the following reason: (Enter information and/or check applicable box(es)).

1 Nonresident vessel purchases:

Place of residence:

Type of proof of residence accepted (driver's license, State Issued ID Card, etc) ,

including any identification numbers , and expiration date .

☐ Watercraft (make, model and serial number of vessel):

☐ Registered or documented with the US Coast Guard or state of principal use and will leave Washington waters within 45 days; or

☐ Buyer is a resident of a foreign country. Purchase is for use outside Washington and will leave Washington water within 45 days.

Seller's signature: _____

Print form

To request this document in an alternate format, please complete the form dor.wa.gov/AccessibilityRequest or call 360-705-6705. Teletype (TTY) users please dial 711.

2 Electric vehicles/vessels:

☐ a. Batteries or fuel cells for electric vehicles and services for installing, repairing, or improving electric vehicle batteries and fuel cells.

☐ b. Tangible personal property that will become a component of a battery or fuel cell electric vehicle infrastructure and labor and services for installing, constructing, repairing, or improving battery or fuel cell electric vehicle infrastructure, including hydrogen fueling stations.

☐ c. Zero emissions buses.

☐ d. Vessels equipped with battery-powered electric marine propulsion systems or the systems themselves with continuous power greater than 15kW.

☐ e. Batteries and battery packs or shoreside battery infrastructure used to exclusively power electric marine propulsion systems operating at a continuous power greater than 15kW.

3 Intrastate air transport:

☐ Airplanes for use in providing intrastate air transportation by a commuter air carrier and the sale of repair and related services for these airplanes.

4 Interstate or foreign commerce or commercial deep sea fishing business:

☐ a. Motor vehicle, trailers and component parts thereof used to transport persons or property for hire in interstate or foreign commerce.

☐ b. Airplanes, locomotives, railroad cars or watercraft and component parts thereof used in transporting persons or property for hire.

☐ c. Labor and services rendered to construct, repair, clean, alter or improve for hire carrier property.

☐ d. Items for use connected with private or common carriers engaged in air, rail or water in interstate or foreign commerce. (Note: Items consumed in the state are subject to use tax.)

☐ e. Watercraft, component parts, labor and services, and/or diesel fuel used in a qualifying commercial deep sea fishing operation.

Registered vessel name: _____ Vessel number: _____

☐ f. Purchases of liquefied natural gas (LNG) by private or common waterborne carriers in interstate or foreign commerce. The exemption applies to ninety percent of LNG transported and consumed outside this State by the buyer.

5 Other:

Prescription items: You must use the Sales Tax Exemption Certificate for Health Care Providers to claim exemptions for items prescribed for human use and other medical purchases.

☐ a. Waste vegetable oil used to produce biodiesel fuel for personal use.

☐ b. Equipment rental and purchase of services for use in motion picture and video production.

☐ c. Objects of art or cultural value purchased by an artistic or cultural organization.

☐ d. Adaptive automobile equipment purchased by disabled veterans.

☐ e. Animal pharmaceuticals purchased by veternarians. This exemption does not apply to pharmaceuticals for pets (describe):

☐ f. Computer hardware, peripherals, software and related installation, used by the aerospace industry.

☐ g. Labor, services and tangible personal property related to the constructing of new buildings by a manufacturer of commercial airplanes, fuselages, or wings of a commercial airplane, or by a port district, political subdivision, or municipal corporation to be leased to such a manufacturer.

☐ h. Computer hardware, peripherals, software and related installation, purchased by publishers and printers.

☐ i. City, County, Tribal, or Inter-Tribal Housing Authorities.

☐ j. Tangible personal property for use in a noncontiguous state delivered to the usual receiving terminal of the shipper.

Types of goods purchased:

Point of delivery: Carrier/agent:

☐ k. Gases and chemicals used by a manufacturer or processor for hire in the production of semiconductor materials.

☐ l. Hog fuel used to produce electricity, steam, heat, or biofuel.

☐ m. Tangible personal property under the weatherization assistance program.

☐ n. Trail grooming services.

☐ o. Honey bees, honey bee feed purchased by an eligible apiarist. Apiarist ID #:

☐ p. Federal credit union purchases.

☐ q. Wax, ceramic materials, and labor used to create molds consumed during the process of creating investment castings.

☐ r. Sales of ferry vessels to the state or local governmental units, components thereof, and labor and service charges.

☐ s. Joint Municipal Utilities Services Authority.

☐ t. Paratransit vehicles purchased by paratransit service providers.

☐ u. Large/private airplanes purchased by nonresidents.

☐ v. Standard financial information purchased by qualifying international investment management companies and their affiliates.

☐ w. Material and supplies directly used in the packing of fresh perishable horticultural products by persons who receive, wash, sort, and pack fresh perishable horticultural products for farmers.

☐ x. Vessel deconstruction services.

☐ y. Only for delivered bottled water ☐ No source of potable water ☐ Prescribed water ☐ Purchased with food stamps (SNAP)

☐ z. Anaerobic digesters and repair services.

☐ aa. Purchases of solar energy machinery and equipment that generates at least 1 kilowatt (kW) and no more than 100 kW of electricity and labor and services rendered in regard to installation of such equipment.

☐ bb. Ride-sharing vehicles to be used in certain rideshare programs.

Certification:

I, the undersigned buyer, understand that by completing and signing this certificate I am certifying that I qualify for the tax exempt purchase(s) indicated above. I understand that I will be required to pay sales or use tax on purchases that do not qualify for an exemption. In addition, I understand that false or erroneous use of this certificate will result in liability for unpaid tax with interest and may result in additional penalties.

Type of entity: ☐ Individual ☐ Corporation ☐ Sole Proprietor ☐ Partnership ☐ Other (explain) _____

Type of business: _____ Account ID: _____

Buyer name: _____ Title: _____

Street address: _____

City, State, Zip: _____

Buyer signature: _____

Seller must retain the original of this certificate for their records.
Do not send a copy of this certificate to the Department of Revenue.

Instructions

Buyer's must ensure entitlement to the exemption before using this certificate.

For information regarding exemptions, contact Washington State Department of Revenue Taxpayer Information Center at 360-705-6705 or visit our website at dor.wa.gov.

Line 1 applies to watercraft purchased by a nonresident for use outside Washington when delivery take place in Washington. The buyer must provide proof of residency (picture ID) and check the applicable box. By checking the box, the buyer certifies that the vessel will leave Washington State waters within forty-five days. Sellers must examine and document the proof of residency provided by the buyer. **Seller must sign the form.** By signing the form, the seller certifies that the seller has examined and listed the buyer's proof of residency. See WAC 458-20-238 for acceptable proof of residency for corporations, partnerships and limited liability companies. Reference: RCW 82.08.0266, RCW 82.08.02665 and WAC 458-20-238.

Line 2a applies to the purchase of batteries or fuel cells for electric vehicles and services for installing, repairing, or improving electric vehicle batteries and fuel cells. Reference: RCW 82.08.816

Line 2b applies to the purchase of tangible personal property that will become a component of an electric vehicle infrastructure or to labor and services rendered in respect to installing, constructing, repairing, or improving electric vehicle infrastructure, including hydrogen fueling stations. Reference: RCW 82.08.816

Line 2c applies to the purchase of zero emissions buses.Reference: RCW 82.08.816

Line 2d applies to the purchases of vessels with battery- powered electric marine propulsion systems or the systems themselves with continuous power greater than 15 kW. Reference: RCW 82.08.996

Line 2e applies to the purchase of marine batteries, shoreside infrastructure, and related labor and installation charges used with electric vessel marine propulsion systems. Reference: 82.08.996

Line 3 applies to the purchase of airplanes for use in providing intrastate air transportation by a commuter air carrier and the sale of repair and related services for these airplanes. Commuter air carriers are air carriers holding authority under Title 14, part 298 of the code of federal regulations that carries passengers on at least five round trips per week on at least one route between two or more points. Reference: RCW 82.08.0262 and 82.12.0254

Line 4a applies to the purchase of motor vehicles, or trailers by a business operating or contracting to operate for the holder of a carrier permit issued by the Interstate Commerce Commission. The exemption also applies to component parts and repairs of such carrier property including labor and services rendered in the course of constructing, repairing, cleaning, altering or improving the same. The buyer must attach a list stating make, model, year, serial number, motor number and ICC permit number. Reference: RCW 82.08.0263 and WAC 458-20-174

Line 4b applies to the purchase of airplanes, locomotives, railroad cars, or watercraft for use in conducting interstate or foreign commerce by transporting therein or there with persons or property for hire. The exemption also applies to component parts of such carrier property. Reference: RCW 82.08.0262 and WAC 458-20-175

Line 4c applies to charges for labor and services rendered in the course of constructing, repairing, cleaning, altering or improving carrier property when carrier property is used for hire. Reference: RCW 82.08.0262 and WAC 458-20-175

Line 4d applies to the purchase of durable goods or consumables, other than those mentioned in line 4b, for use in connection with interstate or foreign commerce by such businesses. The goods must be for exclusive use while engaged in transporting persons or property in interstate or foreign commerce. The exemption does not apply to charges for labor or services in regard to the installing, repairing, cleaning or altering of such property. Although exempt from retail sales tax, materials are subject to use tax if consumed in Washington. Unregistered businesses must attach a list stating the description and quantity of items that will be consumed in Washington and pay use tax to the seller. Reference: RCW 82.08.0261 and WAC 458-20-175

Line 4e applies to the purchase of vessels, component parts, or repairs by persons engaged in commercial deep sea fishing operations outside the territorial waters of the state of Washington. The exemption also applies to the purchase of diesel fuel used in commercial deep or commercial passenger fishing operations when annual gross receipts from the operations are at least five thousand dollars. Reference: RCW 82.08.0262, RCW 82.08.0298, and WAC 458-20-176.

Line 4f applies to the purchase of LNG by carriers that are registered with the Department of Revenue. Carriers not registered with the Department must pay sales tax on all LNG at the time of purchase, and may later apply for a partial refund directly from the Department.

Line 5a applies to the purchase of waste vegetable oil from restaurants and food processors to produce biodiesel fuel for personal use. The exemption does not apply to persons that are engaged in selling biodiesel fuel at wholesale or retail.
Reference: RCW 82.08.0205.

Line 5b applies to the rental of production equipment and purchases of production services by motion picture and video production companies.
Reference: RCW 82.08.0315 and Motion Picture-Video Production Special Notice.

Line 5c applies to the purchase of objects of art or cultural value, and items used in the creation of a work of art (other than tools), or in displaying art objects or presenting artistic or cultural exhibitions or performances by artistic or cultural organizations.
Reference: RCW 82.08.031 and WAC 458-20-249.

Line 5d applies to the purchases of add-on adaptive automotive equipment purchased by disabled veterans and disabled members of the armed forces currently on active duty. To qualify the equipment must be prescribed by a physician and the purchaser must be reimbursed by the Department of Veterans Affairs and the reimbursement must be paid directly to the seller. Reference: RCW 82.08.875

Line 5e applies to the purchase of animal pharmaceuticals by veterinarians or farmers for the purpose of administering to an animal raised for sale by a farmer. Animal pharmaceuticals must be approved by the United States Food and Drug Administration or the United States Department of Agriculture. This exemption does not extend to or include pet animals.
Reference: RCW 82.08.880.

Line 5f applies to the purchase of computer hardware, peripherals, and software, and related installation, not otherwise eligible for the M&E exemption, used primarily in development, design, and engineering of aerospace products or in providing aerospace services. Reference: RCW 82.08.975.

Line 5g applies to charges for labor and services rendered in respect to the constructing of new buildings used primarily to manufacture commercial airplanes, fuselages of commercial airplanes, or wings of commercial airplanes. The exemption is available to manufacturers engaged in manufacturing commercial airplanes, fuselages of commercial airplanes, or wings of commercial airplanes. It is also available to port districts, political subdivisions, or municipal corporations who lease an eligible facility to a manufacturer engaged in eligible manufacturing activities. The exemption also applies to sales of tangible personal property that will become a component of such buildings during the course of the constructing, and to labor and services rendered in respect to installing, during the course of constructing, building fixtures not otherwise eligible for the exemption under RCW 82.08.02565(2)(b).
Reference: RCW 82.08.980 and RCW 82.32.850.

Line 5h applies to the purchase of computer hardware, peripherals, digital cameras, software, and related installation not otherwise eligible for the M&E exemption that is used primarily in the printing or publishing of printed materials. The exemption includes repairs and replacement parts.
Reference: RCW 82.08.806.

Line 5i applies to all retail purchases of goods and services by City, County, Tribal, or Inter-Tribal Housing Authorities.
Reference: RCW 35.82.210.

Line 5j applies to the purchase of goods for use in a state, territory or possession of the United States which is not contiguous to any other state such as Alaska, Hawaii, Guam, and American Samoa. For the exemption to apply, the seller must deliver the goods to the usual receiving terminal of the for-hire carrier selected to transport the goods.
Reference: RCW 82.08.0269.

Line 5k applies to the purchase of gases and chemicals by a manufacturer or processor for hire in the production of semiconductor materials. Limited to gases and chemicals used to grow the product, deposit or grow permanent or sacrificial layers on the product, to etch or remove material from the product, to anneal the product, to immerse the product, to clean the product, and other uses where the gases and chemicals come into direct contact with the product during the production process, or gases and chemicals used to clean the chambers and other like equipment in which processing takes place.

Reference: RCW 82.08.9651.

Line 5l applies to the purchase of hog fuel to produce electricity, steam, heat, or biofuel. Hog fuel is defined as wood waste and other wood residuals including forest derived biomass. Hog fuel does not include firewood or wood pellets.

Reference: RCW 82.08.956.

Line 5m applies to the purchase of tangible personal property used in the weatherization of residences under the
weatherization assistance program. The tangible personal property must become a component part of the residence.

Reference: RCW 82.08.998.

Line 5n applies to the purchase of trail grooming services by the state of Washington and nonprofit corporations organized under chapter 24.03 RCW. Trail grooming activities include snow compacting, snow redistribution, or snow removal on state or privately-owned trails. Reference: RCW 82.08.0203.

Line 5o applies to all honey bees and honey bee feed (e.g. sugar) purchased by an eligible apiarist. An eligible apiarist is a person who: owns or keeps one or more bee colonies; grows, raises , or produces honey bee products for sale at wholesale; and registers their hives/colonies with the WA State Department of Agriculture as required by RCW 15.60.021

References: RCW 82.08.0204 and RCW 82.08.200

Line 5p applies to the purchase of goods and retail services by federally chartered credit unions. Federal credit unions are exempt from state and local consumer taxes under federal law, such as sales tax, lodging taxes and rental car tax. To be exempt, the federal credit union must pay for goods and services directly, such as by a check written on the federal credit union or a credit card issued to the federal credit union. Sellers should keep a copy of the check or credit card used for payment to substantiate the exempt nature of the sale. Reference: WAC 458-20-190

Line 5q applies to the purchase of wax and ceramic materials used to create molds consumed during the process of creating ferrous and nonferrous investment castings used in industrial applications. Also applies to labor or services used to create wax patterns and ceramic shells used as molds in this process. Reference: RCW 82.08.983

Line 5r applies to sales of ferry vessels to the state of Washington or to a local governmental unit in the state of Washington for use in transporting pedestrians, vehicles, and goods within or outside the territorial waters of the state. The exemption also applies to sales of tangible personal property which becomes a component part of such ferry vessels and sales of or charges made for labor and services rendered in respect to constructing or improving such ferry vessels.

Reference RCW 82.08.0285.

Line 5s applies to cities, counties, and other municipalities that create a Joint Municipal Services Authority.
Reference: RCW 82.08.999

Line 5t applies to purchases of small buses, cutaways, and modified vans not more than 28 feet long by a public social service agency (transit authority) or a private, nonprofit transportation provider.
Reference: RCW 82.08.0287.

Line 5u applies to purchases of private airplanes by nonresidents weighing over 41,000 pounds. It also provides an exemption for charges for repairing, cleaning, altering or improving such airplanes owned by nonresidents. A nonresident qualifies for these exemptions when they are not required to register the airplane with the Department of Transportation.

Reference: RCW 82.08.215

Line 5v applies to the purchase and use of standard financial information by a qualifying international investment management companies and their qualifying affiliates to $15 million dollars in a calendar year. The standard financial information may be provided in a tangible format (e.g. paper documents), on a tangible media (e.g. DVD, USB drive, etc.) or as a digital product transferred electronically.

Reference: RCW 82.08.207

Line 5w applies to purchases of materials and supplies used in packing horticultural products. The exemption applies only to persons who receive, wash, sort, and pack fresh perishable horticultural products for farmers as defined in RCW 82.04.330 and that are entitled to a deduction under RCW 82.04.4287 either as an agent or an independent contractor.
Reference: RCW 82.08.0311

Line 5x applies to deconstruction of vessels. "Vessel deconstruction" means permanently dismantling a vessel, including: Abatement and removal of hazardous materials; the removal of mechanical, hydraulic, or electronic components or other vessel machinery and equipment; and either the cutting apart or disposal, or both, of vessel infrastructure. For the purposes of this subsection, "hazardous materials" includes fuel, lead, asbestos, polychlorinated biphenyls, and oils. "Vessel deconstruction" does not include vessel modification or repair. In order to qualify for this exemption the vessel deconstruction must be performed at either a qualified vessel deconstruction facility; or an area over water that has been permitted under section 402 of the clean water act of 1972 (33 U.S.C. Sec. 1342) for vessel deconstruction. Reference RCW 82.08.9996

Line 5x applies to deconstruction of vessels. "Vessel deconstruction" means permanently dismantling a vessel, including: Abatement and removal of hazardous materials; the removal of mechanical, hydraulic, or electronic components or other vessel machinery and equipment; and either the cutting apart or disposal, or both, of vessel infrastructure. For the purposes of this subsection, "hazardous materials" includes fuel, lead, asbestos, polychlorinated biphenyls, and oils. "Vessel deconstruction" does not include vessel modification or repair. In order to qualify for this exemption the vessel deconstruction must be performed at either a qualified vessel deconstruction facility; or an area over water that has been permitted under section 402 of the clean water act of 1972 (33 U.S.C. Sec. 1342) for vessel deconstruction. Reference RCW 82.08.9996

Line 5y this sales tax exemption only applies to bottled water delivered to the buyer in a re-usable container not sold with the water under one of the following three conditions:

1. No Source of Potable Water – Retail sales and use taxes do not apply to sales of bottled water for human use to persons who do not have a readily available source of potable water. Potable water is water that is safe for human consumption.

2. Water dispensed to patients pursuant to a prescription – Retail sales and use taxes do not apply to sales of bottled water for human use dispensed or to be dispensed to patients, pursuant to a prescription for use in the cure, mitigation, treatment, or prevention of disease or medical condition.

"Prescription" means an order, formula, or recipe issued in any form of oral, written, electronic, or other means of transmission by a duly licensed practitioner authorized by the laws of this state to prescribe.

3. Purchased under the Supplemental Nutrition Assistance Program (SNAP), formerly known as the Food Stamp Program.

Line 5z applies to the purchases by owners and operators of anaerobic digesters of services to install, construct, repair, clean, alter, or improve an anaerobic digester. Also applies to purchases of tangible personal property that becomes an ingredient or component of the anaerobic digester. As of July 1, 2018 this includes equipment necessary to process biogas and digestate from an anaerobic and biogas from a landfill into marketable coproducts. See RCW 82.08.900.

Line 5aa applies to the purchases of solar energy machinery and equipment that generates at least 1 kilowatt and no more than 100kW of electricity. This exemption also applies to the labor and services purchased to install such machinery and equipment.
Reference: RCW 82.08.962

Line 5bb applies to purchases of vehicles by a public transportation agency, a major employer, or employees of major employers, to be primarily used for ride sharing or ride sharing for persons with special transportation needs. The vehicle and use of vehicle must meet the criteria in RCW 82.08.0287.

TULALIP TRIBES – UTILITY BUILDING
TULALIP, WASHINGTON

REQUEST FOR INFORMATION FORM

RFI NO.___

Date:

To: **FREIHEIT ARCHITECTS**

From:

Spec Sec. Ref: Para: Drawing Ref: Detail:

Signed:

Response:

❑ Attachments

Response From: To: Sent: Rec'd:

Signed:

Copies: ❑ Owner ❑ Consultants ❑ ❑ ❑ ❑ File

SECTION 006325 - SUBSTITUTION REQUEST FORM

TO: **FREIHEIT ARCHITECTS** DATE: _____

ATTN:_____

We hereby submit the following for your consideration in lieu of the specified item(s) for the above project:

Specification Section_____ . Paragraph _____ . Referenced Drawing(s) _____

Specified Item: _____

Proposed Substitution: _____

Reason for Substitution: _____

.....

COMPLETE THE FOLLOWING (Use back or additional sheets if necessary).

1. Does the substitution affect dimensions shown on Drawings? Yes _____. No _____.
   If yes, indicate changes: _____
2. What effect does the substitution have on other trades? _____
   _____
3. What effect do applicable code requirements have on substitution? _____
   _____
4. Describe the differences between the proposed substitution and the specified item(s):
   _____
   _____
5. How do manufacturer guarantees compare between proposed and specified items?
   ☐ Same ☐ Different (Explain on back.)

.....

What is projected lump sum installed cost difference between proposed substitution and least expensive specified item? $_____. [Ø; (decrease); increase]

The undersigned hereby:

- Certifies that the proposed substitute item has been fully investigated and has been determined to be equal or superior to that specified in all respects; that the same or greater warranty will be furnished, that required maintenance service and source for replacement parts are available, and that incorporation of the proposed substitute item will not affect functional clearances.
- Warrants that coordination, installation, and changes to the project as necessary to accommodate the proposed substitution shall be the Contractor's responsibility, that use of the substitute item(s) will not delay project completion, and that claims for additional costs related to its incorporation which may become subsequently apparent will be borne by the Contractor.

Approved For Architect Review: _____
Signature Title

Signature shall be by a person having authority to legally bind the Contractor to the above terms.

☐ Substitution Allowed ☐ Substitution Allowed As Noted ☐ Substitution Not Allowed Date:_____

By: _____
Signature Title

END OF SUBSTITUTION REQUEST FORM

SECTION 006425 - TESTS AND INSPECTIONS

1.1 SUMMARY

A. Section Includes:
   1. Description of Code required tests and Inspections to be furnished by the Owner.Requirements for tests and inspections for bidder designed elements.
   3. Code required Quality Assurance Plans for
   4. Submittals to the jurisdictional code authorities.

1.2 CODE REQUIRED TESTS AND INSPECTIONS

A. Structural elements will be subject to separate Owner paid tests and inspections, as described on the Structural Drawings.

B. Tests and inspections will be performed in accordance with code requirements.

1.3 GENERAL REQUIREMENTS

A. The Owner will furnish testing and inspection services for the above Project. Requirements herein are intended as basic descriptions of required tests and may be waived or expanded without impact on the Contract price, except as necessary to accommodate substantial changes in coordination requirements.

B. Reference to "testing laboratory" in singular shall not be construed to limit work under this document to a single testing agency.

C. Comply with requirements of the International Building Code as amended by the jurisdictional code authority.

D. Personnel employed in the inspection of soil, rock, concrete, and steel, specified under Divisions 3, 5, and 31 of these specifications shall be qualified under the requirements of ASTM E329 - Standard Specification for Agencies engaged in the Testing and/or Inspection of Materials Used in Construction.

E. Inspection and Test Reports: Prepare reports giving results and observations of tests, and stating compliance or noncompliance with Contract Documents. Include records of observations and tests performed, and other items as specified, herein.

F. Duties and Responsibilities of the Testing Laboratory.
   1. Submit written reports of inspections and tests to the Owner, Architect, and other parties designated by the Owner.
   2. Submit copies of inspection reports to the jurisdictional building department, as required.
   3. Submit copies of inspection reports to the Architect’s Structural Engineer of items specified in Divisions 3, 4, and 5.
   4. Upon request, provide interpretation of test results.
   5. Submit final signed report stating whether the work requiring special inspection was, to the best of the testing and inspection agency inspector’s knowledge, in conformance with the Contract Documents and the applicable workmanship provisions of the governing code.

G. Testing Laboratory is not authorized to:
   1. Release, revoke, alter or enlarge on requirements of Contract Documents.
   2. Approve or accept any portion of the work.
   3. Perform any duties of the Contractor.

1.4 EQUIPMENT

A. Furnish all equipment to perform the required tests and inspections, except as required to be furnished by the General Contractor as described in the Contract Documents.

1.5 REQUIRED TESTS AND INSPECTIONS

A. Earthwork:
   1. Inspect spread footing excavations for conformance to the Contract Documents.
   2. Fill Materials: Perform tests to determine acceptability for use.

3. Compaction: Perform density tests to determine compliance with specified compaction requirements.

B. Trenching and Piping:
   1. Perform compaction tests for bedding at one test per 100 linear feet of pipe bedding.
   2. Perform compaction tests at one compaction test per lift per 100 linear feet of fill over pipe.

C. Asphalt Paving:
   1. Perform in place density tests with a nuclear gage.
   2. Record ambient and asphalt temperatures.
   3. Perform Marshal Analysis tests to determine asphalt composition. Perform one test per day.

D. Concrete Formwork:
   1. Inspect forms for location, design, configuration, and seal of form joints and ties.
   2. Check condition of bond surfaces, locations and sizes of all embedment items, and anchorage for prevention of displacement.

E. Steel Concrete Reinforcement:
   1. Obtain a copy of approved reinforcing steel placement drawings from the General Contractor.
   2. Check reinforcement in place prior to the placement of concrete.
   3. Testing procedure shall conform to ASTM A615.

F. Concrete:
   1. Analyze concrete mix design.
   2. Aggregate: Review source of aggregate to verify that supplier can furnish concrete of consistent quality.
   3. Require mill reports for cement used. Perform tests on cement, at Contractor's expense, if reports cannot be furnished.
   4. Inspect consolidation methods and finishing for conformance with contract requirements.
   5. Slump and Air Content:
      a. ASTM C 172, except modified for slump to comply with ASTM C94.
      b. Test when strength specimens are made, and as often, in the professional opinion of the testing agency, as is necessary for control checks and acceptance proposed.
   6. Concrete Temperature: Test hourly when air temperature is 40 degrees F. and below, and when 80 degrees F. and above; and each time a set of compression test specimens is made.
   7. Compressive Strength Tests: Test in accordance with ASTM C 39.Compression Test Specimens:
      1) Collect in accordance with ASTM C31; mold and store cylinders for laboratories cured test specimens, except when field-cured test specimens are required.
      2) Provide one set of 5 cylinders of each concrete class placed in any one day, or for each 5,000 sq. ft. of surface area placed, unless otherwise indicated. Utilize cylinders in testing procedures as follows: 1 cylinder tested at 7 days, 1 cylinder tested at 14 days,2 cylinders tested at 28 days, and 1 cylinder retained in reserve for later testing if required. Special Requirements for Early Strength Concrete: Provide 2 additional cylinders (for a total of 7 per set) while placing concrete that will be post-tensioned. Test the 2 additional cylinders at 14 day.
      4) Special Requirements for Drilled Piers: Provide one set of 5 cylinders per 50 cubic yards or fraction of drilled pier concrete
      e. When the frequency of testing will provide less than 5 strength tests for a given class of concrete, conduct testing from at least five randomly selected batches or from each batch if fewer than five are used.
      f. When the strength of field-cured cylinders is less than 85 percent of companion laboratory-cured cylinders, notify all parties immediately by use of faxed test reports.
   8. Concrete Reports shall include:
      a. Weather and date of pour.
      b. Name of concrete supplier and truck number.
      c. Exact mix used and maximum size of aggregate.
      d. Location in building where placed.
      e. Cylinder identification.

f. Date cylinder received in laboratory.
g. Slump data.
h. Brand and type of cement used.
i. Entrained air content (if required).
j. Amount of water added after batching, if any.
k. Sequential numbering of reports.
l. Compressive strengths.

9. Report test results in writing to the Architect and the Contractor on the same day that tests are made.

G. Concrete Floor Flatness/Levelness
1. Measure flatness and levelness of concrete floor slabs to ascertain compliance with specified tolerance requirements after slabs are sufficiently cured to support traffic.
2. Test in accordance with ASTM E1155 - Standard Test Method for Determining Floor Flatness and Levelness Using the "F Number" System. Use Type I apparatus (Floor Profilometer)

H. Drilled in Anchors, Anchor Bolts, Headed Studs, and Epoxy or Cement Grouted Dowels or Anchors:
1. Provide periodic inspection of installation, including drilled holes after cleaning.
2. Confirm proper edge distances, depths, and spacings.
3. Provide tension testing. Test anchors indicated on Structural Drawings in accordance with the Structural Notes.

I. Structural Welding:
1. Perform periodic visual inspection of all shop and field fillet welding, including stud anchor welds. Inspection of fillet welds shall be in accordance with AWS D1.1. 15 percent of all fillet welds shall be inspected by magnetic particle or dry penetrant methods. All full penetration welds shall be tested by ultrasonic methods in accordance with the requirements of AWS D1.1, Section 6, part III, by ASNT Level II technicians. Any size frequency (1.0, 2.35, 5.0 MHz) and angle (45, 60, 70, and 90) may be used to indicate the size, orientation, and type of discontinuity more accurately.
2. Verify welding materials, equipment, and welder qualifications.
3. Inspection reports shall include the following:
a. Item inspected.
b. Welder's name, certificate expiration date, certified positions.
c. Electrode used.
4. Exceptions to Welding Inspection: Shop welding need not be inspected when shop has been registered and approved by jurisdictional code authorities, in accordance with IBC 1704.2..

J. Structural Steel
1. Mill reports are required for all structural steel materials. Perform tests to verify strength of steel if mill reports cannot be furnished by the supplier to the laboratory for certification. Notify the Owner of extra services performed.
2. Shop Fabrication: Furnish visual inspection during fabrication of structural steel and components (AISC certified fabricators exempt from inspection requirement). Shapes, sizes, classes, and types of steel and threaded fasteners shall be verified for conformance with Contract Documents.
3. Field Assembly: Perform visual inspection of the installation of structural steel. Verify locations of all anchorages and inserts. Where adjustments are required, reinspect to confirm compliance with Contract Document requirements.

K. Structural Bolting:
1. All high strength bolting is subject to inspection and testing. Test a minimum of 10 percent of all bolts, and at least 2 bolts in each connection a calibrated wrench to verify that minimum required bolt tension was achieved.
2. Verify that the installation procedure for structural bolting meets contract requirements.
3. Mill reports are required for structural high strength bolts. Perform testing if mill tests are unavailable. Notify the Owner if the extra service is performed.

L. Roofing:
   1. Inspect roof deck before roofing is started; perform periodic inspection while roofing is being installed to verify compliance with Contract Documents and roofing materials manufacturer's specifications. Inspect all roof related flashing.
   2. Inspections listed performed by roofing manufacturer's representative will qualify as satisfying the requirements of this heading.

M. Storefront Assembly: Testing and inspecting of representative areas to determine compliance of the various installed systems with specified requirements shall take place as follows.
   1. Air Infiltration: Areas shall be tested for air leakage at an air leakage rate of 0.06 cfm/sq. ft. of fixed wall area when tested according to ASTM E283 at a minimum static-air-pressure differential of 6.24 lbf/sq. ft. .
   2. Water Penetration: A minimum of 75 lineal feet of storefront assembly shall be tested in general accordance with AAMA 501.2, and shall not evidence water penetration.
   3. Notify Architect and Owner, in writing, a minimum of 14 days prior to conducting field testing.
      a. Remove interior finishes to allow for observation during testing.
      b. Replace interior finishes after conclusion of testing.
   4. Test Reports and Photographs: Required for field testing.
   5. Repair or remove work where test results and inspections indicate that it does not comply with specified requirements.
      a. Corrective work shall be approved by Architect before re-testing.
      b. Corrective work and retesting shall be paid by Contractor with no additional cost to Owner, including testing fees, Architect's and Consultant's fees.
   6. Additional testing and inspecting, at Contractor's expense, will be performed to determine compliance of replaced or additional work with specified requirements.

N. Windows:
   1. Test per ASTM E1105 (pressure differential moisture intrusion testing).
   2. Allow for testing of a minimum of 6 windows per ASTM E1105."

O. Air Barrier System: Testing of air barrier system is described in Section 014550.

END OF SECTION

AIA® Document A201™ – 2017

General Conditions of the Contract for Construction

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

THE OWNER:
(Name, legal status and address)

THE ARCHITECT:
(Name, legal status and address)

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

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

TABLE OF ARTICLES

Init.

/

INDEX
(Topics and numbers in bold are Section headings.)

ARTICLE 1 GENERAL PROVISIONS

§ 1.1 Basic Definitions

§ 1.1.1 The Contract Documents

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

§ 1.1.2 The Contract

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

§ 1.1.3 The Work

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

§ 1.1.4 The Project

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

§ 1.1.5 The Drawings

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

§ 1.1.6 The Specifications

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

§ 1.1.7 Instruments of Service

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

§ 1.1.8 Initial Decision Maker

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

§ 1.2 Correlation and Intent of the Contract Documents

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

§ 1.2.1.1 The invalidity of any provision of the Contract Documents shall not invalidate the Contract or its remaining

provisions. If it is determined that any provision of the Contract Documents violates any law, or is otherwise invalid or unenforceable, then that provision shall be revised to the extent necessary to make that provision legal and enforceable. In such case the Contract Documents shall be construed, to the fullest extent permitted by law, to give effect to the parties' intentions and purposes in executing the Contract.

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

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

§ 1.3 Capitalization

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

§ 1.4 Interpretation

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

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

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

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

§ 1.6 Notice

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

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

§ 1.7 Digital Data Use and Transmission

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

§ 1.8 Building Information Models Use and Reliance

Any use of, or reliance on, all or a portion of a building information model without agreement to protocols governing the use of, and reliance on, the information contained in the model and without having those protocols set forth in AIA Document E203™–2013, Building Information Modeling and Digital Data Exhibit, and the requisite AIA Document G202™–2013, Project Building Information Modeling Protocol Form, shall be at the using or relying party's sole risk and without liability to the other party and its contractors or consultants, the authors of, or contributors to, the building

information model, and each of their agents and employees.

ARTICLE 2 OWNER

§ 2.1 General

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

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

§ 2.2 Evidence of the Owner's Financial Arrangements

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

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

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

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

§ 2.3 Information and Services Required of the Owner

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

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

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

§ 2.3.4 The Owner shall furnish surveys describing physical characteristics, legal limitations and utility locations for the

site of the Project, and a legal description of the site. The Contractor shall be entitled to rely on the accuracy of information furnished by the Owner but shall exercise proper precautions relating to the safe performance of the Work.

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

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

§ 2.4 Owner's Right to Stop the Work

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

§ 2.5 Owner's Right to Carry Out the Work

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

ARTICLE 3 CONTRACTOR

§ 3.1 General

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

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

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

§ 3.2 Review of Contract Documents and Field Conditions by Contractor

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

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

capacity as a contractor and not as a licensed design professional, unless otherwise specifically provided in the Contract Documents.

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

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

§ 3.3 Supervision and Construction Procedures

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

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

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

§ 3.4 Labor and Materials

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

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

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

§ 3.5 Warranty

§ 3.5.1 The Contractor warrants to the Owner and Architect that materials and equipment furnished under the Contract will be of good quality and new unless the Contract Documents require or permit otherwise. The Contractor further warrants that the Work will conform to the requirements of the Contract Documents and will be free from defects, except for those inherent in the quality of the Work the Contract Documents require or permit. Work, materials, or equipment not conforming to these requirements may be considered defective. The Contractor's warranty excludes

remedy for damage or defect caused by abuse, alterations to the Work not executed by the Contractor, improper or insufficient maintenance, improper operation, or normal wear and tear and normal usage. If required by the Architect, the Contractor shall furnish satisfactory evidence as to the kind and quality of materials and equipment.

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

§ 3.6 Taxes

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

§ 3.7 Permits, Fees, Notices and Compliance with Laws

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

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

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

§ 3.7.4 Concealed or Unknown Conditions

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

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

§ 3.8 Allowances

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

§ 3.8.2 Unless otherwise provided in the Contract Documents,

.1 allowances shall cover the cost to the Contractor of materials and equipment delivered at the site and all required taxes, less applicable trade discounts;

.2 Contractor's costs for unloading and handling at the site, labor, installation costs, overhead, profit, and other expenses contemplated for stated allowance amounts shall be included in the Contract Sum but not in the allowances; and

.3 whenever costs are more than or less than allowances, the Contract Sum shall be adjusted accordingly by Change Order. The amount of the Change Order shall reflect (1) the difference between actual costs and the allowances under Section 3.8.2.1 and (2) changes in Contractor's costs under Section 3.8.2.2.

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

§ 3.9 Superintendent

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

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

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

§ 3.10 Contractor's Construction and Submittal Schedules

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

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

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

§ 3.11 Documents and Samples at the Site

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

§ 3.12 Shop Drawings, Product Data and Samples

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

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

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

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

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

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

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

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

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

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

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

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

time and in the form specified by the Architect.

§ 3.13 Use of Site

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

§ 3.14 Cutting and Patching

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

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

§ 3.15 Cleaning Up

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

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

§ 3.16 Access to Work

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

§ 3.17 Royalties, Patents and Copyrights

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

§ 3.18 Indemnification

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

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

ARTICLE 4 ARCHITECT

§ 4.1 General

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

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

§ 4.2 Administration of the Contract

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

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

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

§ 4.2.4 Communications

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

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

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

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

Sections 3.3, 3.5, and 3.12. The Architect's review shall not constitute approval of safety precautions or of any construction means, methods, techniques, sequences, or procedures. The Architect's approval of a specific item shall not indicate approval of an assembly of which the item is a component.

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

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

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

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

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

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

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

ARTICLE 5 SUBCONTRACTORS

§ 5.1 Definitions

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

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

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

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

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

§ 5.2.3 If the Owner or Architect has reasonable objection to a person or entity proposed by the Contractor, the

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

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

§ 5.3 Subcontractual Relations

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

§ 5.4 Contingent Assignment of Subcontracts

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

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

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

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

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

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

ARTICLE 6 CONSTRUCTION BY OWNER OR BY SEPARATE CONTRACTORS

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

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

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

§ 6.1.3 The Owner shall provide for coordination of the activities of the Owner's own forces and of each Separate

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

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

§ 6.2 Mutual Responsibility

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

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

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

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

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

§ 6.3 Owner's Right to Clean Up

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

ARTICLE 7 CHANGES IN THE WORK

§ 7.1 General

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

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

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

§ 7.2 Change Orders

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

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

§ 7.3 Construction Change Directives

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

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

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

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

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

.1 Costs of labor, including applicable payroll taxes, fringe benefits required by agreement or custom, workers' compensation insurance, and other employee costs approved by the Architect;
.2 Costs of materials, supplies, and equipment, including cost of transportation, whether incorporated or consumed;
.3 Rental costs of machinery and equipment, exclusive of hand tools, whether rented from the Contractor or others;
.4 Costs of premiums for all bonds and insurance, permit fees, and sales, use, or similar taxes, directly related to the change; and
.5 Costs of supervision and field office personnel directly attributable to the change.

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

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

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

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

§ 7.3.9 Pending final determination of the total cost of a Construction Change Directive to the Owner, the Contractor may request payment for Work completed under the Construction Change Directive in Applications for Payment. The

Architect will make an interim determination for purposes of monthly certification for payment for those costs and certify for payment the amount that the Architect determines, in the Architect's professional judgment, to be reasonably justified. The Architect's interim determination of cost shall adjust the Contract Sum on the same basis as a Change Order, subject to the right of either party to disagree and assert a Claim in accordance with Article 15.

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

§ 7.4 Minor Changes in the Work

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

ARTICLE 8 TIME

§ 8.1 Definitions

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

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

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

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

§ 8.2 Progress and Completion

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

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

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

§ 8.3 Delays and Extensions of Time

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

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

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

ARTICLE 9 PAYMENTS AND COMPLETION

§ 9.1 Contract Sum

§ 9.1.1 The Contract Sum is stated in the Agreement and, including authorized adjustments, is the total amount payable

by the Owner to the Contractor for performance of the Work under the Contract Documents.

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

§ 9.2 Schedule of Values

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

§ 9.3 Applications for Payment

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

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

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

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

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

§ 9.4 Certificates for Payment

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

§ 9.4.2 The issuance of a Certificate for Payment will constitute a representation by the Architect to the Owner, based on the Architect's evaluation of the Work and the data in the Application for Payment, that, to the best of the Architect's knowledge, information, and belief, the Work has progressed to the point indicated, the quality of the Work is in accordance with the Contract Documents, and that the Contractor is entitled to payment in the amount certified. The

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

§ 9.5 Decisions to Withhold Certification

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

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

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

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

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

§ 9.6 Progress Payments

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

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

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

§ 9.6.4 The Owner has the right to request written evidence from the Contractor that the Contractor has properly paid Subcontractors and suppliers amounts paid by the Owner to the Contractor for subcontracted Work. If the Contractor fails to furnish such evidence within seven days, the Owner shall have the right to contact Subcontractors and suppliers

to ascertain whether they have been properly paid. Neither the Owner nor Architect shall have an obligation to pay, or to see to the payment of money to, a Subcontractor or supplier, except as may otherwise be required by law.

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

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

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

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

§ 9.7 Failure of Payment

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

§ 9.8 Substantial Completion

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

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

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

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

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

§ 9.9 Partial Occupancy or Use

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

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

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

§ 9.10 Final Completion and Final Payment

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

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

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

constitute a waiver of Claims.

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

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

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

ARTICLE 10 PROTECTION OF PERSONS AND PROPERTY

§ 10.1 Safety Precautions and Programs

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

§ 10.2 Safety of Persons and Property

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

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

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

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

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

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

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

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

§ 10.2.8 Injury or Damage to Person or Property

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

§ 10.3 Hazardous Materials and Substances

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

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

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

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

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

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

§ 10.4 Emergencies

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

ARTICLE 11 INSURANCE AND BONDS

§ 11.1 Contractor's Insurance and Bonds

§ 11.1.1 The Contractor shall purchase and maintain insurance of the types and limits of liability, containing the

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

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

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

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

§ 11.2 Owner's Insurance

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

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

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

§ 11.3 Waivers of Subrogation

§ 11.3.1 The Owner and Contractor waive all rights against (1) each other and any of their subcontractors, sub-subcontractors, agents, and employees, each of the other; (2) the Architect and Architect's consultants; and (3) Separate Contractors, if any, and any of their subcontractors, sub-subcontractors, agents, and employees, for damages caused by fire, or other causes of loss, to the extent those losses are covered by property insurance required by the Agreement or other property insurance applicable to the Project, except such rights as they have to proceeds of such insurance. The

Owner or Contractor, as appropriate, shall require similar written waivers in favor of the individuals and entities identified above from the Architect, Architect's consultants, Separate Contractors, subcontractors, and sub-subcontractors. The policies of insurance purchased and maintained by each person or entity agreeing to waive claims pursuant to this section 11.3.1 shall not prohibit this waiver of subrogation. This waiver of subrogation shall be effective as to a person or entity (1) even though that person or entity would otherwise have a duty of indemnification, contractual or otherwise, (2) even though that person or entity did not pay the insurance premium directly or indirectly, or (3) whether or not the person or entity had an insurable interest in the damaged property.

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

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

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

§11.5 Adjustment and Settlement of Insured Loss

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

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

ARTICLE 12 UNCOVERING AND CORRECTION OF WORK

§ 12.1 Uncovering of Work

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

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

§ 12.2 Correction of Work

§ 12.2.1 Before Substantial Completion

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

Contractor's expense.

§ 12.2.2 After Substantial Completion

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

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

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

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

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

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

§ 12.3 Acceptance of Nonconforming Work

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

ARTICLE 13 MISCELLANEOUS PROVISIONS

§ 13.1 Governing Law

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

§ 13.2 Successors and Assigns

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

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

§ 13.3 Rights and Remedies

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

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

§ 13.4 Tests and Inspections

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

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

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

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

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

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

§ 13.5 Interest

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

ARTICLE 14 TERMINATION OR SUSPENSION OF THE CONTRACT

§ 14.1 Termination by the Contractor

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

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

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

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

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

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

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

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

§ 14.2 Termination by the Owner for Cause

§ 14.2.1 The Owner may terminate the Contract if the Contractor

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

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

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

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

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

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

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

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

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

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

§ 14.3 Suspension by the Owner for Convenience

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

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

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

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

§ 14.4 Termination by the Owner for Convenience

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

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

.1 cease operations as directed by the Owner in the notice;

.2 take actions necessary, or that the Owner may direct, for the protection and preservation of the Work; and

.3 except for Work directed to be performed prior to the effective date of termination stated in the notice, terminate all existing subcontracts and purchase orders and enter into no further subcontracts and purchase orders.

§ 14.4.3 In case of such termination for the Owner's convenience, the Owner shall pay the Contractor for Work properly executed; costs incurred by reason of the termination, including costs attributable to termination of Subcontracts; and the termination fee, if any, set forth in the Agreement.

ARTICLE 15 CLAIMS AND DISPUTES

§ 15.1 Claims

§ 15.1.1 Definition

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

§ 15.1.2 Time Limits on Claims

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

§ 15.1.3 Notice of Claims

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

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

§ 15.1.4 Continuing Contract Performance

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

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

§ 15.1.5 Claims for Additional Cost

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

§ 15.1.6 Claims for Additional Time

§ 15.1.6.1 If the Contractor wishes to make a Claim for an increase in the Contract Time, notice as provided in Section

15.1.3 shall be given. The Contractor's Claim shall include an estimate of cost and of probable effect of delay on progress of the Work. In the case of a continuing delay, only one Claim is necessary.

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

§ 15.1.7 Waiver of Claims for Consequential Damages

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

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

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

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

§ 15.2 Initial Decision

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

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

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

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

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

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

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

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

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

§ 15.3 Mediation

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

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

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

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

§ 15.4 Arbitration

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

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

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

§ 15.4.3 The foregoing agreement to arbitrate and other agreements to arbitrate with an additional person or entity duly

consented to by parties to the Agreement, shall be specifically enforceable under applicable law in any court having jurisdiction thereof.

§ 15.4.4 Consolidation or Joinder

§ 15.4.4.1 Subject to the rules of the American Arbitration Association or other applicable arbitration rules, either party may consolidate an arbitration conducted under this Agreement with any other arbitration to which it is a party provided that (1) the arbitration agreement governing the other arbitration permits consolidation, (2) the arbitrations to be consolidated substantially involve common questions of law or fact, and (3) the arbitrations employ materially similar procedural rules and methods for selecting arbitrator(s).

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

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

The following supplements the "General Conditions of the Contract for Construction," AIA Document A201, 2017 Edition. All unaltered provisions of the General Conditions shall remain in effect.

ARTICLE 1 GENERAL PROVISIONS

A. Add the following new subparagraphs to 1.2 CORRELATION AND INTENT OF THE CONTRACT DOCUMENTS:

"**1.2.4** Division 1 Specification Sections- General Requirements, govern the execution of all sections of the specifications.

"**1.2.5** The Architect does not guarantee the accuracy of indicated existing dimensions and conditions. Except as provided in Article 4.3.4, no increase in Contract Sum, related to inaccuracies in description of existing conditions, will be authorized.

"**1.2.6** The reference standards referred to in the Contract Documents shall be the edition in effect at the time of the Agreement, unless specifically stated otherwise.

"**1.2.7** Except as otherwise provided in the Agreement, documents numbered 000000 through 004999, and bound in front of the 'General Conditions of the Contract for Construction' in the Project Manual, consist of introductory information, bidding requirements, and information available to the Contractor, and are not part of the Contract."

B. Add the following new subparagraphs to 1.4 INTERPRETATION:

"**1.4.1** Specifications and notes are written in imperative and abbreviated form. Imperative language of the technical sections is directed at the Contractor, unless specifically noted otherwise. Incomplete sentences shall be completed by inserting "shall," "shall be," "the Contractor shall," and similar mandatory phrases by inference. The words "shall be" shall be supplied by inference where a colon (:) is used.

"**1.4.2** Where "as shown," "as detailed," or words of similar meaning are used, references to the Drawings are intended unless stated otherwise. Where "as directed," "as required," "as selected," "approved" or words of similar meaning are used, it shall be understood that "by the Architect" follows unless stated otherwise. "As necessary" shall be understood to mean "as necessary for a complete and fully functioning installation in accordance with requirements of the Contract Documents, applicable codes and jurisdictional requirements, and accepted trade practices." "Furnish" means "Contractor shall procure, pay for, and deliver"; "install" means "Contractor shall set in position and connect or adjust for final use"; "provide" means "Contractor shall furnish and install."

ARTICLE 2 OWNER

No Modifications.

ARTICLE 3 CONTRACTOR

A. Delete subparagraph 3.4.2, and substitute the following:

"**3.4.2** The Contractor may make substitutions only after evaluation and approval by the Architect. Each substitution shall be made in accordance with a Change Order if change in contract price or extension of contract time is inherent in the substitution, or if otherwise required by the Architect."

B. Delete subparagraph 3.7.1, and substitute the following:

"**3.7.1** Unless otherwise provided in the Contract Documents, the Owner will pay for the general plan check fee and the building permit. The Contractor shall secure and pay for all other permits, governmental fees, licenses, and inspections necessary for the proper execution and completion of the Work."

B. Delete subparagraph 3.8.2.2 and substitute the following:

3.8.2.2 allowances shall cover the cost to the Contractor of unloading and handling at the site, labor, installation costs, overhead, profit and other expenses contemplated for stated allowance amounts.

C. Add the following sub-subparagraphs to subparagraph 3.10.2:

"**.1** The Contractor's initial schedule of submittals shall accompany the Contractor's construction schedule submittal.
.2 The Contractor shall keep the Architect advised of all revisions to the schedule of submittals."

D. Add the following sentence to subparagraph 3.12.5:

"If the Contractor fails to review Shop Drawings, Product Data, or Samples to determine their responsiveness to the Contract Documents, or fails to substantially respond to Architect's review comments prior to resubmittal, or if he makes submittals which substantially alter the Contract Documents, the Contractor shall reimburse the Owner for the charges of the Architect for extra services required to review such submittals."

ARTICLE 4 ADMINISTRATION OF THE CONTRACT

A. Add the following sentence to subparagraph 4.2.4:

"Copies or memos of all direct communications between the Owner and Contractor facilitating contract administration shall be promptly transmitted to the Architect by the party initiating the communication."

ARTICLE 5 SUBCONTRACTORS

A. Add the following new subparagraph to 5.1 DEFINITION:

"**5.1.3** The terms 'Installer,' 'Fabricator,' and 'Supplier,' as referenced in the Contract Documents, or in the Contract Documents, refer to the Contractor, a subcontractor, or a sub-subcontractor."

ARTICLE 6 CONSTRUCTION BY OWNER OR BY SEPARATE CONTRACTORS

No Modifications.

ARTICLE 7 CHANGES IN THE WORK

A. Delete subparagraph 7.2.1 and substitute the following:

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

"**.1** 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."

ARTICLE 8 TIME

A. Add the following new subparagraph to 8.3 DELAYS AND EXTENSIONS OF TIME:

"**8.3.4** Should an extension of time be granted by the Owner to the Contractor, the Contractor shall indemnify and save harmless the Owner from the loss to any subcontractor caused by such extension of time."

ARTICLE 9 PAYMENTS AND COMPLETION

No Modifications.

ARTICLE 10 PROTECTION OF PERSONS AND PROPERTY

No Modifications.

ARTICLE 11 INSURANCE AND BONDS

A. Add the following sentence to subparagraph 11.1.3:

"…The Contractor shall cause the Owner and other interested parties as designated by the Owner, to be named additional insured under the Commercial General Liability, Auto Liability, and Umbrella Liability policies."

ARTICLE 12 UNCOVERING AND CORRECTION OF WORK

No Modifications

ARTICLE 13 MISCELLANEOUS PROVISIONS

No Modifications.

ARTICLE 14 TERMINATION OR SUSPENSION OF THE CONTRACT

No Modifications.

END

SECTION 011000 - SUMMARY

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:
   1. Special work requirements.
   2. Separate work.
   3. Owner-furnished Contractor installed products.
   4. Coordination.
   5. Reference standards.
   6. Applicable codes.
   7. Field engineering.
   8. Request for information

B. This Section applies to all Technical Specification Sections, and supplements the General and Supplementary Conditions.

1.2 SPECIAL WORK REQUIREMENTS

A. Limit use of premises to allow for construction operations, to allow for Owner occupancy and work by other Contractors.

B. Limit construction operations to hours between 7 AM and 7 PM, except by written permission from the Owner.

C. Owner Occupancy:
   1. Owner will occupy premises during certain stages of construction, for installation of Owner-provided items. Cooperate with Owner to minimize conflict, and to facilitate Owner's operations.
   2. Owner will require Temporary Certificate of Occupancy for portions of the premises prior to Final Completion. Contractor shall include such portions of Work in the Construction Schedule to the satisfaction of the Owner.
   3. Coordinate use of premises under direction of Owner.
   4. Maintain free and safe passage to and from occupied portions of the existing building, in accordance with Code and the Owner's occupancy requirements.
   5. Perform no utility shutdowns unless approved by the Owner.
   6. Perform demolition to minimize interference with adjacent occupied and public spaces.
   7. To the greatest extent possible, select materials and sequence work in an area as required so that the work may be completed overnight and returned to use the next day in that area.
   8. Unless approved otherwise by the Owner or suitably isolated, do not perform loud, disruptive, dusty, or odor producing work during business hours. Perform such work only during hours that occupied spaces are closed to the public.

D. Noise Producing Activities:
   1. Unless approved otherwise, limit excessive noise producing activities to daylight hours.
   2. Comply with Section 015000 requirements for sound levels and noise control.

E. Select materials, utilize personnel, perform preparatory work, and sequence work in an area as required so that the work may be completed in the least amount of time possible.

F. All work shall be performed in a manner that is sensitive to the residential neighborhood environment to the greatest extent possible.

1.3 SEPARATE WORK

A. Items noted "NIC" (Not In Contract) or FOIO (Furnished by Owner Installed by Owner), will be furnished and installed by Owner.

B. Coordinate with the separate contractors as necessary to integrate their work into the work of this Contract.

C. Owner-provided materials and equipment include, but are not limited to, the following:
   1. Entry Security System

1.4 OWNER-FURNISHED CONTRACTOR INSTALLED PRODUCTS

A. Items noted FOIC (Furnished by Owner Installed by Contractor) will be furnished by the Owner for Installation by the Contractor:

B. Coordinate work to facilitate installation of products furnished by the Owner for Installation by the Contractor, as directed, and as indicated "FOIC," on the Drawings.

C. Owner's Responsibilities:
   1. Arrange for and deliver shop drawings, product data, and samples, to Contractor.
   2. Arrange and pay for product delivery to site.
   3. Upon delivery, inspect products jointly with Contractor.
   4. Submit claims for transportation damage.
   5. Arrange for replacement of damaged, defective, or missing items.
   6. Arrange for manufacturers' warranties, inspections, and service.

D. Contractor's Responsibilities:
   1. Review shop drawings, product data, and samples.
   2. Receive and unload products at site; inspect for completeness, for damage, jointly with Owner.
   3. Handle, store, install and finish products.
   4. Repair or replace items damaged by Work of this Contract.

1.5 REFERENCE STANDARDS

A. For products specified by association or trade standards, comply with requirements of the standard, except when more rigid requirements are specified or are required by applicable codes.

B. The date of the standard is that in effect as of the Bid date, or date of Owner-Contractor Agreement when there are no bids, except when a specific date is specified.

C. Obtain copies of standards when required by Contract Documents. Maintain copy at jobsite during progress of the specific work.

1.6 APPLICABLE CODES

A. Conform to the codes listed on the Drawings.

1.7 FIELD ENGINEERING

A. Provide field engineering services; establish grades, lines, and levels, by use of recognized engineering survey practices.

B. Control points are those shown on Drawings. Locate and protect control and reference points. Notify the Architect if reference points cannot be located.

1.8 REQUEST FOR INFORMATION

A. A Request for Information (RFI) is a request from the Contractor directed to the Architect for clarification, interpretation, or direction regarding the Work as described by Contract Documents.

~~B.~~ Coordinate and submit in timely manner so as not to impede delivery, work, and other conditions that may be detrimental to construction progress.

C. Use the "Request for Information" form or another form as approved by the Architect. Upon request, Architect will furnish the electronic version of the form to expedite the processing of data.

D. Allow sufficient time in construction schedule for Architect’s response to the RFIs.

END OF SECTION

SECTION 012113 - CASH ALLOWANCES

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:
   1. Schedule of monetary amounts of allowances in Contract Sum for purchase and installation of designated products.
   2. Procedures for administration of Allowances.

B. Related Sections:
   1. Document 007200 - General Conditions.
   2. 013300 - Submittal Procedures: Scheduling of allowances.
   3. Individual Specifications Sections Listed Under Schedule of Allowances: Specification of products and installation under Allowances.

C. This Section supplements the General and Supplementary Conditions.

1.2 SCHEDULE OF ALLOWANCES

SCOPE OF WORK	ALLOWANCE
Hazardous Materials Testing and Abatement	$ 43,750.00
Main Building Sign, externally lit	$ 5,500.00
Window Blinds	$ 8,000.00
Storage Area ("Shed") Racking	$ 30,000.00

1.3 COSTS INCLUDED IN ALLOWANCES

A. Cost of product to Contractor or subcontractor, less applicable trade discounts.

B. Delivery to site.

C. Products handling at site, including unloading, uncrating, and storage.

D. Protection of products from elements and from damage.

E. Labor for installation and finishing.

F. Other expenses required to complete installation.

G. Contractor overhead and profit.

1.4 ARCHITECT RESPONSIBILITIES

A. Consult with Contractor in consideration of products.

B. Select products and transmit full information to Contractor:
   1. Manufacturer, product, model or catalog number, accessories, attachments, and finishes.
   2. Supplier and installer as applicable.
   3. Cost to Contractor for delivery to site, installation, finishing and protection during construction.

1.5 CONTRACTOR RESPONSIBILITIES

A. Assist Architect in determining suppliers and installers; obtain proposals when requested.

B. Make recommendations for Architect consideration.

C. On notification of selection, execute purchase agreement with designated supplier and installer.

D. Arrange for and process shop drawings, product data, and samples.

E. Arrange for delivery. Promptly inspect products upon delivery for completeness, damage, and defects. Submit claims for transportation damage.

F. Install, adjust, and finish products.

G. Provide warranties for products and installation.

1.6 CORRELATION WITH CONTRACTOR SUBMITTALS

A. Schedule shop drawings, product data, samples, and delivery dates, in Progress Schedule for products selected under allowances.

1.7 ADJUSTMENT OF COSTS

A. Should net cost of Allowances be more or less than specified amounts, the Contract Sum will be adjusted by Change Order, in accordance with provisions of Owner Contractor Agreement.

PART 2 - PRODUCTS

A. Not Used

PART 3 - EXECUTION

A. Not Used

END OF SECTION

SECTION 012300 - ALTERNATES

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes: Identification and description of Alternate work.

B. Related Sections:
   1. Owner-Contractor Agreement: Alternates accepted by Owner for incorporation into the Work.
   2. Sections of Specifications identified in each Alternate.

C. This Section supplements the General and Supplementary Conditions.

1.2 PROCEDURES

A. Alternates will be exercised at the option of Owner.

B. Coordinate related work and modify surrounding work as required to complete the Work, including changes under each Alternate, when acceptance is designated in Owner-Contractor Agreement.

1.3 ALTERNATE DESCRIPTIONS

A. ALTERNATE 1
   1. **Under Base Bid**:
   2. **Under Alternate 1**:

B. ALTERNATE 2
   1. **Under Base Bid**:
   2. **Under Alternate 2**:

C. ALTERNATE 3
   1. **Under Base Bid**:
   2. **Under Alternate 3**:

END OF SECTION

SECTION 013113 - PROJECT COORDINATION

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:
   1. General coordination provisions.
   2. Requirements for coordination of space.

B. This Section applies to all Technical Specification Sections, and supplements the General and Supplementary Conditions.

1.2 GENERAL COORDINATION PROVISIONS

A. Coordinate work of various specification sections to assure efficient and orderly sequence of installation of construction elements, with provisions for accommodating items installed later.

B. Carefully study and compare Contract Documents before proceeding with fabrication and installation of work. Promptly advise Architect of any error, inconsistency, omission, or apparent discrepancy discovered.

C. Allot time in construction scheduling for liaison with Owner and Architect. Establish procedures for handling queries and clarifications. Use Contractor's standard "Request for Information" form to initiate clarifications. Allow sufficient time in construction schedule for Architect's response to the request.

D. In addition to meetings specified in Section 013119, hold coordination meetings and conferences with personnel and subcontractors to assure coordination of the work.

E. Coordinate scheduling, submittals, and work of various specification sections to ensure efficient and orderly sequence of installation of independent construction elements.

F. Verify that characteristics of operating equipment are compatible with building utilities and services.

G. Verify characteristics of elements of interrelated operating equipment are compatible; coordinate work of various specification sections having interdependent responsibilities for installing, connecting to, and placing in service, such equipment.

H. In finished areas, except as otherwise indicated, conceal pipes, conduit and wiring in the construction. Coordinate locations of fixtures and outlets with finish elements.

I. Execute cutting and patching to integrate elements of work, uncover ill-timed, defective, and non-conforming work, provide openings for penetrations of existing surfaces, and provide samples for testing. Seal penetrations through floors, walls, and ceilings.

1.3 COORDINATION OF SPACE

A. The Contractor shall be responsible for coordinating the actual layout of plumbing, fire protection, HVAC, electrical, and other similar elements, as necessary to avoid interference and maintain the configurations of architectural elements.

B. Layouts shown on the Drawings are diagrammatic. Follow routings shown for pipes, ducts, and conduit as closely as practical. Where routing changes are required in exposed locations within public spaces, or will affect architectural elements, verify modifications with the Architect prior to proceeding.

C. Develop coordination drawings, and other preinstallation coordination methods as necessary to coordinate layouts prior to installation. Coordination drawings shall be based on the approved structural steel framing shop drawings, and shall consist of overlay drawings, or other similar methods to graphically indicate plumbing, fire protection, HVAC, electrical, and other similar elements in a single location in order to identify conflicts.

D. Where coordination drawings, or other preinstallation coordination methods show that available space is inadequate or that modifications will affect architectural elements, request information from the Architect before proceeding with work. No additional payment will be made for installation conflicts which could have been identified by coordination drawings or other preinstallation coordination methods.

E. Provide clear access to control points, valves, strainers, control devices, and specialty items of every nature to such systems and equipment to obtain maximum head room. Provide adequate clearances as necessary for operation and maintenance.

F. Make runs parallel with lines of building. Utilize space efficiently to maximize accessibility for other installations, for maintenance, and for repairs.

PART 2 - PRODUCTS

A. Not Used.

PART 3 - EXECUTION

A. Not Used.

END OF SECTION

SECTION 013119 - PROJECT MEETINGS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:
   1. Contractor participation in pre-construction conferences.
   2. Contractor administration of progress meetings and pre-installation conferences.

B. This Section applies to all Technical Specification Sections, and supplements the General and Supplemental Conditions.

1.2 GENERAL MEETING REQUIREMENTS

A. Make physical arrangements for meetings; notify participants, prepare agenda with copies for each attendee.

B. Take meeting minutes, and distribute copies within 2 days to the Owner, Architect, and all attendees. Distribute copies to other parties as appropriate.

C. All representatives attending meetings shall be authorized to act on behalf of the entity each represents.

D. Architect will attend meetings to ascertain the work is expedited consistent with Contract Documents and construction schedules.

1.3 PRECONSTRUCTION CONFERENCES

A. Architect will administer pre-construction conference for execution of Owner-Contractor Agreement and exchange of preliminary submittals.

B. Architect will administer site mobilization conference at Project site for clarification of Owner and Contractor responsibilities in use of site and for review of administrative procedures.

1.4 PROGRESS MEETINGS

A. Schedule and administer progress meetings throughout the Work at maximum bi-monthly intervals.

B. Attendance: Job superintendent, major subcontractors and suppliers, Owner, Architect, and others as appropriate to the meeting agenda.

C. Suggested Agenda:
   1. Review of Work progress.
   2. Status of progress schedule and adjustments.
   3. Delivery schedules.
   4. Submittals.
   5. Maintenance of quality standards.
   6. Pending changes and substitutions
   7. Other items affecting progress of Work.

1.5 PRE-INSTALLATION CONFERENCES

A. Where required in a specification Section, schedule and administer a pre-installation conference prior to commencing work of the Section.

B. Unless otherwise required, notify the Architect a minimum of 7 calendar days prior to each scheduled meeting.

C. Require the attendance of entities directly affecting, or affected by, the work of the Section.

D. Review conditions of installation, preparation and installation procedures, and coordination with related work.

END OF SECTION

PART 1 - GENERAL

1.1 SUMMARY

A. Section includes administrative and procedural requirements for the following:
   1. Preconstruction photographs.
   2. Periodic construction photographs.

B. Related Requirements:
   1. Section 017700 "Closeout Procedures" for submitting photographic documentation as Project Record Documents at Project closeout.

1.2 INFORMATIONAL SUBMITTALS

A. Key Plan: Submit key plan of Project site and building with notation of vantage points marked for location and direction of each [photograph] [video recording]. Indicate elevation or story of construction. Include same information as corresponding photographic documentation.

B. Digital Record Copy Photographs: Submit unaltered, original, full-size image files within three days of taking photographs.
   1. Digital Camera: Minimum sensor resolution of 8 megapixels.
   2. Identification: Provide the following information with each image description in file metadata tag:
      a. Name of Project.
      b. Name and contact information for photographer.
      c. Date photograph was taken.
      d. Description of vantage point, indicating location, direction (by compass point), and elevation or story of construction.

1.3 QUALITY ASSURANCE

A. Photographer Qualifications: An individual who has been regularly engaged as a professional photographer of construction projects for not less than three years.

1.4 USAGE RIGHTS

A. Obtain and transfer copyright usage rights from photographer to Owner for unlimited reproduction of photographic documentation.

PART 2 - PRODUCTS

2.1 PHOTOGRAPHIC MEDIA

A. Digital Images: Provide images in JPG format, with minimum size of [8] <Insert number> megapixels.

PART 3 - EXECUTION

3.1 CONSTRUCTION PHOTOGRAPHS

A. General: Take photographs using the maximum range of depth of field, and that are in focus, to clearly show the Work. Photographs with blurry or out-of-focus areas will not be accepted.
   1. Maintain key plan with each set of construction photographs that identifies each photographic location.

B. Digital Images: Submit digital images exactly as originally recorded in the digital camera, without alteration, manipulation, editing, or modifications using image-editing software.
   1. Date and Time: Include date and time in file name for each image.
   2. Field Office Images: Maintain one set of images accessible in the field office at Project site, available at all times for reference. Identify images in the same manner as those submitted to Architect and Construction Manager.

C. Preconstruction Photographs: Before commencement of demolition, take photographs of Project site and surrounding properties, including existing items to remain during construction, from different vantage points, as directed by Architect.
   1. Flag construction limits before taking construction photographs.
   2. Take 20 photographs to show existing conditions adjacent to property before starting the Work.
   3. Take 20 photographs of existing buildings either on or adjoining property to accurately record physical conditions at start of construction.

D. Periodic Construction Photographs: Take 20 photographs monthly with the cutoff date associated with each Application for Payment. Select vantage points to show status of construction and progress since last photographs were taken.

E. Final Completion Construction Photographs: Take 20 color photographs after date of Substantial Completion for submission as Project Record Documents. Architect will inform photographer of desired vantage points.

F. Additional Photographs: Architect may request photographs in addition to periodic photographs specified. Additional photographs will be paid for by Change Order and are not included in the Contract Sum.
   1. Three days' notice will be given, where feasible.
   2. In emergency situations, take additional photographs within 24 hours of request.
   3. Circumstances that could require additional photographs include, but are not limited to, the following:
      a. Special events planned at Project site.
      b. Immediate follow-up when on-site events result in construction damage or losses.
      c. Photographs to be taken at fabrication locations away from Project site. These photographs are not subject to unit prices or unit-cost allowances.
      d. Substantial Completion of a major phase or component of the Work.
      e. Extra record photographs at time of final acceptance.
      f. Owner's request for special publicity photographs.

END OF SECTION

SECTION 013300 - SUBMITTAL PROCEDURES

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:
   1. Submittal form requirements.
   2. Submittal schedule.
   3. General requirements for submittals to the Architect.
   4. Requirements for each type of submittal.

B. Related Sections:
   1. 007200 - General Conditions of the Contract: Additional submittal requirements.
   2. 016000 - Product Requirements: Substitution submittals.
   3. 017700 - Closeout Procedures: Closeout submittals.

C. This Section applies to all Technical Specification Sections, and supplements the General and Supplementary Conditions.

1.2 SUBMITTAL FORM REQUIREMENTS

A. All submittals other than physical samples shall be provided in electronic format acceptable to the Architect.

B. Provide the following, as applicable, on each submittal:
   1. Present and previous submittal dates.
   2. The Project title and number.
   3. Contractor’s submittal number.
   4. Subcontract identification.
   5. The names of:
      a. Contractor.
      b. Supplier.
      c. Manufacturer.
   6. Identification of revisions on resubmittals.
   7. For each product, reference corresponding specification section and paragraph number.

C. Deliver submittals to the Architect. Include name of contact person identified at the time of Agreement.

D. Transmit submittals under AIA form G810 or other transmittal form as accepted by the Architect.

E. Submittals in graphic form shall be clear readable copies with Contractor's original stamp. Facsimile submittals will not be accepted.

1.3 SUBMITTAL SCHEDULE

A. Make submittals to the Architect as required to cause no delay in the work.

B. Require each subcontractor to make submittals within 30 days of the subcontract date, unless specified or approved otherwise, or required to meet the work schedule.

C. Allow a minimum of 10 working days from receipt, for the Architect to review each submittal. Allow additional time for large and complex submittals representing major portions of the Work, such as fire protection, structural steel, or curtain wall. Also allow 5 additional days where review by Architect’s consultant is also required.

D. Schedule submittals to allow sufficient time for possible revision and resubmittal of the rejected submittals, without affecting the construction schedule.

E. Make the following submittals to the Owner and Architect prior to starting construction and within 10 working days of the Notice to Proceed:
   1. Certificates of insurance.
   2. List of subcontractors and suppliers.

3. Construction schedule.
4. Submittal log.
5. Products list.

F. Submit Schedule of Values prior to first application for payment.

1.4 GENERAL REQUIREMENTS FOR SUBMITTALS TO THE ARCHITECT

A. Make submittals to the Architect, unless otherwise specified.

B. Review submittals prior to submittal to the Architect.

C. Stamp and sign each submittal as certification that the submittal has been reviewed by the Contractor. Submittals not stamped and signed by the Contractor will be returned by the Architect without review for resubmittal.

D. Notify the Architect in writing, at time of submission, of all deviations in the submittals from requirements of the Contract Documents.

E. Make additional copies of approved submittals as necessary to implement the Work.

F. Review and approval of a submittal by the Architect shall not relieve the Contractor from responsibility for the proper fitting, finishing, quantities, and erection of the work in strict accordance with the Contract requirements.

G. Review and approval of a submittal by the Architect shall not relieve the Contractor from the responsibility for providing work not indicated on the submittal, but otherwise required for the completion of the work.

H. Do not fabricate or erect work prior to approval of the submittals.

I. Should discrepancies become evident, immediately notify Architect for resolution before proceeding with shop work.

J. Incorporation of substitutions into submittals will be considered cause for rejection of the submittal.

K. Submittals will be reviewed by the Architect for conformance to the design concept, only. Architect's review of vendor designed items shall not relieve the Contractor of responsibility for compliance with specified performance requirements.

L. If the Contractor fails to review Shop Drawings, Product Data, or Samples to determine their responsiveness to the Contract Documents, or fails to substantially respond to Architect's review comments prior to resubmittal, or if he makes submittals which substantially alter the Contract Documents, the Contractor shall reimburse the Owner for the charges of the Architect for extra services required to review such submittals.

1.5 CONSTRUCTION SCHEDULE

A. Prepare schedule in the form of a network planning system (CPM) for scheduling and controlling the work. Note the critical path.

B. Show commencement and completion dates proposed for each subdivision of work.

C. Update and submit monthly. Indicate actual start and completion of all completed activities. Graphically indicate changes from previously issued schedule.

D. Incorporate remedial construction into schedule when remedial work is required.

E. Show submittal dates required for shop drawings, product data, and samples, and product delivery dates, including those furnished by Owner.

F. Coordinate with the Owner's schedule, showing all Contract activities to be performed by the Owner including their start, duration, completion, float and critical path.

1.6 SUBMITTAL LOG

A. List each type of submittal, and the date that the submittal will be made. Indicate Architect review time proposed.

1.7 PRODUCTS LIST

A. Complete list of major products proposed for use, with name of manufacturer, trade name, and model number of each product.

1.8 SCHEDULE OF VALUES

A. Submit Schedule of Values prior to first Application for payment.

B. Submit schedule on AIA Form G703. Contractor's standard form or media-driven printout will be considered on request.

C. Format: Table of Contents of this Project Manual. Identify each line item with number and title of the major Specification Sections.

D. Include in each line item a directly proportional amount of Contractor's overhead and profit.

E. Revise schedule to list change orders, for each application for payment.

F. Provide a sub-schedule for each separate stage of Work specified in Section 011000.

1.9 SHOP DRAWINGS

A. Submit Shop Drawings required by individual Sections of the Specifications, and as otherwise required for proper performance of the work.

B. Illustrate fully the requirements of the Specifications and the Contract Drawings, and accurately show quantities, kinds of materials, methods of assembly, and all data required for fabrication, erection, and installation.

C. Show the relationship of adjoining work, relevant field conditions and dimensions; coordinate with affected subcontractors and suppliers if in conflict.

D. Number of Copies: Unless otherwise specified, submit 1 legible right-reading copy (PDF) to the Architect for review.

E. The Architect will return one copy to Contractor with corrections, notations and Architect's stamp indicating action to be taken.

F. Electronic data of portions of the Contract Documents may be available for use as bases for preparation of shop drawings. The General Contractor shall be responsible for all subsequent distribution of such information to subcontractors and suppliers. Request documents by submitting an executed copy of the "Agreement Concerning Use of Electronic Media" form, following this Section. Use of such documents implies Contractor's and subcontractors' agreement to the terms described on the form. Fully describe requirements for each request.
   1. Reproducible backgrounds.
      a. Copies of contract drawings, or copies of CADD generated drawings with designated data layers, only.
      b. The Contractor shall reimburse the Architect directly for reproducible backgrounds, $200.00 per request, plus direct printing costs.
   2. Database of CADD generated drawings.
      a. Release of CADD information will be restricted to the following categories:
         1) Architectural floor plans.
         2) Site plan.
         3) Reflected ceiling plans.
         4) Exterior elevations.
         5) Structural framing plans.

b. The CADD database will be generated on PC hardware by exporting from Revit platform. Architect has the capability to format CADD output to meet capabilities of all major platforms and major media types.
c. When requesting CADD databases, specify the output form required.
d. The Contractor shall reimburse the Architect directly for CADD databases; $200.00 per request of all or any categories listed above.

1.10 PRODUCT DATA

A. Mark each copy to identify applicable products, models, options, and other data. Include manufacturer's printed installation instructions.

B. Submit the number of copies which Contractor requires, plus 1 copy which will be retained by Architect.

C. Modify product data and installation instructions to delete information which is not applicable to the work.

D. Supplement standard information to provide information specifically applicable to the work.

1.11 SAMPLES

A. Submit samples as specified in the technical Sections.

B. Include identification on each sample, giving full information.

C. Submit the number of samples specified in the technical Sections. Where quantity is not specified, submit 3 samples. One will be retained by the Architect.

D. Unless specified otherwise, submit full range of manufacturers' standard colors, textures, and patterns for Architect's selection. Submit samples for selection of finishes within 20 days after date of Contract.

E. Submit samples to illustrate functional characteristics of the product, with integral parts and attachment devices. Coordinate submittal of different categories for interfacing work.

END OF SECTION

PART 1 - GENERAL

1.1 SUMMARY

A. Section includes:
   1. Description of the Construction Indoor Air Quality (IAQ) Management Plan

B. Related sections:
   1. 013300 – Submittals

C. Construction Indoor Air Quality Requirements:
   1. The Owner has set indoor air quality goals for job site operations on project, within the limits of the construction schedule, contract sum, and available materials, equipment, products and services. These goals include:
      a. Protect workers on the site from undue health risks during construction.
      b. Install low-VOC materials as specified in Part 2 – Products.
      c. Prevent residual problems with indoor air quality in the completed building.

D. This Section applies to all Technical Specification Sections, and supplements the General and Supplementary Conditions.

1.2 REFERENCES

A. Sheet Metal and Air Conditioning National Contractors Association (SMACNA)*:*
   1. IAQ Guideline for Occupied Buildings Under Construction, 1995, Chapter 3.

1.3 SUBMITTALS

A. Submit the following in accordance with Section 013300 – Submittals.

B. Indoor Air Quality Management Plan:
   1. Develop and submit a written construction indoor air quality management plan.
   2. Submit within fourteen days after receipt of Notice to Proceed and prior to beginning any work on the site.
   3. The IAQ management plan shall comply with the five requirements of SMACNA *IAQ Guideline for Occupied Buildings under Construction*, 1995, Chapter 3: HVAC protection, source control, pathway interruption, housekeeping, and scheduling and shall include:
      a. List of IAQ protective measures to be instituted on the site:
         1) HVAC system protection during construction.
         2) Source control through specification and installation of low-toxic or non-toxic materials.
         3) Pathway interruption to isolate work areas where emitting materials are being installed.
         4) Housekeeping to protect materials that are stored before installation and to avoid spreading contamination through the Project.
         5) Sequencing installation of materials to avoid contaminating absorptive materials during construction.
      b. Schedule for inspection and maintenance of IAQ measures.

C. Procedure Verification: Submit a minimum of 18 photos (6 date-stamped photos on each of three different occasions during construction. Indicate the SMACNA IAQ procedure feature in each photograph to show conformance to the credit requirements.

PART 2 - PRODUCTS

2.1 MATERIALS AND PRODUCTS

A. Low emitting products have been specified in appropriate sections.

B. If air handlers must be used during construction, filtration media with a Minimum Efficiency Reporting Value (MERV) of 8, as determined by ASHRAE 52.5-1999, must be used at each return air grille.

PART 3 - EXECUTION

3.1 ALL PHASES

A. Meet or exceed the minimum requirements of the Sheet Metal and Air Conditioning National Contractors Association (SMACNA) IAQ Guidelines for Occupied Buildings Under Construction, 1995, as applicable to new buildings. As a minimum, this means:
   1. Protect the ventilation system components from contamination:
      a. Store HVAC equipment in a clean, dry location.
      b. Seal all HVAC inlets and outlets.
      c. Seal HVAC components during installation.
      d. Use a temporary ventilation system during construction.
      e. Use temporary filtration media.
         1) Filtration media shall have a Minimum Efficiency Reporting Value (MERV) of 8 as determined by ASHRAE 52.2-1999) on any return air systems operational during construction. For air intakes into rooms that are very sensitive to dust contamination, such as computer rooms, filtration media should be the best that the HVAC systems fans can handle, up to an MERV rating of 17.
         2) Replace all filtration media immediately prior to occupancy.
      f. Clean air plenums before closing them in.
      g. Inspect filters regularly.
   2. Provide pollution source control:
      a. Protect on-site stored and installed absorptive materials (such as insulation, drywall, and wood) from moisture damage and from contamination by construction dust, debris, and fumes during all phases of construction, both before and after installation.
      b. Do not install moisture-damaged materials.
      c. Ensure that construction detailing will not result in moisture intrusion.
      d. Use low-emitting products (specified in appropriate sections).
      e. Provide strategies to avoid tracking pollutants into the work areas.
      f. Allow high-VOC materials to off-gas prior to installation. For example, all dry furnishing and materials (such as carpet, floor tile, acoustical tile, textiles, office furniture, wood shelving, etc.) shall be allowed to “air-out” in clean environments prior to installation in a building.
      g. Use the least amount of "wet" materials (such as adhesives, sealants, glazes, caulks, paints, etc.) during construction and product applications while still maintaining installation protocol required to meeting for manufacturer’s warrantee requirements.
   3. Provide interruption of pollutant pathways:
   4. Practice healthy housekeeping.
      a. Minimize accumulation of dust and other contaminants.
      b. Confine dust-generating activities.
      c. Suppress dust.
         1) Use wet sanding for gypsum board assemblies. Exception: Dry sanding allowed subject to owner approval of the following measures:
            a) Full isolation of space under finishing
            b) Plastic protection sheeting is installed to provide air sealing during the sanding
            c) Closure of all air system devices and ductwork
            d) Sequencing of construction precludes the possibility of contamination of other spaces with gypsum dust
            e) Worker protection is provided
      d. Clean up dust.
      e. Clean up spills.
      f. Keep work area dry.
      g. Seal containers of volatile liquids.
   5. Schedule construction activities to reduce exposure to VOCs.
      a. Install porous materials only after closing in the building.
      b. Account for curing time and off-gassing when scheduling construction activities.
      c. Allow wet-spray cellulose to dry before covering.
      d. Install carpeting, acoustical panels, and furnishings after interior finishes have been allowed time to cure/dry in accordance with other good building practices.

e. Provide adequate ventilation during curing period.
   1) Provide supplemental (spot) ventilation for at least 72 hours after work is completed. Preferred HVAC system operation uses supply air fans and ducts only; exhaust provided through windows. Use exhaust fans to pull exhaust air from deep interior locations. Stair towers and other paths to exterior can be useful during this process.

B. Use safety meetings, signage, and subcontractor agreements to communicate the goals of the construction indoor air quality management construction plan.

C. Conduct regular inspection and maintenance of indoor air quality measures including ventilation system protection, and ventilation rate.

D. Require VOC-safe masks for interior and exterior workers installing VOC-emitting products (products that contain 150 g/L or more VOCs).

E. Use low-toxic cleaning supplies for surfaces, equipment, and worker's personal use. Options include several soybean-based solvents and cleaning options and citrus-based cleaners. (SoySolv provides several soy-based solvents and cleaning options. Phone 1-800-231-4274 or www.soysolv.com.)

F. Smoking is prohibited inside the building once the building is closed in by any means or absorptive materials are located within the structure.

END OF SECTION

SECTION 014500 - QUALITY CONTROL

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:
   1. General requirements.
   2. Workmanship.
   3. Special installation procedures
   4. Manufacturer's instructions.
   5. Manufacturer's certificates.
   6. Mock-ups.
   7. Special exterior siding/windows mock-up.
   8. Manufacturers' field services.
   9. Testing laboratory services.
   10. Contractor tests and inspections.

B. Related Sections:
   1. 011000 - Summary: Applicability of specified reference standards.
   2. 013300 - Submittal Procedures: Submittal of manufacturer's instructions.

C. This Section applies to all Technical Specification Sections, and supplements the General and Supplemental Conditions.

1.2 GENERAL QUALITY CONTROL

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

1.3 WORKMANSHIP

A. Comply with industry standards, except when more restrictive tolerances or specified requirements indicate more rigid standards or more precise workmanship.

B. Perform work with persons qualified to produce workmanship of specified quality.

C. Secure products in place with positive anchorage devices designed and sized to withstand stresses, vibration, and racking.

1.4 SPECIAL INSTALLATION PROCEDURES

A. Make no attachment to structural concrete or steel members in the building in such a way as to overload or impair the structural integrity of the member.

1.5 MANUFACTURERS' INSTRUCTIONS

A. Unless specified otherwise, comply with instructions in full detail, including each step in sequence. Should instructions conflict with Contract Documents, request clarification from Architect before proceeding.

1.6 MANUFACTURERS' CERTIFICATES

A. When required by individual Specifications Section, submit, in duplicate, manufacturer's certification that products meet or exceed specified requirements.

1.7 MOCK-UPS

A. Provide mock-ups as specified in the individual specification sections. When the initial mock-up is unacceptable to the Architect, provide additional mock-ups until approval is obtained. Unacceptability of mock-ups does not constitute reason for increase in Contract Price or Schedule.

B. Unless specified or approved otherwise, schedule mock-ups for completion a minimum of 5 working days prior to actual commencement of the work represented by the mock-up.

C. Notify the Architect and Owner a minimum of 5 working days prior to mock-up.

D. For each mock-up, provide conditions which will replicate the conditions of the actual installation, including lighting, to the greatest reasonable extent.

E. Approved mock-up shall be the standard of workmanship and materials for the remainder of the related work.

F. Obtain Architect's written approval for each mock-up.
   1. Allow access to the mock-up for Architect's review and for review by manufacturer and trade representatives as the Architect deems appropriate.
   2. Proceed with the work upon Architect's approval of the mock-up. Each approved mock-up shall represent the standard of workmanship and materials for the remainder of the related work.
   3. Modify and correct mock-up as necessary to obtain Architect's approval; allow time in construction schedule for adjustment or reconstruction of mock-up to obtain approval. Claims for delays due to unacceptable mock-ups will not be considered.

G. Maintain mock-up in approved condition, until directed otherwise.

H. Disposition of Mock-Ups:
   1. Rejected mock-ups shall be selectively demolished to accommodate new mock-ups, or completely removed as appropriate.
   2. Mock-ups constructed as part of the proposed work, and which have been approved by the Architect, may be incorporated into the work.
   3. Unless specified or directed otherwise, approved mock-ups which are not incorporated into the work shall be removed upon project completion.

1.8 MANUFACTURERS' FIELD SERVICES

A. When specified, require product manufacturer to furnish qualified personnel to observe field conditions and quality of workmanship, and to provide recommendations, certifications, and other specified services.

B. Representative shall submit written report to Architect listing observations and recommendations.

1.9 TESTING LABORATORY SERVICES

A. The Owner will arrange for the services of an Independent Testing Laboratory to inspect and test the Work in accordance with regulatory requirements and to verify compliance with the contract documents.

B. Contractor's Responsibilities:
   1. Cooperate with Testing Laboratory personnel, and furnish access, tools, samples, certifications, test reports, design mixes, equipment, storage, and assistance as requested by the Testing Laboratory.
   2. Notify Architect and Testing Laboratory 48 hours prior to expected time for operations requiring inspection and testing. When tests or inspections cannot be performed, through the fault of the Contractor, reimburse the Owner for the additional costs incurred.
   3. Remove and replace all work found not complying with the Contract Documents. Remedies shall be in accordance with the Contract Documents and code requirements.
   4. If initial tests and inspections indicate deficient work, the Contractor shall reimburse the Owner for the costs of all subsequent tests and inspections related to the deficiency.
   5. All damage which may occur to the work as a result of normal testing operations shall be repaired to match surrounding surfaces.
   6. Schedule testing and inspection so that the work of testing and inspection personnel will be as continuous and brief as possible.

C. Tests and inspections shall be in accordance with code requirements and as otherwise required to verify conformance to Contract requirements.

1.10 CONTRACTOR TESTS AND INSPECTIONS

A. Tests and Inspections are specified in the individual specification Sections.

B. Contractor's Convenience Testing: Inspection and testing performed exclusively for the Contractor's convenience shall be the sole responsibility of the Contractor.

END OF SECTION

SECTION 014550 AIR BARRIER SYSTEM

PART 1 - GENERAL

1.1 SUMMARY

A. This section includes administrative and procedural requirements for accomplishing an airtight building enclosure that controls infiltration or exfiltration of air.

B. Related Sections:
1. 003152 - Testing and Inspection Services: Owner paid testing and inspections.
2. 014500 – Quality Control.
3. 030013 – Concrete.
4. 061643 - Gypsum Sheathing
5. 072100 – Thermal Insulation
6. 076100 - Sheet Metal Roofing
7. 076200 - Sheet Metal Flashing And Trim
8. 079200 - Joint Sealants: Expansion joint fillers.
9. 081113 – Hollow Metal Doors And Frames
10. 083323 – Overhead Coiling Doors
11. 084113 – Aluminum-Framed Storefronts, Entrances And Windows

C. Drawings, the provisions of the Agreement, the General Conditions, and Division 1 specification sections apply to all work of this Section.

1.2 DEFINITIONS AND REQUIREMENTS

A. Air Barrier System:
1. The airtight components of the building enclosure and the joints, junctures and transitions between materials, products, and assemblies forming the air-tightness of the building enclosure are called “the air barrier system”. Services include coordination between the trades, the proper scheduling and sequencing of the work, preconstruction meetings, inspections, tests, and related actions, including reports performed by Contractor, by independent agencies, and by governing authorities. They do not include contract enforcement activities performed by Architect.

B. Requirements of this section relate to the coordination between subcontractors required to provide an airtight building enclosure, customized fabrication and installation procedures, not production of standard products.
1. Continuity of the air barrier materials and products with joints to provide assemblies. Continuity of all the enclosure assemblies with joints and transition materials to provide a whole building air barrier system.
2. Specific quality-control requirements for individual construction activities are specified in the sections of the specifications. Requirements in those sections may also cover production of standard products. It is the Contractor’s responsibility to ensure that each subcontractor is adequately and satisfactorily performing the quality assurance documentation, tests and procedures required by each section.
3. Specified inspections, tests, and related actions do not limit Contractor's quality-control procedures that facilitate compliance with Contract Document requirements.
4. Requirements for Contractor to provide an airtight building enclosure is not limited by quality-control services required by Architect, Owner, or authorities having jurisdiction and are not limited by provisions of this section.

1.3 QUALITY CONTROL

A. The Contractor shall ensure that the intent of constructing the building enclosure with a continuous air barrier system to control air leakage into, or out of the conditioned space is achieved. The air barrier system shall have the following characteristics:
1. It must be continuous, with all joints sealed.
2. It must be structurally supported to withstand positive and negative air pressures applied to the building enclosure.

3. Connection shall be made between:
   a. Foundation and walls.
   b. Walls and windows or doors.
   c. Different wall systems.
   d. Wall and roof.
   e. Wall and roof over unconditioned space.
   f. Walls, floor and roof across construction, control and expansion joints.
   g. Walls, floors and roof to utility, pipe and duct penetrations.

B. Air Barrier Penetrations: All penetrations of the air barrier and paths of air infiltration / exfiltration shall be sealed.

C. Testing and Inspection Services:
   1. Inspection and testing services are required to verify compliance with requirements specified or indicated. These services do not relieve Contractor of responsibility for compliance with Contract Document requirements.
   2. Qualifications for Air Barrier Testing and Inspection Agencies: Owner will engage an Air Barrier inspection and testing service agencies, including independent testing laboratories, that are prequalified and that specialize in the types of air barrier system inspections and tests to be performed.

D. Contractor Responsibilities: Unless otherwise indicated as the responsibility of another identified entity, Contractor shall provide coordination of the trades, and the sequence of construction to ensure continuity of the air barrier system joints, junctures and transitions between materials and assemblies of materials and products, from substructure to walls to roof. Provide quality assurance procedures, testing and verification as specified herein. Facilitate inspections, tests, and other quality-control services specified elsewhere in the Contract Documents and required by authorities having jurisdiction or by the Owner. Costs for services listed below are included in the Contract Sum.
   1. Organize preconstruction meetings between the trades involved in the whole building's air barrier system to discuss where each trade begins and ends and the responsibility and sequence of installation of all the air-tight joints, junctures, and transitions between materials, products and assemblies of products specified in the different sections, to be installed by the different trades.
   2. Participate in exterior wall mock-up specified in Section 014500 before proceeding with the work, satisfactory to the Architect.

E. Associated Services: Cooperate with agencies performing required inspections, tests, and similar services, and provide reasonable auxiliary services as requested. Notify the agency sufficiently in advance of operations to permit assignment of personnel. Auxiliary services required include, but are not limited to, the following:
   1. Provide access to the Work.
   2. Furnish incidental labor and facilities necessary to facilitate inspections and tests.
   3. Take adequate quantities of representative samples of materials that require testing or assist the agency in taking samples.
   4. Deliver samples to testing laboratories.
   5. Provide security and protection of samples and test equipment at the Project Site.
   6. Prepare the building for air leakage testing per ASTM E 779. Including providing temporary isolations of intentional penetrations through the building envelope.

1.4 PERFORMANCE REQUIREMENTS

A. Compliance:
   1. Performance shall comply with the Washington State Energy Code and additional requirements as indicated.
   2. If the leakage rate when tested as described below tested exceeds that defined here, the owner's testing and inspection agency will conduct a visual inspection of the air barrier. The contractor shall seal all leaks noted to the extent practicable and submit an additional report identifying the corrective actions taken to the building owner and the Code Official

1.5 SUBMITTALS

A. The independent testing agency shall submit a certified written report, in duplicate, of each inspection, test, or similar service to the Architect. If the Contractor is responsible for the service, submit a certified written report, in duplicate, of each inspection, test, or similar service through the Contractor.
   1. Submit additional copies of each written report directly to the governing authority, when the authority so directs.
   2. Report Data: Written reports of each inspection, test, or similar service include, but are not limited to, the following:
      a. Date of issue.
      b. Project title and number.
      c. Name, address, and telephone number of testing agency.
      d. Dates and locations of samples and tests or inspections.
      e. Names of individuals making the inspection or test.
      f. Designation of the Work and test method.
      g. Identification of product and Specification Section.
      h. Complete inspection or test data.
      i. Test results and an interpretation of test results.
      j. Ambient conditions at the time of sample taking and testing.
      k. Comments or professional opinion on whether inspected or tested Work complies with Contract Document requirements.
      l. Name and signature of laboratory inspector.
      m. Recommendations on retesting.

PART 2 - PRODUCTS

NOT USED

PART 3 - EXECUTION

3.1 REPAIR AND PROTECTION

A. Upon completion of inspection, testing, sample taking and similar services, repair damaged construction and restore substrates and finishes.

B. Protect construction exposed by or for quality-control service activities, and protect repaired construction.

C. Repair and protection is Contractor's responsibility, regardless of the assignment of responsibility for inspection, testing, or similar services.

3.2 TESTING AND INSPECTION

A. The Owner will hire a testing and inspection agency to provide periodic observation during installation of the air barrier system. The testing and inspection agency will provide the following listed services:
   1. Qualitative Testing and Inspection:
      a. Reports of observations, with copies to the Owner, Contractor and Architect. The observations will include the following items as applicable to the project:
         1) Continuity of the air barrier system throughout the building enclosure with no gaps, holes.
         2) Structural support of the air barrier system to withstand design air pressures.
         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.
         5) Maximum length of exposure time of materials to ultra-violet deterioration.
         6) Surfaces are properly primed.
         7) Measure application thickness of liquid-applied materials to manufacturer’s specifications for the specific substrate.
         8) Materials used for compatibility.

9) Transitions at changes in direction, and structural support at gaps.
10) Connections between assemblies (membrane and sealants) for cleaning, preparation and priming of surfaces, structural support, integrity and continuity of seal.

END OF SECTION

SECTION 015000 - TEMPORARY FACILITIES AND CONTROLS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:
1. General requirements.
2. Electricity, lighting.
3. Heat, ventilation, cooling.
4. Telephone service.
5. Water.
6. Sanitary facilities.
7. Barriers.
8. Closures.
9. Protection of installed work.
10. Security.
11. Safety.
12. Water control.
13. Cleaning during construction.
14. Project identification.
15. Field offices and sheds.
16. Removal.

B. Related Sections:
1. 011000 - Summary: Contractor use of premises.
2. 013544 - Construction Indoor Air Quality Management: Indoor air quality management plan and post construction flush-out.
3. 017421 - Construction Waste Management and Disposal: Construction waste management plan.
4. 017700 - Closeout Procedures: Final cleaning.

C. This Section applies to all Technical Specification Sections, and supplements the General and Supplemental Conditions.

1.2 GENERAL REQUIREMENTS

A. Temporary facilities and controls shall conform to the requirements of the jurisdictional code authorities.

1.3 ELECTRICITY, LIGHTING

A. Provide service required for construction operations, with branch wiring and distribution boxes located to allow service and lighting by means of construction-type power cords.

B. Provide lighting for construction operations.

C. Existing and permanent lighting may be used during construction. Maintain lighting and make routine repairs.

D. Conserve energy.

1.4 HEAT, VENTILATION

A. Provide temporary heating and cooling as necessary to maintain specified conditions for Construction operations, to protect materials and finishes from damage due to temperature or humidity.

B. Provide temporary ventilation of enclosed areas to cure materials, disperse humidity, and prevent accumulations of dust, fumes, vapors, or gases in accordance with the Construction Indoor Air Quality Management requirements specified in Section 013544.

C. Prior to operation of permanent facilities for temporary purposes, verify that installation is approved for operation, and that filters are in place. Provide minimum Merv 8 filters in accordance with the Construction Indoor Air Quality Management requirements specified in Section 013544

D. Furnish and pay for operation and maintenance of equipment during construction. Owner will pay for utilities.

E. Conserve energy.

1.5 WATER

A. Provide service required for construction operations. Extend branch piping with outlets located so that water is available by use of hoses.

B. The Owner will pay the costs for all water used.

C. Conserve water use whenever possible.

1.6 SANITARY FACILITIES

A. Provide and maintain required portable facilities and enclosures.

1.7 BARRIERS

A. Provide as required to prevent public entry to construction areas, to provide for Owner's use of site, and to protect existing facilities and adjacent properties from damage from construction operations.

B. Provide 6 foot high fence around construction site; equip with vehicular and pedestrian gates with locks. Construction: Commercial grade chain link fence.

C. Provide barricades and covered walkways as required by governing authorities for public rights-of-way and for public access to existing buildings.

D. Provide barriers around trees and plants designated to remain. Protect against vehicular traffic, stored materials, dumping, chemically injurious materials, and puddling or continuous running water.

E. Provide barricades around openings in floors and roof decks.

1.8 CLOSURES

A. Exterior Closures:
   1. Provide temporary weather-tight closures as necessary to create proper interior environmental conditions, protection of materials, and to prevent entry of unauthorized persons. Conform to Construction Indoor Air Quality Management requirements specified in Section 013544.
   2. Where doors are necessary for access by construction personnel, provide self-closing hardware and locks.
   3. Except as necessary for construction access, do not remove exterior closures until permanent construction is ready to be installed and made weathertight.
   4. Enclosures shall be constructed to prevent blow off during inclement weather, and shall be sealed to prevent water penetration and excessive air infiltration.

B. Interior Closures:
   1. Provide temporary closures to prevent penetration of dust and moisture into areas separate from work areas, damage to operating systems and components, and to create environmental conditions necessary for the proper installation of materials and systems.
   2. Conform to Construction Indoor Air Quality Management requirements specified in Section 013544.

C. Installed construction which has been damaged due to lack of protection shall be replaced or restored to original or new condition. This includes construction required to be protected under Construction Indoor Air Quality Management requirements specified in Section 013544.

1.9 PROTECTION OF INSTALLED WORK

A. Provide temporary protection for installed work, including protection from impact, water, dust contamination, overspray, and similar damage. Conform to Construction Indoor Air Quality Management requirements specified in Section 013544.

B. Secure temporary protections as necessary to prevent blow off during inclement weather.

C. Provide protective coverings at exposed exterior walls and horizontal surfaces, projections, and window and door openings.

D. Protect finished surfaces from damage caused by traffic, movement of heavy objects, and storage of materials. Where necessary, control traffic in immediate area as necessary to minimize the risk of impact damage.

E. Prohibit traffic and storage on waterproofed and roofed surfaces, on lawn and landscaped areas.

F. Installed construction which has been damaged due to lack of protection shall be replaced or restored to original or new condition.

1.10 SECURITY

A. Provide security program and facilities to protect Work, materials stored off-site, existing facilities, and Owner's operations from unauthorized entry, vandalism, and theft. Coordinate with Owner's security program.

1.11 SAFETY

A. Furnish safety program and facilities to protect the safety of workers and other persons affected by the Work.

1.12 WATER CONTROL

A. Grade site to drain. Maintain excavations free of water. Provide and operate pumping equipment.

1.13 CLEANING DURING CONSTRUCTION

A. Control accumulation of waste materials and rubbish on a daily basis, and dispose of off-site or in a designated container on site. Conform to Construction Waste Management and Disposal requirements specified in Section 017421.

B. Clean interior areas prior to start of finish work, maintain areas free of dust and other contaminants during finishing operations.

C. Remove excess debris from cavities which are to be concealed in the finished Work.

D. Cleaning procedures shall be in accordance with Indoor Air Quality Management Plan specified in Section 013544.

1.14 PROJECT IDENTIFICATION

A. Provide 8 x 6 foot Project identification sign of wood frame and exterior grade plywood construction, painted, with exhibit lettering by professional sign painter, to Architect's design and colors. List title of Project, names of Owner, Architect, professional consultants, Contractor and major subcontractors. Erect on site at location established by Owner.

1.15 FIELD OFFICES AND SHEDS

A. Field Office:
   1. Office: Weather-tight, with lighting, electrical outlets, heating, cooling, and ventilating equipment, and equipped with furniture. Provide, in addition, space for Project meetings, with table and chairs to accommodate 6 persons.
   2. Equipment:
      a. Copier: Contractor's option; 11 x 17 inch size capability.
      b. Facsimile Machine: Contractor's option. Connect to public phone lines as required for communication with Architect’s office and Contractor's home office.
      c. Communication Service
         1) Minimum one dedicated telephone line with instrument.
         2) An Internet Service Provider (ISP) account.
         3) Com ISDN LAN modem or Office Connect
         4) WI-FI, including audio and large screen monitor for Zoom teleconferencing
         5) Remote Dual Analog Router (analog or ISDN depending on telephone company service), or approved, for use and communication with Internet Service Provider (ISP).

d. Computer: Minimum one Pentium PC with minimum 128 MB of RAM, including the following.
   1) Windows XP and Microsoft Office 2003, or later; Internet Explorer V6.0 or later.
   2) Bluebeam Revu at least one station for initiating documents.
   3) Adobe Acrobat Reader.
e. Printer: Minimum 11x17 inch graphics capability.
f. Sheet-feed or flatbed scanner and related software.

B. Storage Sheds for Tools, Materials, and Equipment: Weather-tight, with heat and ventilation for Products requiring controlled conditions, with adequate space for organized storage and access, and lighting for inspection of stored materials.

1.16 CONTRACTOR DESIGNATED AREAS

A. Exterior Storage Sheds for Tools, Materials, and Equipment: Weather-tight, with adequate space for organized storage and access, and lighting for inspection of stored materials.

1.17 REMOVAL

A. Completely remove temporary materials and equipment when their use is no longer required. Conform to Construction Waste Management and Disposal requirements specified in Section 017421.

B. Clean and repair damage caused by installation or use of temporary facilities. Remove underground installations to a depth of 2 feet; grade site as indicated. Restore existing facilities used during construction to specified, or to original, condition.

END OF SECTION

SECTION 016000 - PRODUCT REQUIREMENTS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:
   1. Products.
   2. Transportation and handling.
   3. Storage and protection.
   4. General installation requirements.
   5. Product options.
   6. Substitutions.

B. Related Sections:
   1. 006325 - Substitution Request Form.
   2. 011000 - Summary: Owner-furnished products.
   3. 014500 - Quality Control: Submittal of manufacturers' certificates.
   4. 017421 - Construction Waste Management and Disposal: Construction waste management plan.
   5. 017700 - Closeout Procedures: Systems demonstration, operation and maintenance data, warranties and guarantees, spare parts and maintenance materials.

C. This Section applies to all Technical Specification Sections, and supplements the General and Supplementary Conditions.

1.2 PRODUCTS

A. Products include material, equipment, and systems.

B. Comply with size, make, type, and quality specified, unless otherwise approved in writing by the Architect. Specifications and referenced standards are minimum requirements.

C. All components required to be supplied in quantity shall be identical, whether furnished under one or several Sections of the specifications.

D. Unless specified or indicated otherwise, materials employed for construction purposes, such as formwork, scaffolding, and temporary lighting, shall not be incorporated into the work.

E. Unless indicated or specified otherwise, all products incorporated into the Work shall be of the most suitable grade of their respective kinds for the intended use.

1.3 TRANSPORTATION AND HANDLING

A. Transport by methods to avoid product damage.

B. Deliver products in manufacturer's original containers or packaging, with identifying labels intact and legible. Where options exist, select container or packaging systems that can be recycled or reused. Coordinate packaging waste removal and recycling with the Construction Waste and Demolition Management Plan

C. Furnish equipment and personnel to handle products by methods to prevent soiling or damage.

D. Promptly inspect shipments to assure that products comply with requirements, quantities are correct, and products are undamaged.

E. Immediately replace non-conforming products with new conforming products, at no additional cost to the Owner.

1.4 STORAGE AND PROTECTION

A. Store products in accordance with manufacturer's instructions, with seals and labels intact and legible.

B. Store sensitive products in weather-tight enclosures. Maintain within temperature and humidity ranges required by manufacturer's instructions, and as otherwise required to prevent damage.

C. For exterior storage of fabricated products, place on sloped supports above ground. Protect from soiling or staining through ground contact. Cover products subject to deterioration with impervious sheet covering; provide ventilation to avoid condensation.

D. Store loose granular materials on solid surfaces in a well-drained area; prevent mixing with foreign matter.

E. Arrange storage of products to furnish convenient access for inspection and inventory.

1.5 GENERAL INSTALLATION REQUIREMENTS

A. Unless indicated or specified otherwise, install each product in accordance with the product manufacturer's instructions.

B. Distribute copies of manufacturer's instructions to parties involved in the installation.

C. Maintain one set of complete instructions at the job site during installation and until completion.

1.6 PRODUCT OPTIONS

A. Product Specified by Reference Standards or by Description Only: Provide product meeting those standards.

B. Product Specified by Naming One or More Manufacturers with an "or approved" provision: Use specified product or submit a request for substitution in accordance with the specified substitution requirements. When approved a substitute product may be used.

C. Product Specified by Naming One or More Manufacturers, without a provision for Substitution: No substitution will be allowed, except as specified under the Article on Substitutions.

1.7 SUBSTITUTIONS

A. Timing: Substitution requests will be considered to 15 days after date of Owner-Contractor agreement, as pertinent to that phase of work for which the product substitution is proposed. Substitution requests prior to such cutoff date may originate directly from the General Contractor, or from a prospective supplier or subcontractor. Substitution requests within 15 days after cutoff date shall be submitted through the General Contractor. Subsequent substitutions will be considered only for the following reasons:
   1. A product becomes unavailable due to no fault of the Contractor.
   2. Subsequent information or changes indicate that the specified product will not perform as intended.
   3. A substitute product will be in the Owner's best interest.

B. Substitution requests shall be submitted only through the General Contractor.

C. Documentation:
   1. Document each request with complete data substantiating compliance of proposed substitution with Contract Documents.
   2. Requests for substitution shall be made on Document 006325 - Substitution Request Form.
   3. Limit each request to one proposed product or system.
   4. For substitutions prior to Agreement, signature and projected cost data are not required.

D. Request for substitution constitutes a representation that the proposer:
   1. Certifies that the proposed substitute item has been fully investigated and has been determined to be equal or superior to that specified in all respects.
   2. Certifies that the same or greater warranty will be furnished
   3. Certifies that required maintenance service and source for replacement parts are available
   4. Certifies that incorporation of the proposed substitute item will not affect functional clearances.
   5. Warrants that coordination, installation, and changes to the project as necessary to accommodate the proposed substitution shall be the Contractor's responsibility, that use of the substitute item(s) will not delay project completion
   6. Warrants that claims for additional costs related to its incorporation which may become subsequently apparent will be borne by the Contractor.

E. Substitutions will not be considered when they are indicated or implied on shop drawing or product data submittals.

F. Review: The Architect will be the judge of the acceptability of the proposed substitution; in the judgment of Architect the product shall meet the following criteria:
   1. It is equal or superior in quality and serviceability to the specified product.
   2. Its use will not entail unacceptable changes in details and construction of related work.
   3. Its design and artistic effect complies with design concept.

G. The Architect will review requests for substitutions with reasonable promptness, and request additional information, documentation, or samples, as necessary for evaluation of the request. Within two weeks of receipt of the completed request, the Architect will take one of the following actions.
   1. If the substitution is allowed by the Architect prior to the cutoff date, an Addendum to the Bid Documents will be issued by the Architect.
   2. If the substitution is allowed by the Architect after the cutoff date, the Architect will notify the General Contractor and issue the appropriate Construction Change Authorization, Supplemental Instruction, or Proposal Request.
   3. If the request for substitution is denied, the proposer will be notified of the rejection. If a decision on the substitution request cannot be made or obtained within the time allocated, use the specified product.

END OF SECTION

SECTION 017421 - CONSTRUCTION WASTE MANAGEMENT AND DISPOSAL

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:
   1. Waste Diversion Plan requirements
   2. Deconstruction and Salvage Assessment requirements.
   3. Waste Diversion Report

B. Related Sections:
   1. 015000 – Construction Facilities and Controls.

C. This Section applies to all Technical Specification Sections, and supplements the General and Supplementary Conditions.

1.2 DEFINITIONS

A. Commingled or Off-site Separation: Collecting all material types into a single bin or mixed collection system and separating the waste materials into recyclable material types in an off-site facility.

B. Construction, Demolition and Land Clearing Waste (CDL): For purpose of this section, includes all non-hazardous solid wastes such as building materials, packaging, rubbish, debris and rubble resulting from construction, remodeling, alterations, repair, deconstruction, demolition and land clearing.

C. Deconstruction; The process of removing existing building materials from renovation and demolition projects for the purposes of reuse, and recycling, in as efficient and safe manner as possible.

D. Hazardous Waste: As defined by the state where the Project is located.

E. Recyclable Materials: Products and materials that can be recovered and remanufactured into new products.

F. Recycling: The process of sorting, cleaning, treating and reconstituting materials for the purpose of using the material in the manufacture of a new product. Can be conducted on site (as in the grinding of concrete for reuse on site).

G. Recycling Facility: An operation that can legally accept materials for the purpose of processing the materials into an altered form for the manufacture of a new product. Recycling facilities have their own specifications for accepting materials.

H. Salvage and Reuse: Existing usable product or material that can be saved and reused in some manner on the project site. Materials that can be salvaged and reused on site must comply with the applicable technical specifications.

I. Salvage for Resale: Existing usable product or material that can be saved and removed intact (as is) from the project site to another site for resale to others without remanufacturing.

J. Source-Separated Materials: Materials that are sorted at the site for the purpose of reuse or recycling.

K. Sources Separation: Sorting the recovered materials into specific material types with no or a minimum amount of contamination on site.

L. Time-Based Separation: Collecting waste during each phase of construction or deconstruction that results in primarily one major type of recovered material. The material is removed before it becomes mixed with the material from the next phase of construction.

M. Trash: Product or material unable to be salvaged for resale, salvaged and reused, returned, or recycled.

N. Waste: Excess materials generated by the construction and demolition operations of the Project that are produced on site or brought to the site. Waste includes, without limitation, packaging materials such as banding, crates, pallets, plastic film, polystyrene, and cardboard. Waste does not include excavated soils, rocks, vegetation, and hazardous waste removed from the site

1.3 WASTE MANAGEMENT REQUIREMENTS

A. Salvage, recycle, and reuse a minimum of 50% of construction and demolition waste material generated by the Project in order to meet the Owner's requirements.

B. Minimize the creation of construction and demolition waste on the job site. Minimize factors that contribute to waste, such as excess packaging, improper storage, ordering errors, poor planning, breakage, mishandling, and unnecessary contamination.

C. Total construction waste to landfill shall be less than 1.5 pounds per square foot of building.

D. Targeted Salvage Materials: This Project will use certain salvaged materials from a previous demolition project on this site. As such, they are indicated as Owner-furnished materials.

E. The following waste materials may be diverted from landfill to the greatest extent possible to meet the specified requirements:
   1. Clean dimensional wood, pallet wood, plywood, OSB, and particleboard
   2. Asphalt.
   3. Concrete
   4. Concrete masonry units
   5. Brick
   6. Rock and gravel
   7. Soil and sand
   8. Ferrous and non-ferrous metals
   9. Gypsum products.
   10. Acoustical ceiling tile.
   11. Glass, both window and bottle.
   12. Plastics, including plastic film.
   13. Carpet and pad.
   14. Cardboard, paper, paper-based packaging
   15. Insulation
   16. Batteries.
   17. Doors, windows frames, relites, hardware, millwork.
   18. Other wood
   19. Equipment and appliances.
   20. Non-asbestos roofing.

F. Hazardous materials such as paints, solvents, adhesives, batteries, and fluorescent light bulbs and ballasts which cannot be reused shall be disposed of at authorized hazardous waste outlets.

1.4 CONSTRUCTION WASTE DIVERSION PLAN

A. Develop and submit to the Architect a Waste Diversion Plan in accordance with the requirements herein. Revise and resubmit the Plan until approval is obtained.

B. Unless approved otherwise, no waste generating construction work may proceed until the Waste Diversion Plan is approved. Approval of the Contractor's Waste Diversion Plan will not relieve the Contractor of responsibility for meeting the waste management goals specified.

C. The Waste Diversion Plan shall include the following:
   1. A list of waste materials that will be salvaged for resale, salvaged for reuse, recycled, and disposed.
   2. Estimated quantities of each waste material.
   3. Description of waste handling methods to be used, including one or more of the following:
      a. Requiring subcontractors to take their waste to a recycling facility.
      b. Contracting with diversion/recycling hauler to haul recyclable waste to an approved recycling or material recovery facility.
      c. Processing and reusing materials on-site.
      d. Self hauling to a recycling or material recovery facility.
   4. Name, address and phone number and qualifications of each proposed diversion/recycling hauler that will be used in the Project.

5. Identification of each recycling or material recovery facility to be utilized.
6. Description of the method to be employed in collecting, and handling, waste materials, including a description of the methods that will be used to protect recycled materials from contamination.
7. Description of the means of transportation of waste materials.
8. Description of methods to communicate waste management plan to personnel and subcontractors.

D. Calculation shall be done by weight (tons) or by volume (cubic yards) but shall be consistent throughout.

E. Implement procedures to communicate the Waste Diversion Plan to personnel and subcontractors.

1.5 DECONSTRUCTION AND SALVAGE ASSESSMENT

A. Develop and submit to the Architect a Deconstruction and Salvage Assessment in accordance with the requirements herein. Revise and resubmit the assessment until approval is obtained.

B. Use the deconstruction and salvage assessment to identify which of the potential materials listed on the waste diversion plan might be salvageable.

C. The assessment form must be completed by a salvage verifier that meets one of the following:
1. An established salvage and reuse retail company
2. A licensed contractor specializing in deconstruction
3. A demolition company with knowledge of local and current salvage retail markets.

D. Unless approved otherwise, no salvage or waste generating construction work may proceed until the Deconstruction and Salvage Assessment is approved. Approval of the Deconstruction and Salvage Assessment will not relieve the Contractor of responsibility for meeting the salvage and waste management goals specified.

1.6 QUALITY ASSURANCE

A. Regulatory Requirements: Comply with applicable requirements of the jurisdictional authorities, local ordinances and regulations concerning management of construction waste, clearing, and inert materials.

B. Preconstruction Meeting:
1. Prior to beginning work at the site, schedule and conduct a meeting to review the Waste Diversion Plan and discuss procedures, schedules, coordination and specific requirements for waste materials recycling and disposal.
2. Discuss coordination and interface between Contractor, sub-contractors, architect, engineers, project manager, Owner, and other C&D activities. Identify and resolve problems of compliance with requirements.
3. Record minutes of the meeting, identifying conclusions reached and matters requiring further resolution. Maintain waste management as an agenda item at future construction meetings.
4. Attendees: Contractor and related contractor personnel associated with work of this section, including personnel in charge of the waste management program; C&D Quality Manager; architect; engineers; material and equipment suppliers where appropriate; and such additional Owner personnel as Owner deems appropriate.
5. Plan Revision: Make revisions to Waste Diversion Plan agreed upon during the meeting and incorporate resolutions agreed to be made subsequent to the meeting. Submit revised plan to architect or the Owner personnel, as Owner deems appropriate for approval.

C. Progress Meetings: Waste management goals and issues shall be discussed at regularly scheduled progress meetings as specified in Section 013119 Project Meetings.

D. Disposal Site, Recyclers and Waste Materials Processors: Use only facilities properly permitted in the State where the Project is located, and/or by local authorities where applicable.

PART 2 - PRODUCTS

2.1 WASTE CONTAINERS

A. Durable, covered, secured, reusable container for each category or waste.

B. All recycling containers shall be clearly marked and shall list the materials which can be recycled as well as appropriate materials which cannot.

PART 3 - EXECUTION

3.1 PROJECT / SITE CONDITIONS

A. Use construction methods that reduce construction waste. When possible:
   1. Order materials precut to required size.
   2. Order exact quantity required.
   3. Use temporary materials and facilities that will be reused at other projects.

B. Field Measurements: Contractor is to verify that field measurements are as indicated on construction and/or shop drawings before confirming product orders or proceeding with work, in order to minimize waste due to excessive materials.

C. Protect products from damage during storage, installation and in-place. Materials that become wet, damp or unusable for any reason due to improper storage shall be replaced at the Contractor's expense.

D. Request or require products delivered to the Site with packing materials that can be returned to sender, reused by others, or easily recycled.

E. Use detailed take-offs to identify location and uses in structure to reduce risk of unplanned and potentially wasteful cuts.

3.2 PACKING AND SHIPPING

A. Shipping: Coordinate the schedule of product delivery to designated prepared areas in order to minimize site storage time and potential damage to stored materials.

B. Packing: Arrange for the return of packing materials, such as wood pallets, where economically feasible.

3.3 CUTTING AND PATCHING

A. Use on-site waste as primers, sealers, underlayments, supports, backing, blocking, furring, suspension systems, and accessories as required for any purpose in patching existing work.

B. Provide environmentally benign non-hazardous or recycled content materials for cutting and patching.

END OF SECTION

SECTION 017700 - CLOSEOUT PROCEDURES

1.1 SUMMARY

A. Section Includes:
1. Closeout procedures.
2. Temporary Certification of Occupancy.
3. Final cleaning.
4. Project record documents.
5. Project record documents
6. Operation and maintenance data.
7. Operation instruction.
8. Manufacturer's warranties.
9. Guaranties.
10. Spare parts and maintenance materials.

B. Related Sections:
1. 011000 - Summary: Partial Owner occupancy.
2. 015000 - Temporary Facilities and Controls: Cleaning during construction.
3. 017421 - Construction Waste Management and Disposal: Construction waste management plan.
4. Division 23 and 26 for special closeout requirements for mechanical and electrical systems.

C. This Section applies to all Technical Specification Sections, and supplements the General and Supplemental Conditions.

1.2 DEFINITIONS

A. As-Built / Redline Drawings: As-built/Redline drawings shall mean a set of Construction Drawings that reflect on-site changes required during the project as directed by ASI/RFI. These drawings can be managed as a hard-copy with mark-ups then scanned to PDF at the end of the project or as PDF files using Bluebeam during the project with ASI/RFI files hyperlinked. At the end of the project, either can be delivered as Final Record Documents.

B. Final Documents: The properties of the project as constructed, defined by final drawings, specifications, maintenance manuals and operating instructions as provided by the Operation & Maintenance Manuals for each discipline and/or trade.

1.3 CLOSEOUT PROCEDURES

A. Comply with procedures stated in General Conditions of the Contract for Substantial and Final Completion.

B. Certain areas will be subject to partial occupancy or use as specified in Section 011000.

C. Submit all certificates of approval issued by the governing authorities, including, without limitation, the following:
1. Certificate of Occupancy.
2. Any and all Temporary Certificates of Occupancy.

D. Prior to final payment, submit the following affidavits using the forms listed below:
1. Contractor's Affidavit of Payment of Debts and Claims AIA Document G706.
2. Consent of Surety to Final Payment AIA Document G707.
3. Contractor's lien release, and lien releases from each subcontractor; Contractor's Affidavit of Release of Liens AIA Document G706A

E. Temporary Certificate of Occupancy: It is the intention of this project to allow for and receive a temporary certificate of occupancy for the Early Childhood Education Area prior to final completion. This shall be coordinated by the General Contractor and shall be included as a milestone on the Construction Schedule.

F. Submit final Application for Payment identifying total adjusted contract sum, previous payments, and sum remaining due.

G. Submit building permit documents and building inspection signoff sheets to the Owner.

1.4 FINAL CLEANING

A. Execute prior to final inspection.

B. Clean interior and exterior 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 a sanitary condition.

D. Clean or replace filters of mechanical equipment.

E. Clean roofs, gutters, downspouts, and drainage systems.

F. Clean site; sweep paved areas, rake clean other surfaces.

G. Touch up and otherwise repair and restore marred, exposed finishes and surfaces. Replace finishes and surfaces that cannot be satisfactorily repaired or restored or that already show evidence of repair or restoration.

H. Remove waste and surplus materials, rubbish, and construction facilities from the Project and from the site. Conform to Construction Waste Management and Disposal requirements specified in Section 017421.

1.5 PROJECT RECORD DOCUMENTS

A. Maintain a complete set of record documents which clearly and neatly indicate all changes from the Contract Documents, and all uncovered existing conditions which will be subsequently concealed.

B. Record documents shall include:
   1. Contract drawings.
   2. Specifications.
   3. Reviewed shop drawings, product data, and samples
   4. Closeout documentation for action items identified by owner inspection agencies

C. Record documents shall be used for no other purpose and shall be stored separate from those used for construction.

D. Keep documents current; do not permanently conceal any work until required information has been recorded.

E. Mark specifications legibly and record at each Product section a description of actual products installed. Include the manufacturer's name and product model and number.

F. Drawings shall indicate exact installed locations and dimensions of all concealed work, including, without limitation, conduit, piping, ducts, mechanical and electrical equipment, and foundations. Indicate all changes to details which involve concealed construction.

G. Prior to approving each Payment Request, the Architect reserves the right to inspect the Record Documents. The Payment Request may not be approved until the record documents are current to the Date of the Payment Request.

H. At Contract Closeout, submit documents with transmittal letter containing date, Project title, Contractor's name and address, list of documents, and signature of Contractor.

1.6 OPERATION AND MAINTENANCE DATA

A. Furnish published operation and maintenance information covering all equipment and finish materials installed on the project. Whether specified or not, furnish published information whenever special maintenance procedures are required to assure the proper operation and durability of project material, equipment, and finishes.

B. O&M Manuals are to be delivered as one (1) Hard Copy Binder and one (1) Soft-copy in PDF format.

C. Information shall be submitted by the General Contractor through the Architect.

1.7 OPERATION INSTRUCTION

A. Prior to Final Completion, instruct Owner's personnel in operation, adjustment, and maintenance of products, equipment and systems. Provide instruction at mutually agreed upon times.

B. Use experienced personnel trained and experienced in the operation and maintenance of the building equipment or system involved.

C. Use operation and maintenance manuals for each piece of equipment or system as the basis of instruction. Review contents in detail to explain all aspects of operation and maintenance.

D. Refer to the individual technical Sections for additional requirements for instruction of Owner's personnel.

1.8 MANUFACTURER'S WARRANTIES

A. Furnish original and duplicate copies of each manufacturer warranty executed to the Owner.

B. Execute Contractor's submittals to the manufacturers, and assemble documents executed by the manufacturers.

C. Provide table of contents and assemble in binder with durable plastic cover.

D. Submit material prior to final application for payment in accordance with Section 013300. For equipment put into use with Owner's permission during construction, submit warranty within 10 days after first operation. For items of Work delayed materially beyond Date of Substantial Completion, furnish warranty within ten days after acceptance, listing date of acceptance as start of warranty period.

1.9 GUARANTIES

A. Furnish written guaranty, executed to the Owner, on work covered by the additional guaranty requirements specified in the technical sections. The guaranty shall commence on the date of Owner acceptance of that portion of the work or Substantial Completion, whichever occurs first.

B. Transmit through the Architect in accordance with Section 013300.

1.10 SPARE PARTS AND MAINTENANCE MATERIALS

A. Furnish products, spare parts, and maintenance materials in quantities specified in each Section, in addition to that used for construction of Work. Coordinate with Owner, deliver to Project site and obtain receipt prior to final payment.

B. Unless specified otherwise, deliver materials in manufacturer's original factory cartons or containers.

C. Materials shall be clearly labeled, and shall include designations used in the Contract Documents.

1.11 KEYS

A. Deliver properly identified and tagged keys and hardware maintenance tools to the Owner, including those specified in Sections 064000, 083100, 087100 and 102813.

B. Obtain itemized receipt for all keys and tools.

C. Send all master keys by registered mail directly from manufacturer to Owner's representative as later directed.

END OF SECTION

PART 1 - GENERAL

1.1 DESCRIPTION

A. General work items include, but are not limited to:
   1. Assessment: Site investigation, inventory and analysis.
   2. Remediation: Activities requiring compliance with this Section include the manual demolition, and removal of building components determined by assessment to be hazardous materials as defined by state and federal guidelines and regulations.
   3. Handling: Conduct activities involving regulated materials under Work of this Contract in accordance with this Section and current applicable state and federal regulations including, but not limited to WAC 296-155-176 and WAC 296-841.
   4. Waste Disposal: The Contractor is responsible for determining current waste handling requirements according to applicable local, state and federal regulations.

B. Related Sections
   1. 012113 - Cash Allowances
   2. 024119 - Selective Building Demolition.

C. Drawings, the provisions of the Agreement, the General Conditions, and Division 1 specification sections apply to all work of this Section.

D. Work of this Section is by Allowance. Refer to Section 012113 for further information.

1.2 PROJECT CONDITIONS

A. Contractor shall hire a professional firm (“Consultant”) licensed to provide hazardous materials assessment and remediation services.

B. Consultant shall be fully capable of identifying, analyzing, evaluating, isolating, removing, and disposing of hazardous materials including but not limited to asbestos, lead, mercury, and PCBs. Consultant shall also comply with all local, state, and federal regulations including but not limited to obtaining permits for the Work.

C. Firm shall inspect the existing buildings on site prior to their demolition, prepare a report identifying hazardous materials, make recommendations as to material removal or isolation, and disposition, and perform the Work as outlined in the approved Work Plan.

1.3 SUBMITTALS

A. Submit the following prior to start of work. The Work may not proceed until complete Submittal package has been reviewed by the Contractor, the Architect, and the Owner.
   1. Environmental Report: Consultant shall prepare a written report identifying all regulated materials, their nature or categorization as defined by regulating agencies, their quantity and locations.
   2. Work Plan: Submit a site-specific plan for activities impacting clean-up of regulated materials. The Work Plan shall be developed and implemented to provide engineering, work practice and administrative controls to reduce and maintain exposure at or below the permissible exposure limit. The plan will include at a minimum task-specific descriptions of activities; controls; personnel; procedures; method of compliance; technology used to meet compliance; air monitoring plan when necessary; detailed schedule; work practice program; administrative controls and other relevant information. Implementation of work practices not described in the Work Plan shall not be permitted until an amendment to the submittal is reviewed by the Environmental Consultant and Owner.

B. Final Submittals:
   1. Project Record Documents: Provide record of remediation activities including disposition of each type of regulated material removed from the site.

1.4 SUBCONTRACTORS

A. Subcontractors employed by the Consultant shall be bound to all the work and safety standards specified. Subcontractor's personnel shall meet requirements as specified and shall be supervised by the Contractor during performance of this work.

1.5 LIABILITY

A. The Consultant is an independent contractor and not an employee of the Owner or the Architect. The Owner and the Architect shall have no liability to the Consultant or any third persons for Consultant's failure to faithfully perform and follow the provisions of these Specifications and the requirements of the governing agencies. Notwithstanding the failure of the Owner or the Architect to discover a violation by the Consultant of any of the provisions of these Specifications, or to require the Consultant to fully perform and follow any of them, such failure shall not constitute a waiver of any of the requirements of these Specifications which shall remain fully binding upon the Contractor.

PART 2 - PRODUCTS

NOT USED

PART 3 - EXECUTION

3.1 WORK PRACTICES

A. Perform the Work in strict compliance with Work Plan and governmental agency requirements.

B. Restrictions
   1. Use of mechanical methods including, but not limited to power sanding, grinding, sand-blasting, etc. shall be performed within a negative pressure enclosure (NPE) pending approval of negative exposure assessment by the Owner.
   2. Negative Exposure Assessment: The Contractor may waive the requirement of a negative pressure enclosure when using mechanical methods upon approval by the Consultant of data indicating a negative exposure assessment has been completed per WAC 296-155 and 296-841 and paragraph 1.4, Air Monitoring. The Contractor shall allow 48-hours for review of such data.

C. Housekeeping: Maintain all surfaces as free as practicable of accumulations of regulated materials and perform clean-up of work areas as necessary according to WAC 296-155-17617.

D. Disposal Procedures:
   1. Waste characterization will be performed, as necessary, by the Consultant in coordination with the Contractor on the anticipated general waste stream. Results of such characterization will be provided to the Owner by the Contractor.
   2. The Consultant shall be responsible for disposal of regulated materials. Materials that have been cleaned of hazardous materials, and certified by the Consultant as such, may be disposed of by the Contractor in accordance with Section 024119.-in accordance with applicable local, state and federal regulations.

END OF SECTION

SECTION 024119 - SELECTIVE BUILDING DEMOLITION

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:
   1. Demolition and removal from the site of existing construction to accommodate the new construction.
   2. Removal of existing components for reinstallation.
   3. Salvaging of existing materials.
   4. Capping and identification of utility lines.
   5. Contractor design of shoring and bracing.
   6. Patching of existing construction to remain.

B. Related Sections:
   1. 011000 - Summary: Contractor's use of the site; Owner occupancy requirements.
   2. 015000 - Temporary Facilities and Controls: Temporary enclosures, guardrails, barriers, barricades, lighting and dust control.
   3. 017700 - Closeout Procedures: Project record documents.
   4. 022600 - Hazardous Materials Assessment and Remediation

C. Drawings, the provisions of the Agreement, the General Conditions, and Division 1 specification sections apply to all work of this Section.

D. Substitutions: Substitute products will be considered only under the terms and conditions of Section 016000.

1.2 PROJECT CONDITIONS

A. Work of this Section shall be performed in 2 phases. Refer to Demolition Drawings for Phase description and requirements.

B. Following completion of, and Owner’s acceptance of, the new Lab Building, and prior to demolition of existing Lab Building, provide labor and expertise to move salvaged furnishings and equipment from existing Lab Building to New Lab Building. Use trades people appropriate to the items being salvaged.

C. Do not begin demolition of existing Lab Building prior to receiving written authorization from the Owner.

1.3 SUBMITTALS

A. Make submittals in accordance with Section 013300, unless specified otherwise.

B. Submit certification that temporary shoring, support, and restraining systems have been designed by a structural engineer licensed to practice in the State of the Project.

1.4 QUALITY ASSURANCE

A. Comply with the applicable health and safety regulations of the jurisdictional authorities.

B. Obtain and pay for all permits required for the demolition work.

C. Obtain approval of demolition procedures which affect the normal operation of Owner occupied spaces.

D. The design of shorings, temporary supports, and restraining systems shall be the responsibility of the Contractor.

E. Pre-bid Inspection: Visit the Site to determine existing conditions, and as much as possible to determine the extent of demolition required.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Patching Materials: Materials used to patch existing construction shall match the existing construction unless indicated otherwise.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Prior to starting work, carefully inspect existing conditions and verify that the work of this Section may properly commence. Notify the Architect in writing of conditions detrimental to the proper and timely completion of the work.

B. Do not begin demolition until all unsatisfactory conditions are resolved. Beginning work constitutes acceptance of site conditions and responsibility for defective demolition caused by prior observable conditions.

C. When unanticipated mechanical, electrical, structural or other elements that conflict with intended function or design are encountered, investigate and ascertain the nature and extent of conflict. Promptly submit a written report to Architect. Perform no further demolition in such areas, unless approved by the Architect.

3.2 PREPARATION

A. Provide and maintain all temporary barriers and security devices necessary for the demolition work. Conform to requirements of Section 015000.

B. Provide protection to all surrounding public spaces. Perform work and provide temporary construction as approved by the local jurisdictional code authorities.

C. Protect existing construction which will not be subject to demolition.

3.3 SALVAGE

A. Salvage furnishings and equipment from the existing Lab Building as directed by the Owner for moving into new Lab Building.

B. Photo survey: Prior to Demolition of existing Lab Building, provide photo documentation showing furnishings and equipment to be salvaged. Special attention to be given to the interface of selective demolition and salvage as any damage of furnishings and equipment to be salvaged shall be corrected by the Contractor

3.4 DEMOLITION

A. Perform demolition as indicated and as required to accommodate the new work. Demolish in an orderly and careful manner. Where demolition exceeds that indicated, verify such demolition with the Architect prior to proceeding.

B. Protect existing structural members. Contact the Architect prior to modifying structural members beyond the extent indicated. Cease operations and notify the Architect immediately if continued demolition operations might endanger the existing structure.

C. Notify the Owner of hazardous materials discovered during demolition operations.

D. Provide Contractor designed temporary shoring as required to support existing construction against movement or overload during demolition operations, until permanent supports are in place.

E. Except where noted or specified otherwise, take possession of materials being demolished, and immediately remove from site. Do not overload existing construction to remain with demolished materials. Demolished materials which cannot be recycled or reused shall be disposed of at a legal dump site.

F. If relics, antiques, corner stones and their contents, commemorative plaques and tablets, or other similar items are discovered, they shall remain the property of the Owner. Notify the Architect prior to removal, and obtain approval on method of removal.

G. Carefully remove, store, and protect all materials and components to be reused.

H. Where removal of materials indicated to remain is necessary to facilitate new construction, carefully remove, store, and protect such materials for future reinstallation.

I. Carefully remove, protect, and turn over as directed, materials and components claimed by the Owner for salvage. Prior to demolition, contact the Owner to determine which items will be claimed.

J. Where cut edges of the existing construction will be visible in the completed work, cut in uniform straight lines. Concrete and masonry shall be sawcut or coredrilled.

K. Repair all demolition performed in excess of that required, at no additional cost to the Owner.

L. Remove all disconnected utility lines. Cap remaining ends. Place markers to indicate location of disconnected utilities. Indicate location of disconnected utilities on the Project Record drawings as specified in Section 017700.

M. Pay for and coordinate the work performed by public utilities. Notify the affected utility company well in advance of the scheduled work.

N. Dust producing demolition operations shall be sprinkled in areas not subject to water damage. Provide other approved means of controlling dusting in areas subject to water damage.

O. Electrical Demolition Requirements:
   1. Remove electrical system components as indicated on the electrical drawings.
   2. Abandoned underslab conduit shall be removed and cut off below the finished surface line, and all conductors shall be removed. Patch and fill the opening flush with the finish.
   3. Abandoned electrical conductors shall be removed back to the branch circuit panel, unless indicated otherwise. Abandoned conduit which is exposed and readily accessible shall be removed. Leave abandoned conduit which is concealed in existing construction to remain.
   4. Existing electrical equipment that is not shown on the Drawings shall be brought to the immediate attention of the Architect. Such equipment shall remain unless required to be removed or relocated to accommodate the remodel work.
   5. All existing low voltage cabling disconnected and abandoned shall be fully removed from the project.
   6. Electrical demolition drawings are generally diagrammatic. Complete extent of required electrical demolition which effects completion of work is not shown. In addition to verification of existing site conditions, coordinate with new and existing Architectural, Structural, Mechanical, and Electrical Drawings.
   7. All electrical services to equipment which is indicated to be removed shall be fully removed.
   8. Retain removed light fixtures for relocation and reuse as indicated. All light fixtures not to be reused shall be delivered to the Owner.

P. Leave site in a condition acceptable to the Owner at all times. Remove demolished materials from site daily as work progresses. Do not overload existing structure with demolished materials.

3.5 CLEANUP

A. After each demolition phase, leave the area broom clean and ready for the work of other Sections.

B. Occupied spaces which receive demolition work shall be thoroughly and completely cleaned prior to Owner's daily operations. Cleaning shall include: vacuuming, dusting, stain and dirt removal, and cleaning of glass and countertops.

3.6 PATCHING AND REPAIR

A. Repair cut edges, replace damaged construction, and fit new work as required to match and mate with existing construction. Make joints smooth, even and invisible.

B. Where new paint or other finishes are applied, carry to nearest break line, joint or corner as required to achieve a homogeneous appearance.

END OF SECTION

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:
   1. Cast-in-place concrete.
   2. Exterior concrete pads.
   3. Concrete accessories.
   4. Formwork, shoring, bracing, and anchorage.
   5. Concrete reinforcement.
   6. Underslab vapor retarder.
   7. Concrete Sealer.

B. Related Sections:
   1. 079200 - Joint Sealants: Expansion joint fillers.
   2. 099620 - Anti-Graffiti Coating
   3. 312000 - Earth Moving: Fill under slabs on grade.

C. Drawings, the provisions of the Agreement, the General Conditions, and Division 1 specification sections apply to all work of this Section.

D. Substitutions: Substitute products will be considered only under the terms and conditions of Section 016000.

1.2 DEFINITIONS

A. Architectural Concrete: Formed Concrete elements which are exposed to view as an exterior or interior surface in the completed structure.

1.3 REFERENCES

A. American Concrete Institute (ACI):
   1. 117 - Standard Specification for Tolerances for Concrete Construction and Materials.
   2. 301-05 - Specifications for Structural Concrete.
   3. 315 - Details and Detailing of Concrete Reinforcement.

B. American Society for Testing and Materials (ASTM):
   1. A615 - Deformed and Plain Billet-Steel for Concrete Reinforcement.
   2. C33 - Specifications for Concrete Aggregates.
   3. C94 - Specifications for Ready Mixed Concrete.
   4. C132 - Test for Slump of Portland Cement Concrete.
   5. C150 - Specification for Portland Cement.
   6. C156 - Test Method for Water Retention by Concrete Curing Materials.
   7. C171 - Specification for Sheet Materials for Curing Concrete.
   8. C260 - Specifications for Air-Entraining Admixtures for Concrete.
   9. C311 – Standard Test Methods for Sampling and Testing Fly Ash or Natural Pozzolans for Use in Portland-Cement Concrete.
   10. C309 - Specification for Liquid Membrane Forming Compounds for Curing Compounds.
   11. C494 - Specifications for Chemical Admixtures for Concrete.
   12. C618 - Specification for Fly Ash and Raw or Natural Pozzolan for Use as a Mineral Admixture in Portland Cement Concrete.
   13. C1107 - Specification for Packaged Dry, Hydraulic-Cement Grout (Non-shrink)
   14. D1751 - Preformed Expansion Joint Fillers for Concrete Paving and Structural Construction.

1.4 SUBMITTALS

A. Make submittals in accordance with Section 013300.

B. Product Data: Submit data for each accessory, admixture, and curing material proposed for the work.

C. Shop Drawings:
   1. Reinforcing:
      a. Detail reinforcing in accordance with ACI 315. Indicate reinforcement sizes, spacings, locations and quantities of reinforcing, bending and cutting schedules, splicing, and supporting and spacing devices.
      b. Indicate embedded items.
   2. Slab Layouts: Dimension locations of control, expansion, and construction joints. Relate to building grid lines.
   3. Architectural Concrete: Show arrangement and fitting of form joints; note materials and finishes of forming surfaces; indicate locations of all openings and locations of form ties.

D. Quality Control Submittals:
   1. Mix Designs: Two weeks prior to placing any concrete, submit mix designs for approval.
   2. Test Results: Submit test results per ASTM C311 performed less than 6 months prior to use for approval by Architect.
   3. Certifications: Submit mill certificates for cement, aggregates, and reinforcing.

1.5 QUALITY ASSURANCE

A. Perform work in accordance with ACI 301.

B. Pre-Installation Conference:
   1. At least 35 days prior to start of concrete work the Contractor shall hold, in accordance with Section 013119, a meeting to review the detailed requirements of the concrete design mixes and to determine the procedures for producing proper concrete construction.
   2. Required in attendance:
      a. Contractor's superintendent.
      b. Testing Laboratory representative.
      c. Concrete subcontractor.
      d. Ready-mix producer.
      e. Admixtures manufacturer's representative.
      f. Architect/Engineer
      g. All subcontractors with work to be installed in, or affected by concrete work.
   3. Notify Architect 10 days prior to the scheduled date of the meeting.
   4. Agenda: Include the following.
      a. Installation scheduling and coordination; scheduling of mock-up construction and review.
      b. Classes of concrete required; mix designs; applicable references.
      c. Formwork and requirements for Architectural concrete.
      d. Reinforcement and placement.
      e. Climatic conditions; hot and/or cold weather concreting procedures (as appropriate); unusual placing conditions.
      f. Substrate preparation; placement methods; construction joints.
      g. Flatwork; flatness and levelness requirements; finishing; criteria for acceptance; remedies.
      h. Curing and protection procedures
      i. Site quality control; inspection and testing requirements.
      j. Sealers; locations and coverage rates

C. Concrete work is subject to special testing and inspection as specified in 014500. Notify Architect and Owner’s Testing Service at least 48 hours before concrete is poured.

PART 2 - PRODUCTS

2.1 FORM MATERIALS

A. Unless specified otherwise, conform to ACI 301.

B. Plywood: One of the following:
   1. APA rated High Density Overlay, Plyform Class 1. Ext.
   2. APA B-B Plyform Class 1, ext.

C. Board-Formed Concrete: Where board-formed concrete is indicated; one of the following:
   1. Proprietary form liners; urethane or fiberglass panels; pattern as selected by Architect.
   2. Plain sawn softwood planks, mixed 4-inch and 6-inch widths, sandblasted to expose grain; horizontal installation.

D. Form Ties:
   1. Where concealed: Snap-off metal; metal washer ends
   2. At exposed stem walls and fins: 1” diameter by 1” deep plastic cones in layout indicated in the documents. Remove plastic cones and seal the back of the recess with sanded sealant.

E. Chamfers and Rustication Strips: Wood or plastic; fabricate to the shapes indicated.

2.2 REINFORCING

A. Reinforcing Steel: Types as indicated on the structural drawings.

B. Chairs, Bolsters, Bar Supports, and Spacers: Sized and shaped for strength and support of reinforcement during installation and placement of concrete.

2.3 CONCRETE MATERIALS

A. Cement: ASTM C150, normal - Type 1 Portland, grey color.

B. Fly Ash: ASTM C618, Class C or F; loss on ignition (LOI) not to exceed 1 percent. Use fly ash from one single source for the whole Project.

C. Water: ASTM C94, para. 5.1.3.

2.4 ADMIXTURES

A. Air-Entrainment: ASTM C 260; Master Builders Inc. "Micro-Air" or "MBVR", Euclid Chemical Co. "Air Mix," or approved.

B. Water Reducer Normal: ASTM C 494, Type A; Master Builders Inc. "Pozzolith/Polyheed," Euclid Chemical Co. "Eucon WR 75," or approved.

C. High Range Water Reducer (Superplasticizer): ASTM C 494, Type F or G and shall be of the second or third generation type. Shall be batch plant added, extend plasticity time, reduce water 20 to 30 percent. Master Builders Inc. "Rheobuild," Euclid Chemical "Eucon 37," or approved.

D. Accelerator: ASTM C 494, Type C or E, non-corrosive, non-chloride; Master Builders "Pozzutech 20," Euclid Chemical Co. "Accelgard 90," or approved.

E. Set Retarder: ASTM C494, Type B.

F. Colorant: Davis Colors. L.M. Scofield "Chromix," or approved; colors as scheduled on the Drawings.

2.5 ACCESSORIES

A. Bonding Agent: Acrylic type; Sonneborn "Sonnocrete", W.R. Grace "Duraweld C", Euclid Chemical Co. "Flex-con", or approved.

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

C. Form Release Coating: Water based type; VOC <150g/l; Nox-Crete "Utility Release," Cresset Chemical Company "Crete-Lease 20-VOC," or approved; non staining.

D. Curing Materials:
   1. Waterproof Sheet Material: Waterproof paper in accordance with ASTM C171; reinforced waterproof kraft paper; white color at exterior applications; Burke Kraft Curing Paper Type I-SK-30, or approved.
   2. Mats and Burlap: Fabric covering composed of quilted polyethylene sheeting laminated to outer covering of burlap, cotton, or other approved fabric; outer covering shall weigh not less than 6 ounces per square yard.

3. Curing Compound: ASTM C309; clear or translucent with fugitive dye; moisture loss not more than 0.03 gr./sq.cm. when tested in accordance with ASTM C156 and applied in a single coat at the manufacturers recommended rate. Euclid Chemical Co. "Kurz DR" or approved. Curing compounds shall be compatible with subsequently applied waterproof membranes and finishing systems.
4. Curing/Sealing Compound: ASTM C309; water based curing compound; Euclid Chemical Company "Aqua-Cure," Sonneborn "Kur-N-Seal WB," Burke by Edoco "Spartan-Cote WB II," W. R. Meadows, Inc., Hampshire IL (800/342-5976); “Sealtight 100-Clear” or approved.

E. Liquid Floor Treatments:
1. Sealer and Hardener: A Water-based, reactive siliconate solution, surface applied, deep penetrating, VOC compliant, USDA accepted, liquid sealer densifier hardener that reacts with concrete surfaces to produce a dense, hydrophobic, insoluble, moisture barrier to seal out contaminants, while hardening and densifying the concrete surface.
2. Do not use material containing fluorine, fluosilicate-base materials, or material that dries to a film on the concrete surface.
3. Use one of the following Sealer and Hardener products:
   a. “Sure Hard Densifier J17” siliconate hardener manufactured by Dayton Superior Corporation.
   b. "Shur-Seal (HD)" siliconate hardener manufactured by Paul M. Wolff Co., Inc.
   c. “Pentra-Sil” siliconate hardener manufactured by Convergent Concrete Technologies.
   d. “EUCO Diamond Hard” siliconate hardener manufactured by Euclid Chemical Company.

F. Underslab Vapor Retarder: ASTM E1745, Class A; one of the following:
1. "Stego Wrap 15 Mil" by Stego Industries, LLC (877-464-7834).
2. "Vapor Block VB15" by Raven Industries (800-635-3456).
3. "Griffolyn 15 MIL Green" by Reef Industries, Inc. (800-231-6074).
4. “Perminator 15 Mil” by WR Meadows, Inc. (847-214-2100)
5. “Florprufe 120” by Grace Construction Products.

G. Prefabricated Slab Construction Joints: Burke by Edoco "Keyed Kold Joint," with splice plates, stakes, and driving accessories, or approved; depth 1/2 inch less than slab thickness, galvanized sheet metal tongue and groove joint form, with knockouts for passing reinforcing bars through.

H. Preformed Joint Fillers:
1. Non-extruding type; ASTM D1751; Sonneborn "Expansion Joint Filler,” WR Meadows “Sealtight Fiber”, " Burke by Edoco "Fiber expansion Joint,” or approved.
2. Joint Cap: Strippable plastic type; W.R. Meadows "SealTight Snap-Cap", Burke by Edoco "Joint Cap", or approved; width to match expansion joint filler material.

I. Waterstop Tape: Bentonite Waterstop: “Waterstop-RX” by Cetco Building Materials Group (800-527-9948) or "Superstop" by Tremco Sealant/Waterproofing Division, or approved (800-321-7906); size as recommended by the manufacturer for the application.

J. Finishing Aid: Evaporation retardant for preventing rapid drying during hot windy weather, Master Builders "Confilm."

2.6 CONCRETE MIX

A. Mix concrete in accordance with ASTM C94, and in accordance with the requirements indicated on the structural drawings.

B. Concrete at slabs on grade shall have a maximum water/cement ration of 0.45.

C. Provide fly ash in the following proportions:
1. A minimum of 20 percent and a maximum of 40 percent by weight of cementitious materials in footings, walls, columns and slabs on grade.

D. Admixtures:
1. All concrete shall contain the specified water reducing or high range water reducing admixture, except architectural concrete and concrete with a required water/cement ratio of 0.45 or lower shall contain a high range water reducing admixture.

2. All concrete required to be air entrained shall contain air entraining admixture to produce 4% to 6% air.
3. All concrete placed in ambient temperatures from 40 degrees F to 20 degrees F, and all slab concrete placed in ambient temperatures below 50 degrees F, shall contain an accelerator at the manufacturer's required dosage.
4. All concrete placed in ambient temperatures of 90 degrees F or above, shall contain a set retarder at the manufacturer's required dosage.
5. Add colorants as necessary to obtain the concrete colors to match the approved samples.

E. Provide 28 day compressive strengths as indicated on the Structural Drawings. Where not indicated on the Structural Drawings, provide minimum 3000 psi compressive strength unless indicated otherwise.

2.7 REINFORCEMENT FABRICATION

A. Fabricate as indicated and in accordance with ACI 315.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Prior to starting work, carefully inspect installed work of other trades and verify that such work is complete to the point where work of this Section may properly commence. Notify the Architect in writing of conditions detrimental to the proper and timely completion of the work.

B. Do not begin installation until all unsatisfactory conditions are resolved. Beginning work constitutes acceptance of site conditions and responsibility for defective installation caused by prior observable conditions.

3.2 FORMWORK ERECTION

A. Verify lines, levels, and measurement before proceeding with formwork. Align form joints. Locate form ties in rows aligned vertically and horizontally with equal spacing per Architect’s direction at exposed locations.

B. Use plywood forms, unless other systems are approved by the Architect.

C. Use form coating on forms in accordance with the manufacturer's recommendations. Verify that form coatings will not affect the bond of subsequent concrete surface treatments.

D. Architectural Concrete Forms:
1. Construct forms of high density overlay plywood.
2. Use coned form ties at an even spacing as approved by the Architect.
3. Additional Tolerance Requirements: In accordance with the additional requirements of ACI 301. Form surfaces at the joints between each panel shall be flush within a tolerance of plus or minus 1/16 inch.
4. Form Joint Seal for "Architectural" Concrete: Apply double face tape, not more than 1/16th inch thick to edges of form panels holding back from form surface at least 1/16 inch; apply continuous bead of silicone sealant for the length of the joint; tool sealant smooth and flush with adjoining contact surfaces. Wipe off all excess sealant. Fill flush all holes and imperfections in forming surface with sealant.
5. Rustication Strips: Glue or nail to form surfaces; set and fill nail holes; seal to surface of forms.
6. Form Reuse: Clean forms and repair all holes and damage; obtain approval of form for each reuse; formwork with patches and repairs affecting the appearance of concrete surfaces will not be accepted.

E. Coordinate with work of other Sections in forming and setting openings, slots, recesses, chases, sleeves, bolts, anchors, and other inserts.

F. Tolerances: Comply with ACI 117.

G. Where earth forms are used, hand trim sides and bottoms of earth forms. Remove loose dirt.

H. Waterstop Tape:
   1. Ensure that all surfaces to receive waterstop tape are formed, troweled, or ground smooth.
   2. Remove all debris and other materials which would impair bond.
   3. Install in locations indicated in accordance with the manufacturer's recommendations. Install to maintain a minimum of 2 inch of concrete coverage over the tape or more if required by manufuacturer.

3.3 REINFORCEMENT

A. Place, support, and secure reinforcement against displacement.

B. Locate reinforcing splices not indicated on the drawings at points of minimum stress.

C. Provide laps and concrete cover as indicated in the Drawings.

3.4 UNDERSLAB VAPOR RETARDER

A. Place and protect vapor-retarder sheets according to ASTM E 1643 and manufacturer's written instructions under all interior slabs-on-grade.

B. Extend and repair, or replace existing vapor retarder materials at locations of work at existing slabs on grade. Tie in to existing vapor retarder membranes by lapping and seal with tape.

C. Lap and seal all seams a minimum of 6 inches, seal around all penetrations, lap and seal against foundation walls and footings with manufacturer’s recommended sealing tape or mastic.

3.5 PLACING CONCRETE

A. In accordance with ACI 301.

B. Bonding Agent: Mix thoroughly and apply strictly in accord with the manufacturer's instructions; do not use when ambient temperature is below 45 degrees F. Place concrete in contact immediately while bonding agent is still tacky.

3.6 SUBSEQUENT TREATMENT FOR FORMED SURFACES

A. Provide smooth form finish for concrete to remain exposed in the finished work; rough form finish for concrete to remain concealed in the finished work.

B. Where waterproofing or dampproofing is scheduled or indicated, grout fill all rock pockets, tie holes, and other surface imperfections to create a smooth surface ready to receive the membrane. Grind concrete fins and other surface projections flat with adjacent surfaces.

3.7 SLABS

A. Expansion Joints for Slabs on Grade:
   1. Place expansion joints at locations indicated and where exterior slabs abut concrete walls, the building perimeter, and other fixed objects abutting or within the slab area.
   2. Form joints 1/2 inch wide x full depth of slab.
   3. Form expansion joints with preformed joint filler. Install strippable joint at joints to receive sealant specified in Section 079200.
   4. Tool expansion joints to 1/8 inch radius.
   5. Discontinue reinforcing at the expansion joint. Use 16 inch long sleeved 3/4 inch diameter smooth dowels at 12 inches on center for expansion joints in the field of the slab.
   6. Place perpendicular to longitudinal axis of walls.

B. Control Joints for Slabs on Grade:
   1. Make joints straight; perpendicular or parallel to building lines and slab edges, as appropriate.
   2. Control joints shall be saw cut, unless indicated otherwise.
   3. Radius tooled control joints to match expansion joints.
   4. Control joints shall penetrate the slab a minimum of 1/4 the thickness of the slab and shall be 3/16 inch in width minimum.
   5. Space control joints at the locations indicated, except when not indicated locate at 36 times the slab thickness. Provide circular or diamond shaped joint lines around columns. Locate control joints at reentrant corners.

6. At exterior sidewalks and pads, place control joints at maximum 5 foot intervals unless indicated otherwise on the Drawings .
7. Align joints with column lines when ever possible. Joints shall form rectangular panels with the long side less than 1-1/2 times the length of the short side. Provide circular or diamond shaped joint lines around columns. Locate control joints at reentrant corners.

C. Construction Joints: Place at either expansion or control joint locations for slab on grade construction.

D. Curing:
1. Moisture cure all concrete for a minimum of 7 days, unless approved or specified otherwise.
2. Use liquid floor treatment on concrete slabs subject to wheeled traffic.
3. Use curing/sealing compound on concrete slabs subject to foot traffic only.
4. Use waterproof sheet material at surfaces to receive subsequent bonded finish materials. A curing compound may be used on surfaces to receive subsequent bonded finish materials, provided the curing compound is approved in writing by the manufacturer of the adhesive or the bonding finish material. Curing compound may also be used on surfaces to receive subsequent bonded finish materials, provided the curing compound is removed with shot blasting or other approved method prior to installation of bonded materials.
5. Curing compounds may be used at exterior concrete pads or paving.
6. Apply curing compounds and curing/sealing compounds in accordance with the manufacturer's recommendations.
7. Maintain concrete temperatures above 50 degrees F.

E. Finishes:
1. Full Trowel finish interior floor slab surfaces, unless specified otherwise.
2. Light steel trowel finish interior floor slab surfaces scheduled to receive tile, terrazzo, or other similar bonded materials.

F. Curing/Sealing Compound: Apply a second coat of curing/sealing compound to concrete slabs scheduled to receive sealer. Clean floor and apply just prior to substantial completion. Apply in accordance with the manufacturer's recommendations.

G. Liquid Floor Treatments:
1. Sealer and Hardener: Prepare, apply, and finish penetrating liquid floor treatment according to manufacturer's written instructions.
   a. Remove curing compounds, sealers, oil, dirt, laitance, and other contaminants and complete surface repairs.
   b. Apply to concrete per manufacturer’s written instructions.
   c. Apply liquid until surface is saturated, scrubbing into surface until a gel forms; rewet; and repeat brooming or scrubbing. Rinse with water; remove excess material until surface is dry. Apply a second coat in a similar manner if surface is rough or porous.

H. Slab Tolerances: Slabs: Class B in accordance with ACI 301.

END OF SECTION

SECTION 035416 – HYDRAULIC CEMENT UNDERLAYMENT

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:
   1. Underlayments and topping slabs as necessary for leveling of new and existing cast-in-place concrete slabs to meet specified tolerances.
   2. Leveling of existing cast-in-place concrete slabs.
   3. Ramps and tapers as necessary to correct levels between dissimilar finishes.

B. Related Sections:
   1. 030013 - Concrete: Slab tolerances.

C. Drawings, the provisions of the Agreement, the General Conditions, and Division 1 specification sections apply to all work of this Section.

D. Substitutions: Proposals for alternate products and methods for applications indicated may be considered by the Architect, subject to requirements of Section 016000, system performance requirements, and applicable requirements of this Section.

1.2 SUBMITTALS

A. Make submittals in accordance with Section 013300.

B. Manufacturer's product data and installation instructions.

1.3 QUALITY ASSURANCE

A. All interior primers, adhesives, coatings and sealants shall comply with the most recent version of Rule 1168 of the South Coast Air Quality Management District.

1.4 DELIVERY, STORAGE AND HANDLING

A. Deliver materials in their original unopened packages and protect from freezing, direct sun exposure, and exposure to moisture.

1.5 ENVIRONMENTAL REQUIREMENTS

A. Maintain surface and ambient temperature of between 50 and 80 degrees F for 24 hours before, during, and 24 hours after underlayment installation.

B. Keep traffic out of area in which underlayment is being applied or cured.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Self Leveling Underlayment System: Self-leveling, pourable, cement based material, minimum 28 day compressive strength 2,000 psi; minimum bond strength 200 psi; one of the following.
   1. Ardex Inc. "K-22" Self-Leveling Underlayment Concrete

B. Trowelable Underlayment System:
   1. Ardex Inc. "SD-P" Fast-Setting Underlayment.

C. Accessories: Furnish primers, patching compounds, and sand fillers as recommended by the underlayment manufacturer for the conditions of the project.

2.2 MIXING

A. Thoroughly mix underlayment materials for each type of product in proper proportions to achieve smooth homogeneous mix, free of lumps.

PART 3 - EXECUTION

3.1 GENERAL

A. With the exception of areas where leveling can be accomplished by use of latex underlayment, as specified in other sections, install cementitious underlayment to concrete slabs as indicated on the Drawings, and as necessary to level slabs or bring substrates to proper elevation.

3.2 PREPARATION

A. Inspect floor to verify that demolition is complete to the point where work may progress.

B. Survey floor as necessary to set screeds and reference points. Identify construction joints, control, and expansion joints. Prepare for underlayment at all locations where floor does not meet specified tolerance requirements.

C. Ensure that subfloor is clean, dry, hard, sound, and free of oils, or other substance which would affect proper bonding and curing. Verify that all areas to be leveled are at or below final design elevation.

E. Do not begin installation until all unsatisfactory conditions are resolved. Beginning work constitutes acceptance of conditions and responsibility for defective installation caused by prior observable conditions.

3.3 APPLICATION

A. Install trowelable underlayment at locations where slopes are indicated and at other locations as appropriate to installation conditions; install self leveling underlayment at other locations as necessary to correct slab flatness and levelness.

B. Set screeds, markers, and reference blocks. Set screeds at all construction and control joints to establish weakened plane joints in underlayment.

C. Install patching compounds in accordance with the manufacturer's recommendations. Where subsequent finishing of the material is required, float to level surface. Do not trowel.

D. Apply primer to all areas to receive underlayment; repeat application if necessary to achieve proper build.

E. Mix materials and pour or pump and squeegee into place to achieve appropriate thickness. At areas to receive cork tile flooring, provide fill thickness as necessary to align cork flooring with adjacent floor surfaces.

F. Finish to a smooth level surface within tolerances specified for concrete floors.

G. Cure in accordance with the manufacturer's instructions.

H. Tolerances:
   1. As specified in Section 030013.

3.4 CLEANING

A. As work proceeds, clean up excess materials, rubbish, and splash.

END OF SECTION

SECTION 051200 - STRUCTURAL STEEL FRAMING

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:
   1. Elements indicated on the Structural Drawings, including the following:
      a. Structural steel.
      b. Structural welding.
      c. Baseplate grouting.
   2. Priming of structural steel.

B. Related Sections:
   1. 014500 - Quality Control: Requirements for testing and inspection.
   2. 030013 - Concrete: Placement of structural steel to be embedded in concrete.
   3. 055000 - Metal Fabrications: Steel fabrications not indicated on the Structural Drawings.
   4. 099000 - Painting: Field painting of structural steel elements.

C. Drawings, the provisions of the Agreement Conditions of the Contract, and Division 1 specification sections apply to all work of this Section.

D. Substitutions: Substitute products will be considered only under the terms and conditions of Section 016000.

1.2 REFERENCES

A. American Institute of Steel Construction (AISC):
   1. Specification for Structural Steel Buildings, 2010.
   2. Code of Standard Practice for Steel Buildings and Bridges, 2010.
   3. Manual of Steel Construction, 14th Edition 2010.
   4. Specifications for Structural Joints Using ASTM A325 or A490 Bolts, 2014.

B. American Society for Testing and Materials (ASTM):
   1. A36 - Structural Steel.
   2. A108 - Steel Bars, Carbon, Cold-Finished, Standard Quality.
   3. A569 - Steel, Carbon (0.15 Maximum, Percent), Hot-Rolled Sheet and Strip, Commercial Quality.
   4. A992 - Standard Specification for Steel for Structural Shapes For Use in Building Framing
   5. C1107 - Packaged Dry, Hydraulic-Cement Grout (Nonshrink).

C. American Welding Society (AWS): D1.1 - Structural Welding Code - Steel.

D. Steel Structures Painting Council (SSPC): "Steel Structures Painting Manual, Volume 2, Systems and Specifications."

1.3 SUBMITTALS

A. Make submittals in accordance with Section 013300.

B. Product Data:
   1. Shop applied primers.
   2. Non-shrink grout.

C. Shop Drawings:
   1. Indicate profiles, sizes, spacing, and locations of structural members, connections, attachments, fasteners, cambers, loads.
   2. Indicate welded connections using standard AWS welding symbols. Indicate net weld lengths.
   3. Indicate types and locations of field welds.
   4. Indicate members to be shop primed and type of primer proposed.

D. Quality Control Submittals:
   1. Certifications: Submit certification of materials with copies of mill reports for each heat of steel used.

1.4 QUALITY ASSURANCE

A. The work of this Section is subject to testing and inspection as specified in Section 014500.

B. Use only certified welders approved by the jurisdictional code authorities.

C. Unless specified or indicated otherwise, work shall comply with AWS and AISC Standards.

PART 2 - PRODUCTS

2.1 STRUCTURAL STEEL

A. Types as indicated on the Structural Drawings.

2.2 ACCESSORIES

A. Non-Shrink Grout: BASF "Masterflow 713 Plus," Sonneborn "Sonogrout," or approved; non-shrink, non-metallic grout in compliance with ASTM C1107.

B. Welding Electrodes: E-70 series, low hydrogen, appropriate for use.

C. Interior Primer: Modified alkyd type (VOC compliant); lead and chromate free; gray or white color; one of the following unless approved otherwise.
   1. "Azeron Primer Series 88HS" by Tnemec Company Inc. (Kansas City, MO; 816-483-3400).
   2. "Amercoat 5105" by Ameron Protective Coatings (Brea, CA; 714-529-1951).
   3. "Carbocoat 150HG" by Carboline Company (St. Louis, MO; 314-644-1000; 800-848-4645).

D. Special Exterior Primers:
   1. First Primer: One of the following; provide product from same manufacturer selected for finish systems specified in Section 099000.
      a. “Series 394 PerimePrime" by Tnemec Company Inc. (Kansas City, MO; 816-483-3400).
      b. "Carbozinc 859" by Carboline Company (St. Louis, MO; 314-644-1000; 800-848-4645); organic zinc-rich epoxy primer.
      c. "68HS" by Ameron Protective Coatings (Brea, CA; 714-529-1951); organic zinc-rich epoxy primer.
      d. "Catha-Coat 302H" by Akzo Nobel / International Coatings; "reinforced" inorganic zinc-rich epoxy.
   2. Epoxy Tie-Coat Primer: One of the following; provide product from same manufacturer selected for first primer specified above:
      a. "Hi-Build Epoxoline II" Series N69 by Tnemec Company Inc. (Kansas City, MO; 816-483-3400).
      b. "Carboline 888 " by Carboline Company (St. Louis, MO; 314-644-1000; 800-848-4645); organic zinc-rich epoxy primer.
      c. "Amercoat 385." by Ameron Protective Coatings (Brea, CA; 714-529-1951); organic zinc-rich epoxy primer.
      d. " "Bar-Rust 231," or "Bar-Rust 233H." by Akzo Nobel / International Coatings; "high-build epoxy primer.

2.3 FABRICATION

A. Fabricate structural steel items in accordance with AISC and AWS Standards and in accordance with approved shop drawings. Properly mark and match-mark all materials for field assembly. Fabricate for delivery sequence that will expedite erection and minimize field handling.

B. Shop Assembly: Fabricate units in as large a part or section as practicable.

C. Standard Shop Primer Application:
   1. Preparation: Remove rust and scale by wire brushing, scraping, and sanding down to bare metal in accordance with SSPC-SP2 and SP3. Where SP2 and SP3 measures are insufficient, provide commercial blast cleaning in accordance with SSPC-SP6.
   2. Application: Spray apply primer in accordance with manufacturer's recommendations, mil minimum dry film thickness. Apply primers to receive field application of finish coats as specified in Section 099000.

3. Shop Primer: Shop prime all steel except:
   a. Steel encased in concrete.
   b. Surfaces to be field welded.
   c. Contact surfaces at high-strength bolts.
   d. Members to be galvanized.
   e. Members which will be concealed by interior finishes.
   f. Surfaces to receive other special shop primers.

D. Special Shop Primer Application:
1. Prepare surfaces in accordance with the manufacturer's recommendations, and as specified below.
2. Solvent clean in accordance with SSPC SP-1; near white blast ungalvanized ferrous metal surfaces in accordance with SSPC SP-10.
3. Spray apply one coat zinc primer and one intermediate coat epoxy primer in accordance with the manufacturer's recommendations. Apply primers to receive field application of finish coats as specified in Section 099000.
4. Maintain at least one coat of primer at all times during installation. Immediately patch damaged coatings.
5. Apply organic zinc/epoxy primer to all steel in locations exposed to the weather or high moisture.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Prior to starting work, carefully inspect installed work of other trades and verify that such work is complete to the point where work of this Section may properly commence. Notify the Architect in writing of conditions detrimental to the proper and timely completion of the work.

B. Do not begin installation until all unsatisfactory conditions are resolved. Beginning work constitutes acceptance of site conditions and responsibility for defective installation caused by prior observable conditions.

3.2 ERECTION

A. Embedded Items: Provide anchor bolts and templates, and other items as indicated, to other Sections for installation prior to placement of cast-in concrete.

B. Temporary Shoring and Bracing: Provide as required with connections of sufficient strength to bear imposed loads. Remove temporary members when permanent members are in place and final connections are made.

C. Erect structural steel in accordance with approved shop drawings and AISC "Code of Standard Practice," Section 7.

D. Welds shall be in accordance with AWS D1.1.

E. Cut holes by drilling only.

F. Tolerances: Maximum deviation from plumb, level, and alignment shall not exceed 1 to 500.

G. Base Plate Grouting: Set on leveling nuts to accurate elevations and grout solid with non-shrink grout.

H. Cleaning and Touch-Up:
1. Clean steel of oil or other contaminants as specified under Fabrication.
2. Columns, beams, girders, and other members which are to receive sprayed-on fireproofing shall be cleaned free of loose rust, heavy mill scale, oil, dirt or other foreign substances prior to application of fireproofing materials.

3. Immediately after erection, clean field welds, bolted connections, and abraded areas and touch-up factory primed surfaces with same primer as used in shop; touch-up galvanized surfaces with zinc-rich primer.

END OF SECTION

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:
   1. Fabricated metal items indicated on the Architectural Drawings and scheduled at the end of this Section.
   2. Structural design of the following systems:
      a. Ladders.
      b. Railing assemblies including handrails and guardrails.

B. Related Sections:
   1. 014500 - Quality Control: Requirements for testing and inspections.
   2. 030013 - Concrete: Embedment of metal fabrications.
   3. 051200 - Structural Steel Framing: Steel elements indicated on the Structural Drawings.
   4. 099000 - Painting: Field painting of metal fabrications shop primed in this section.

C. Drawings, the provisions of the Agreement, the General Conditions, and Division 1 specification sections apply to all work of this Section.

D. Substitutions: Substitute products will be considered only under the terms and conditions of Section 016000.

1.2 REFERENCES

A. American Society for Testing and Materials (ASTM):
   1. A36 - Specification for Structural Steel.
   2. A53 - Specification for Welded and Seamless Steel Pipe.
   3. A123 - Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products.
   4. A143 - Safeguarding Against Embrittlement of Hot Dipped Galvanized Structural Steel Products and Procedures for Detecting Embrittlement.
   5. A153 - Specification for Zinc Coating (Hot Dip) on Iron and Steel Hardware.
   6. A307 - Specification for Carbon Steel Externally Threaded Standard Fasteners.
   7. A366 - Specification for Carbon Steel Cold Rolled Sheet.
   8. A384 - Safeguarding Against Warpage and Distortion During Hot Dip Galvanizing of Steel Assemblies.
   9. A385 - Providing High Quality Zinc Coatings (Hot Dip).
   10. A500 - Specification for Cold-Formed Welded and Seamless Carbon Steel Structural Tubing in Rounds and Shapes.
   11. A501 - Specification for Hot-Formed Welded and Seamless Carbon Steel Structural Tubing.
   12. A569 - Specification for Commercial Quality Hot Rolled Sheet and Strip Carbon (0.15 Maximum Percent) Steel.
   13. A570 - Specification for Hot-Rolled Carbon Steel Sheet and Strip, Structural Quality.

B. American National Standards Institute (ANSI):
   1. A14.3 – Fixed Ladders.

C. National Association of Architectural Metal Manufacturers (NAAMM):
   1. "Metal Bar Grating Manual," current edition.
   2. "Pipe Railing Manual," current edition.

1.3 SYSTEM DESCRIPTION

A. Metal Ladders:
   1. Structural Performance for Steel Ladders: Steel ladders shall withstand the effects of loads and stresses within limits and under conditions specified in ANSI A14.3.
   2. Thermal Movements: Allow for thermal movements from ambient and surface temperature changes acting on exterior metal fabrications by preventing buckling, opening of joints, overstressing of components, failure of connections, and other detrimental effects.
      a. Temperature Change: 120 deg F (67 deg C), ambient; 180 deg F (100 deg C), material surfaces.

B. Railing Assemblies:
   1. Structural Requirements:
      a. Railing assemblies and attachments shall be capable of resisting a force of 200 lbs at any point in any direction without damage or permanent set.
      b. Railing assemblies and attachments shall be capable of resisting a force of 50 plf in any direction without damage or permanent set.
   2. Bidder Designed Guardrails, Railings, and Handrails:
      a. Guardrails: Unless indicated otherwise, provide steel pipe or steel tube design; continuous top and bottom rail; vertical steel bar pickets spaced at maximum of 4 inch centers.
      b. Rail transitions between flights shall be continuous with uniform radius section; vertical drops with mitered joints are not permitted.
      c. Handrails may be mounted to the stairs, or to building walls at the Contractor's option. Where handrails are attached to walls, include support brackets spaced at 6 foot maximum and metal backing plate for anchoring.
      d. Return terminating ends to within 1/2 inch of wall.
      e. Provide guardrail where elevation to adjacent surfaces exceeds 1'-6".

1.4 SUBMITTALS

A. Make submittals in accordance with Section 013300.

B. Product Literature: Submit product literature for all prefabricated products.

C. Shop Drawings:
   1. Show details of fabrication and installation; indicate materials, thicknesses, dimensions, methods of reinforcement and embedment, attachments, shop finishes, provisions for work of other trades, and other pertinent information as requested by Architect.
   2. Shop drawings for ladders and railing assemblies shall be sealed by the designing engineer.

1.5 QUALITY ASSURANCE

A. Fabricator Qualifications: Experienced and regularly engaged in producing metal fabrications of the type specified; must employ only skilled personnel using proper equipment to produce work.

B. Testing and Inspection: All metal fabrications are subject to special inspection as specified in Section 014500.
   1. Fabricated steel ladders shall be designed to meet the requirements of ANSI A14.3.
   2. Furnish all calculations, engineer's stamps, drawings, and other items required by the code authorities to obtain approval of the fabricated steel ladders.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Carbon Steel:
   1. Structural Shapes, Plates, and Bars: ASTM A36.
   2. Sheet: ASTM A366.
   3. Pipe: ASTM A53, seamless, Type S, plain end; schedule 40 unless indicated otherwise.
   4. Tubing: ASTM A500 or A501, seamless.

B. Fasteners: Types as indicated, specified, or required for the assembly and installation of fabricated items.
   1. Bolts: ASTM A307, unless indicated otherwise; include nuts and plain harden washers.
   2. Drilled-In Concrete Anchors: Ramset "Trubolt Stud Anchor," Hilti Fastening Systems "Kwikbolt," or approved.

C. Interior Primer: Modified alkyd type (VOC compliant); lead and chromate free; gray or white color; one of the following unless approved otherwise.
   a. "Azeron Primer Series 88HS" by Tnemec Company Inc. (Kansas City, MO; 816-483-3400).
   b. "Amercoat 5105" by Ameron Protective Coatings (Brea, CA; 714-529-1951).
   c. "Carbocoat 150HG" by Carboline Company (St. Louis, MO; 314-644-1000; 800-848-4645).

D. Exterior Finish Materials:
   1. Manufacturer: Tnemec Company Inc. (Kansas City, MO; 816-483-3400).
   2. Epoxy Primer: Tnemec Series 69 Epoxoline."

E. Cold Galvanizing Compound: "Galv-Weld," "Galvican," "ZRC Cold Galvanizing Compound," or equivalent zinc-rich primer.

F. Miscellaneous Materials: Furnish incidental accessory materials, tools, and equipment as necessary for fabrication and installation of miscellaneous metal items as indicated on the Drawings.
   1. Non-Shrink Grout: Master Builder's "Master Flow 713," Sonneborn "Sonogrout," or approved.

2.2 PREFABRICATED COMPONENTS

A. Unistrut: Unistrut Corporation (Wayne, MI), or approved. Furnish manufacturer's standard components corresponding to "P" numbers indicated on the drawing. Include 1/4 inch thick steel connecting hardware, and 1/2" diameter bolts, nuts, and lock washers.

2.3 FABRICATION

A. General Fabrication Requirements: Fabricate as follows, unless specified or indicated otherwise.
   1. Verify all dimensions and fabricate to detail with accurate sizes and shapes, straight lines, smooth curves, and sharp angles.
   2. Welds shall have sufficient strength to withstand the loads applied.
   3. For items exposed to view or subject to contact, grind welds smooth and level with adjacent surfaces; remove all burrs from cut edges. Fill imperfections with body putty as necessary for a smooth even finish.
   4. Bend curved sections to a smooth radius free from buckles and twists.
   5. Fabrications in exterior locations shall be fabricated to shed water.

B. Fabrication of Elements to Receive Galvanized Coatings:
   1. Fabricate in accordance with the applicable requirements of ASTM A143, A384, and A385.
   2. Remove welding slag and burrs prior to galvanizing.
   3. Avoid fabrication techniques which could cause distortion or embrittlement of the steel.

2.4 SHOP FINISHES

A. Hot Dip Galvanizing:
   1. Steel fabrications shall be galvanized in accordance with ASTM A123. Bolts, nuts, washers, and other hardware shall be galvanized in accordance with A153.
   2. Surface Finish: The galvanized coatings shall be continuous, firmly adhered, smooth, and free from defects.
   3. Locations: Provide hot dip galvanizing for all metal fabrications in exterior or moist conditions, in direct contact with concrete or masonry, and as indicated. Unless otherwise approved by the Architect, plug and cold galvanize ventilation and lifting holes which will be exposed to moisture penetration in the finished work.

B. Interior Primed finish:
   1. Preparation: Solvent clean in accordance with SSPC-SP1. Remove rust and scale by wire brushing, scraping, and sanding down to bare metal in accordance with SSPC-SP2 and SP3. Where SP2 and SP3 measures are insufficient, provide commercial blast cleaning in accordance with SSPC-SP6. Immediately apply specified prime coat.
   2. Apply interior primer in accordance with manufacturer's recommendations.
   3. Locations: Provide at all interior metal fabrication exposed to view, unless otherwise indicated. Do not prime surfaces to be embedded in concrete, and surfaces to be field welded.

C. Exterior and Galvanized Finish:
   1. Prepare surfaces in accordance with the finish coat manufacturer's recommendations, and as specified below.
   2. Galvanized Surfaces: Clean per SSPC SP1. Abrade galvanized surfaces with a metal preparation pad.
   3. Spray apply primers in accordance with the manufacturer's recommendations. Apply primers to receive field application of finish coats as specified in Section 099000.

4. Except for surfaces indicated to be field welded, coat all surfaces of fabrication, whether or not exposed to view in installed position.
5. Maintain at least one coat of primer at all times during installation. Immediately patch damaged coatings.
6. Finish coat shall be free of dirt, flow lines, sags, blisters, pinholes, and other surface imperfections.
7. Locations: Provide at all exterior metal fabrications exposed to view, fabrications in direct contact with concrete or masonry, and other fabrications as scheduled. Do not prime surfaces to be field welded.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Prior to starting work, carefully inspect installed work of other trades and verify that such work is complete to the point where work of this Section may properly commence. Notify the Architect in writing of conditions detrimental to the proper and timely completion of the work.

B. Do not begin installation until all unsatisfactory conditions are resolved. Beginning work constitutes acceptance of conditions as satisfactory.

3.2 INSTALLATION

A. Install metal fabrications in accurate locations shown. Unless indicated otherwise, fabrications shall be installed plumb and level.

B. Provide all anchorage devices as indicated and required for a secure installation.

C. Touch-up all surfaces damaged during installation. Patch all welds and damage marks with matching primer.

D. Coordinate with Section 030013 for foundations, installation, and concrete fill at pipe bollards.

3.3 FIELD QUALITY CONTROL FOR BIDDER DESIGNED ITEMS

A. The design engineer for ladders and railing assemblies, or an authorized representative, shall visit the site to inspect the work, and shall verity and certify that it has been installed as designed and in accordance with the specified requirements.

3.4 SCHEDULE

A. The following list includes, without limitation, the principal metal fabrications and finishes in the Work.
   1. Interior ladders: standard primer for finishing under Section 099000.
   2. Steel fence posts at solid waste enclosure; galvanized finish only.
   3. Counter support brackets; standard primer for finishing under Section 099000.
   4. Handrails and guardrails: standard primer for finishing under Section 099000.

END OF SECTION

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:
   1. Exterior stair assembly including overhead canopy.
   2. Structural design of exit stairs.

B. Related Sections:
   1. 030013 - Concrete: Surrounding construction; requirements for concrete fill for metal pan treads.

C. Drawings, the provisions of the Agreement, the General Conditions, and Division 1 specification sections apply to all work of this Section.

D. Substitutions: Substitute products will be considered only under the terms and conditions of Section 016000.

1.2 REFERENCES

A. American Society for Testing and Materials (ASTM):
   1. A123 - Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products.
   2. A143 - Safeguarding Against Embrittlement of Hot Dipped Galvanized Structural Steel Products and Procedures for Detecting Embrittlement.
   3. A153 - Specification for Zinc Coating (Hot Dip) on Iron and Steel Hardware
   4. A384 - Safeguarding Against Warpage and Distortion During Hot Dip Galvanizing of Steel Assemblies.
   5. A385 - Providing High Quality Zinc Coatings (Hot Dip).

B. American Welding Society (AWS).

1.3 SYSTEM DESCRIPTION

A. Unless specified otherwise, stair system shall be fabricated from steel. Design details indicated may be modified by the fabricator subject to the specified requirements.

B. Stair systems shall include stairs, landings, handrails, guardrails, steel framing, overhead metal canopy, and all supports and anchors to adjacent construction. Handrails may be mounted to the stairs, or to building walls at the Contractor's option. Where handrails are attached to walls, metal backing within walls shall be included.

C. Floor construction, as indicated on the Drawings, includes bearing capacity to support steel stairs and design live loading, except for slab edge supports which are to be provided under the work of this Section. Stair system shall accommodate the surrounding construction indicated. All modifications to structure as required to support or otherwise accommodate the design/build stairs shall be the responsibility of the Contractor. Changes in dimension or location of finish surfaces indicated are subject to prior approval by the Architect. The Contractor shall reimburse the Owner for the Architect's charges for redesign necessitated by changes in building structure to accommodate stairs.

D. Tread, landing, and stringer deflections shall be limited to 1/360 span under design live loading indicated in the Structural Notes.

E. Railings:
   1. Railing assembly, wall rails, and attachments shall be capable of resisting a force of 200 lbs at any point in any direction without damage or permanent set.
   2. Railing assembly, wall rails, and attachments shall be capable of resisting a force of 50 plf in any direction without damage or permanent set.

F. Stair treads, nosings, and landing surfaces shall have non-slip finish. Risers may have open design.

G. Stair treads and landings shall be galvanized steel grating with checker plate nosings.

H. Unless indicated otherwise, size stairs for a clearance of 1 to 1-1/2 inches between the stringers and landing edges and the finish surface of the adjacent stair shaft wall.

1.4 SUBMITTALS

A. Make submittals in accordance with Section 013300.

B. Shop Drawings:
   1. Show materials, finishes, fastening systems, blocking requirements, and connections to surrounding construction.
   2. Shop drawings shall bear the stamp of the designing structural engineer.

C. Quality Control Submittals:
   1. Certification: Submit written certification that the stair system has been designed to meet the specified requirements.

D. Closeout Submittal:
   1. In accordance with Section 017700.
   2. Submit designing engineer's certification that products and installation comply with design requirements.]

1.5 QUALITY ASSURANCE

A. Regulatory Requirements:
   1. Stair system shall meet the requirements of jurisdictional code authorities.
   2. Furnish all calculations, engineer's stamps, drawings, and other items required by the code authorities to obtain approval of the installation.

B. Fabricator Qualifications: Minimum of 5 years experience in the fabrication of exit stairs of the type specified.

C. Structural Design: Structural design of the stair system shall be by a Structural Engineer Licensed to practice in the State where the Project is located.

D. The work of this Section is subject to tests and inspections as specified in Section 006426.

PART 2 - PRODUCTS

2.1 APPROVED MANUFACTURERS

A. Pacific Stair (Spokane, WA; 888-477-8247).

B. StairCo Division of Alfab, Inc. (Enterprise, AL ;800-239-9451).

C. Panel Built Inc. (Blairsville, GA; 800-636-3873).

2.2 MATERIALS

A. Carbon Steel:
   1. Structural Shapes, Plates, and Bars: ASTM A36.
   2. Sheet: ASTM A366.
   3. Pipe: ASTM A53, seamless, Type S, plain end; schedule 40 unless indicated otherwise.
   4. Tubing: ASTM A500 or A501, seamless.

B. Steel Decking (at canopy):
   1. ASTM A653, SS Grade 33 minimum quality.
      a. Galvanized to A60 minimum.
   2. Furnish deck capable of supporting design loads indicated on the structural drawings with detailed support conditions. Maximum deflection L/360, unless otherwise indicated.

2.3 FABRICATION

A. Fabricate stairs and rails in accordance with approved shop drawings.

B. Form exposed work true to line and level with accurate angles and surfaces and straight sharp edges. Ease exposed edges to a radius of approximately 1/32" unless otherwise indicated. Form bent-metal corners to smallest radius possible without causing grain separation, or otherwise impairing the work.

C. Welding: Comply with AWS standards.

D. Provide galvanic isolation between dissimilar metals.

E. Joints at mechanical and adhesive fastenings shall be accurately fitted to present neat hairline joints; welded connections exposed to view shall be neat and uniform, free of spatter and protrusions. All welds exposed to view at stairs shall be full penetration welds and shall be ground to a tight inside radius.

F. Galvanizing:
   1. Fabricate in accordance with the applicable requirements of ASTM A143, A384, and A385.
   2. Remove welding slag and burrs prior to galvanizing.
   3. Avoid fabrication techniques which could cause distortion or embrittlement of the steel.
   4. Steel fabrications shall be galvanized in accordance with ASTM A123. Bolts, nuts, washers, and other hardware shall be galvanized in accordance with A153.
   5. Locations: Provide hot dip galvanizing at all exterior stairs and railings.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Prior to starting work, carefully inspect installed work of other trades and verify that such work is complete to the point where work of this Section may properly commence. Notify the Architect in writing of conditions detrimental to the proper and timely completion of the work.

B. Do not begin installation until all unsatisfactory conditions are resolved. Beginning work constitutes acceptance of conditions as satisfactory.

3.2 PREPARATION

A. Place inserts, blocking, and related support framing in adjacent construction in accordance with construction sequence requirements.

3.3 INSTALLATION

A. Install in accordance with the approved shop drawings.

B. Perform field assembly in accordance with specified fabrication requirements.

C. Repair all damage caused by installation; retouch damaged finishes with matching material.

3.4 FIELD QUALITY CONTROL

A. The structural design engineer or an authorized representative shall visit the site to inspect the work. Verity and certify that the installation has been installed in accordance with the structural requirements.

END OF SECTION

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:
   1. Sheathing.
   2. Dimensional wood framing.
   3. Glued-laminated beams and lumber.
   4. Resilient sound isolation clips.
   5. Blocking, nailers, and curbing.
   6. Plywood terminal back boards.
   7. Wood treatment

B. Related Sections:
   1. 061643 - Gypsum Sheathing
   2. 061733 – Wood I-Joists
   3. 061739 - Open-Web Wood Chord Trusses
   4. 076200 - Sheet Metal Flashing and Trim.
   5. 092200 – Lightgage Metal Support Framing: Support framing; metal backing.
   6. 098100 - Acoustic Insulation: Acoustic sealant

C. Drawings, the provisions of the Agreement, the General Conditions, and Division 1 specification sections apply to all work of this Section.

D. Substitutions: Substitutions will be considered only under the terms and conditions of Section 016000.

1.2 REFERENCES

A. American Institute of Timber Construction (AITC)

B. American National Standards Institute (ANSI): 190.1 - Structural Glued Laminated Timber.

C. American Plywood Association (APA)

D. American Society for Testing and Materials (ASTM):
   1. D2898 - Test Method for Accelerated Weathering of Fire-Retardant Treated Wood for Fire Testing.
   2. E84 - Test Method for Surface Burning Characteristics of Building Materials.

E. American Wood Preservers' Association: Book of Standards (AWPA).

F. National Lumber Grading Authority of Canada (NLGA).

G. Product Standard (PS): PS-20 - American Softwood Lumber Standard.

H. Southern Pine Inspection Bureau (SPIB).

I. West Coast Lumber Inspection Bureau (WCLB): Standard Grading Rules for West Coast Lumber.

J. Western Wood Products Association (WWPA).

1.3 SUBMITTALS

A. Make submittals in accordance with Section 013300.

B. Product Data: Submit complete technical and product data on the following:
   1. Preservative wood treatments.
   2. Framing and sheathing accessories.
   3. Fabricated structural wood members.

1.4 QUALITY ASSURANCE

A. Regulatory Requirements: Work shall conform to the requirements of the currently enforced International Building Code as adopted by the jurisdiction.

B. Fabricated Wood Structural Member Manufacturers Qualifications:
   1. For each type of fabricated structural wood member, use company specializing in the manufacture of the type of structural wood member with a minimum of three years experience.
   2. Glued Laminated Wood Structural Member Manufacturer: Certified by the AITC or APA-EWS (American Wood Systems), in accordance with ANSI A190.1.

C. Glued laminated structural units shall conform to Voluntary Product Standards PS 56 "Structural Glue Laminated Timber" and AITC 117 "Standard Specifications for Structural Glue-Laminated Timber of Softwood Species".

D. All interior primers, adhesives, coatings and sealants shall comply with the most recent version of Rule 1168 of the South Coast Air Quality Management District.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Store and protect products under provisions of Section 016000.

B. Glued Laminated Wood Members:
   1. Protective Wrapping: Industrial grade members may be shipped unwrapped. Individually wrap architectural and premium grade members. Maintain protection until immediately prior to installation.
   2. Use padded, non-marring slings when handling architectural grade members.
   3. Prevent glued laminated members from becoming wet.

PART 2 - PRODUCTS

2.1 DIMENSION LUMBER

A. Lumber shall be manufactured in accordance with PS 20, and shall be stamped and graded in accordance with WWPA, WCLB, NLGA, or SPIB grading rules.

B. Moisture Content: Kiln dried to 19% maximum moisture content, except for material whose least dimension is 4 inches thick or greater.

C. Species: Hem-Fir, Spruce-Pine-Fir (SPF), or Douglas Fir Larch, unless indicated or specified otherwise.

D. Structural Lumber Grades: As indicated on the Structural Drawings.

E. Architectural Lumber Grades: Unexposed non-structural wood framing and blocking indicated on the Architectural Drawings shall be graded as follows:
   1. Blocking and Nailers: "Utility - Light Framing," or better.

2.2 PANEL MATERIALS

A. Wall and Roof Sheathing: APA Rated Sheathing; Structural I; CD grade; Exterior; plywood, unless indicated otherwise on the Structural Drawings; thicknesses as indicated.

B. Terminal Backboards: APA AC grade exterior; fire retardant treated.

2.3 FABRICATED WOOD STRUCTURAL MEMBERS

A. Glued Laminated Wood Members:
   1. As indicated on the Structural Drawings.
   2. Appearance grade where exposed in the finish work.

B. Laminated Veneer Lumber (LVL): ICBO listed.

C. Parallel Strand Lumber (PSL): As indicated on the Structural Drawings.

D. General Fabrication Requirements for Fabricated Wood Structural Members:
   1. Verify dimensions and site conditions prior to fabrication.
   2. Fabricate to meet the structural requirements specified.

2.4 ACCESSORIES

A. Fasteners:
   1. Hot-dipped galvanized steel for exterior and high humidity locations.
   2. For Use With Preservative Treated Wood: 300 Series stainless steel.
   3. Use ring shank nails at floor sheathing.
   4. Screws: Self tapping; countersunk or low profile head.

B. Metal Connectors: Simpson Company, Silver Metal Products, Inc, USP Structural Connectors, or approved; types as indicated on the Drawings; minimum G-185 galvanized coating.

C. Construction Adhesive: M-D Building Products (Oklahoma City OK; 800-654-0007) "MD400," Surebond Inc. (Aliso Viejo, CA; 866-600-7873) "SB-400," or other product meeting the requirements of AFG-01.

D. Resilient Sound Isolation Clips: Acoustical Solutions “RSIC-1,” Buildcorp “A237R,” or approved.

E. Sill Gasket: Closed cell polyethylene foam, glass fiber strips, or approved; continuous rolls; width of sill plate.

F. Strip Flashing: "Vycor Ultra" by WR Grace., 800-444-6459, or "Moistop E-Z Seal" by Fortifiber Corporation 800-343-3972.

2.5 WOOD TREATMENT

A. Wood Preservative (Pressure Treatment):
   1. Preservative treat all exterior lumber, including roofing nailers, curbs and other wood in contact with concrete, masonry, and moist conditions.
   2. For above ground use, use AWPA certified Ammonium Copper Quaternium (ACQ) or Copper Hydroxide Sodium Dimethyldithiocarbamate (CDDC) waterborne preservative with 0.25 pounds per cubic foot of wood retention.
   3. For ground contract use, use AWPA Treatment C-22 using CCA waterborne preservative with 0.40 pounds per cubic foot of wood retention.
   4. Treated lumber shall be kiln dried to a maximum moisture content of 19%; treated plywood shall be kiln dried to a maximum moisture content of 15%.
   5. Treated lumber shall bear the quality stamp of an inspection agency approved by the jurisdictional code authorities.

B. Fire Retardant Treatment:
   1. Fire retardant treat lumber and plywood at locations indicated on the Drawings and as otherwise specified.
   2. All fire retardant treated wood materials shall bear a UL "FR-S" label, or a label from an approved inspection agency certifying that the material Pressure treat lumber in accordance with meets the requirements of AWPA C-20 Type A for lumber and plywood in accordance with AWPA C-27 Type A for plywood.
   3. Treated lumber shall be kiln dried to a maximum moisture content of 19%; treated plywood shall be kiln dried to a maximum moisture content of 15%.
   4. All fire retardant treated wood shall bear a UL "FR-S" label, or a label from an approved inspection agency certifying that the material has a flame spread rating no higher than 25 with no evi-dence of significant progressive combustion when tested in accordance with ASTM E84. Ex-terior fire retardant treated wood shall be treated by means of a system which has been demonstrated to exhibit no increase in fire hazard classification in accordance with ASTM E84 test after having been subjected to accelerated weather conditioning in accordance with ASTM D2898.
   5. Approved Products:
      a. Interior Fireproofing: Clear finish product, Hickson Corporation "Dricon", Hoover Treated Wood Products "Pyro-guard," or Osmose Wood Preserving Co. of America, Inc. "Flame Proof LHC."
      b. Exterior Fireproofing: Hoover Treated Wood Products "Exterior Fire-X."

PART 3 - EXECUTION

3.1 EXAMINATION

A. Prior to starting work, carefully inspect installed work of other trades and verify that such work is complete to the point where work of this Section may properly commence. Notify the Architect in writing of conditions detrimental to the proper and timely completion of the work.

B. Do not begin installation until all unsatisfactory conditions are resolved. Beginning work constitutes acceptance of site conditions and responsibility for defective installation caused by prior observable conditions.

3.2 FRAMING

A. Erect as indicated.

B. Erect wood framing members level and plumb unless indicated otherwise.

C. Place horizontal members crown side up.

D. Provide acoustical sealant under wall plate and track, between all apartments and hallways. Coordinate with the Work of Section 098100.

E. Nailing shall be in accordance with Seattle Building Code, unless indicated otherwise. Use screws when fastening into metal framing and supports.

F. Use framing members full length without splices.

G. Tolerances:
   1. Maximum 1/4 inch from true position.
   2. Maximum 1/4 inch in 10 feet from true plumb or level.

H. Site treat cut ends of field cut treated lumber with compatible material as recommended by the treatment materials manufacturer.

I. After end trimming glued laminated beams, seal with penetrating sealer in accordance with AITC requirements. Do not apply sealer to surfaces to receive stains or other finish treatments.

J. Place sill gasket directly on concrete foundation. Puncture gasket clean and fit tight to protruding foundation anchor bolts.

3.3 SHEATHING

A. Install sheathing as indicated. When not indicated, install as follows:
   1. Secure sheathing with edges on firm bearing. Provide solid edge blocking between sheets.
   2. Secure roof sheathing perpendicular to framing members with ends staggered.

B. Fastening shall be in accordance with code requirements. Use screws in lieu of nails when fastening into metal lightgage metal framing. Use screws at all floor and deck sheathing.

C. Allow 1/8 inch spacing at ends and edges between panels, unless otherwise recommended by panel manufacturer.

3.4 BLOCKING, NAILERS, AND CURBS

A. Provide blocking, nailers, and curbs for sheathing, roof construction, metal flashing, and other construction as indicated, and as necessary for firm support. Unless otherwise indicated, solid wood backing shall be minimum 2 inch nominal thickness; plywood shall be minimum 3/4 inch thick, except that sloped parapet caps may be 1/2 inch thick.

B. Blocking: Install wood blocking to receive mechanical fasteners for support of plumbing and electrical fixtures and equipment, cabinets, door stop plates, wood base, wainscots, coat hooks, toilet and bath accessories, kitchen equipment, and all other wall and ceiling mounted components.

C. Screw fasten wood components to metal framing and support elements.

D. For attachment of plywood backing, kerf plywood 1/4" (3/8", maximum if required for heavy gage studs) to receive flange return (or crimp the return closed); provide supplementary sheet metal angle

attached to back of stud where necessary to support backing. Screws into edge of plywood are unacceptable.

3.5 PLYWOOD TERMINAL BACKBOARDS

A. Provide a fire retardant treated plywood terminal backboard for telephone systems.

B. Mechanically apply directly over gypsum backing board.

END OF SECTION

SECTION 061500 - WOOD DECKING

PART 1 - GENERAL

1.1 SUMMARY

A. This Section includes design, fabrication and erection of tongue-and-groove wood decking using solid wood decking.

B. Connectors, anchors, and accessories for the framing are specified in Section 061800.

C. Related Sections include the following:
   1. Division 6 Section “Rough Carpentry” for dimension lumber items associated with solid wood decking construction.

D. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2 REFERENCES

A. Solid Wood Decking: AITC 112-93

1.3 PERFORMANCE REQUIREMENTS

A. Structural Performance: Provide solid wood decking, including connectors, capable of withstanding structural loads shown on Drawings without exceeding allowable design working stresses or allowable deflections per the International Building Code or its reference standards.
   1. Seismic Performance: Provide solid wood decking, including connectors, capable of withstanding the effects of earthquake motions determined according to seismic design criteria shown on the Drawings.

1.4 SUBMITTALS

A. Manufacturers Data: Grade of timber used and allowable stresses for it.

B. Shop Drawings: Show layout of structural glued-laminated timber system and full dimensions of each member.
   1. Indicate configuration, span, and slope.
   2. For installed products indicated to comply with design loads, include structural analysis data signed and sealed by the licensed professional engineer responsible for their preparation. The engineer will be licensed in the state where the Project is located.

C. Samples: Three 12” long pieces of wood decking without stain, which show final face texture, edge, and end conditions. The pieces shall demonstrate the range in the grade and final finish to be expected in the finished work. These unstained pieces are to be reviewed and approved by the Architect prior to applying any stain to any wood in the shop. Three 12” long pieces of wood decking with stain, which show final face texture, edge, and end conditions.

1.5 QUALITY ASSURANCE

A. Quality Standard: Comply with AITC Al 90.1, “Structural Glued-Laminated Timber.”

1.6 DELIVERY, STORAGE, AND HANDLING

A. General: Comply with provisions in AITC 111, “Recommended Practice for Protection of Structural Glued-Laminated Timber during Transit, Storage, and Erection.”

B. Provide water-resistant wrapping.

C. Use non-marring slings for loading, unloading, and handling members to prevent damage to surfaces and wrapping. Unload at site, place on level supports with members off of ground surface, and adequately cover to protect from weather and site debris.

D. All timber members that are stored inadequately to prevent damage, left in contact with earth, or which have damage or staining will be rejected. Such members must be replaced with in-kind timber members at the sole expense of the Contractor.

PART 2 - PRODUCTS

2.1 WOOD DECKING

A. Species shall be Douglas-Fir/Larch Commercial.

B. Moisture content shall be a maximum of 12%.

C. Grade: Select Grade for Douglas-Fir Larch.

D. Surface Texture: Smooth Sanded Surface.

E. Decking pattern shall have standard V-joint one side, and shall and have tongue and grooves along both of the long sides and both of the ends.

F. End Sealer: Manufacturers standard, transparent, colorless wood sealer that is effective in retarding the transmission of moisture at cross-grain cuts and is compatible with Indicated finish.

G. Penetrating Sealer: Manufacturers standard, transparent, penetrating wood sealer that will not interfere with application of wood stain and transparent finish.

H. Stain: Semi-transparent oil-based stain “Water Repellant Semi-Transparent Oil Stain”, Color No. 718, as manufactured by Olympic Stains, PPG Industries, Architectural Finishes Group.

I. Sealant: Latex Sealant Caulk: Provide exterior use caulk of one of the following manufacturers or approved equal:
   1. Chem-Calk 600; Bostic Inc.
   2. NuFlex 300; Nuco Industries Inc.
   3. Tremflex 834; Tremco

2.2 FABRICATION

A. Timber Grades:
   1. Decking: Select Grade

B. Minimum Stress Values: The following values are for primary load carrying members that collect loads from other members and transfer them to trusses or columns. Other secondary timber members may be designed using allowable stresses and material grade that are compatible with the applied secondary loads. Higher stress grade may be required to meet structural loads, as determined by the manufacturer’s structural engineer.
   1. 1450 psi in bending
   2. 625 psi in tension and compression perpendicular to grain
   3. 1,700,00 psi modulus of elasticity

C. Conditions of Service:
   1. Fabricate interior components for dry condition of service
   2. Fabricate exterior components for wet condition of service

D. Adhesive: Bond laminated members with waterproof adhesive.

E. Factory Finishes:
   1. Apply a coat of end sealer to all members as soon as practical after end trimming.
   2. After fabricating, sanding, and end-coat sealing each unit, apply a heavy saturation coat of penetrating sealer to surfaces of each unit, except for treated wood where treatment has included water repellant.
   3. Stain Finish: Apply semi-transparent oil based stain specified to decking.

F. Factory-Applied Protection: Before shipping or exposing to outdoor conditions, bundle-wrap wood members with manufacturer’s standard, opaque, durable, water-resistant, plastic-coated paper covering with water-resistant seams.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates in areas to receive structural decking, with Installer present, for compliance with requirements, installation tolerances, and other conditions affecting performance of decking. If substrates are unsatisfactory, provide written notification to General Contractor.
   1. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

A. General: Erect decking true and plumb, with uniform, closefitting joints.
   1. Lift with padded slings and protect comers with wood blocking.
   2. Install structural glued-laminated timber to comply with Shop Drawings.
   3. Install timber connectors as indicated on Shop Drawings.

B. Sealant: Apply a continuous bead of latex sealant caulk between the outermost timber edge supporting member and the underside of the wood decking to provide an airtight seal.

C. Wood Deck Nailing: Nail decking to supports according to AITC recommendations.

D. Cutting: Avoid cutting after fabrication. Where field fitting is unavoidable, comply with requirements for shop fabrication.
   1. Where surface-treated members must be cut during erection, apply a heavy brush coat of the same preservative to comply with AWPA M4.
   2. Coat cuts with end sealer of paragraph 2.1 .C. This is not required at field drilling for bolts.

3.3 ADJUSTING

A. Repair damaged surfaces after completing erection. Replace damaged decking if repairs are not approved by Architect.

3.4 PROTECTION

A. Wood Deck Protection: Provide temporary waterproof covering to protect exposed decking prior to installation of roof.

END OF SECTION

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes: Gypsum sheathing.

B. Related Sections:
   1. 092900 - Gypsum Board: Interior gypsum products.

C. Drawings, the provisions of the Agreement, the General Conditions, and Division 1 specification sections apply to all work of this Section.

D. Substitutions: Substitute products will be considered only under the terms and conditions of Section 016000.

1.2 REFERENCES

A. American Society for Testing and Materials (ASTM):
   1. C1177 - Specification for Glass Mat Gypsum Substrate for Use as Sheathing.
   2. C1278 - Standard Specification for Fiber Reinforced Gypsum Panel

1.3 SUBMITTALS

A. Make submittals in accordance with Section 013300.

B. Product Data: Product literature on gypsum sheathing and screw fasteners.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Gypsum Sheathing: One of the following:
   1. G-P Gypsum Corporation "Dens-Glass Gold"; glass mat faced; ASTM C1177; 5/8 inch thickness.
   2. BPB America, Inc. "GlasRoc"; glass mat faced; ASTM C1177; 5/8 inch thickness.
   3. USG "FIBEROCK® Brand Sheathing with Aqua-Tough(TM)"; ASTM C1278; 5/8 inch thickness.

B. Screws: Galvanized, self-drilling bugle head screws; minimum 1-1/4 inch long.

C. Joint and Penetration Sealant: Dow Corning 795 Building Sealant.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Prior to starting work, carefully inspect installed work of other trades and verify that such work is complete to the point where work of this Section may properly commence. Notify the Architect in writing of conditions detrimental to the proper and timely completion of the work.

B. Do not begin installation until all unsatisfactory conditions are resolved. Beginning work constitutes acceptance of site conditions and responsibility for defective installation caused by prior observable conditions.

C. Verify that framing is ready for installation of sheathing.

3.2 GYPSUM SHEATHING INSTALLATION

A. Install sheathing boards parallel or perpendicular to framing. Apply sheathing with vertical joints staggered. All edges shall be supported as follows:
   1. Maximum span: 24 inches.
   2. Maximum cantilever: 2 inches.

B. Install sheathing with coating towards exterior.

C. Screw to framing. Space fasteners 8 inches o.c. in field and 4 inches o.c. at ends along each framing member.

D. Do not bridge expansion or seismic joints.

E. Coordinate with Division 16 work for cutouts for electrical penetrations.

F. If sheathing is not to be covered by finish material within 6 months after purchase, cover the material as necessary to maintain the manufacturer's warranty.

END OF SECTION

SECTION 061733 – WOOD I-JOISTS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:
   1. Wood chord and plywood web joists for roof and floor framing.
   2. Bridging, bracing, and anchorage.
   3. Framing for openings.

B. Related Sections:
   1. 061000 - Rough Carpentry: Coordination.
   2. 061500 - Wood Decking: Solid lumber decking
   3. 061739 - Open Web Wood Chord Trusses.
   4. 098100 – Acoustic Insulation: Acoustical sealant

C. Drawings, the provisions of the Agreement, the General Conditions, and Division 1 specification sections apply to all work of this Section.

D. Substitutions: Substitute products will be considered only under the terms and conditions of Section 016000.

1.2 REFERENCES

A. APA - American Plywood Association.

1.3 SYSTEM DESCRIPTION

A. Design Floor Live Load: As indicated on the Drawings.

B. Design Roof Live Load: As indicated on the Drawings.

1.4 SUBMITTALS

A. Make submittals under provisions of Section 013300.

B. Shop Drawings. Include seal and signature of designing engineer.

C. Product Data.

D. Indicate framing system, sizes and spacing of joists, loads and joist cambers, bearing and anchor details, bridging and bracing, and framed openings.

E. Submit manufacturer's installation instructions under provisions of Section 013300.

F. Closeout Submittal:
   1. In accordance with Section 017700.
   2. Submit designing engineer's certification that products and installation comply with design requirements.

1.5 QUALITY ASSURANCE

A. Manufacturer: Company specializing in manufacture of plywood web joists with three years minimum experience.

B. Design joists under direct supervision of Professional Engineer experienced in structural framing design registered in State of Washington.

1.6 REGULATORY REQUIREMENTS

A. Conform to applicable code for loads, seismic zoning, and other governing criteria.

1.7 DELIVERY, STORAGE, AND HANDLING

A. Deliver products to site under provisions of Section 016000.

B. Store and protect products under provisions of Section 016000.

C. Transport and store joists in vertical position resting on bearing ends.

D. Protect joists from moisture, warpage, and distortion during transit and when site stored.

PART 2 - PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS

A. RedBuilt Red-I Joists (Boise, ID; 866-859-6757)

B. Trus Joist by Weyerhauser (Seattle, WA; 800-525-5440)

C. Trus Joist MacMillan (Foothill Ranch, CA; 949-616-1600).

D. Pacific Woodtech Corporation (Burlington, WA; 888-707-2285)

E. Boise Cascade Company (Boise, ID; 208-384-6161)

F. Roseburg Forest Products Company (Roseburg, OR; 800-347-7260)

G. Substitutions: Under provisions of Section 016000.

2.2 MATERIALS

A. Wood Chord Members: As indicated on the Structural Drawings

B. Web: As indicated on the Structural Drawings

C. Joist Bridging: Type, size and spacing required by joist manufacturer.

2.3 ACCESSORIES

A. Wood Blocking, Plating, Support Members, Framing for Openings: Softwood lumber, hem-fir species, construction grade, maximum moisture content of 19 percent.

B. Fasteners: Galvanized steel, type to suit application.

2.4 FABRICATION

A. Verify dimensions and site conditions prior to fabrication.

B. Tolerances:
   1. Depth: ±1/16 inch.
   2. Flange Width: ±1/16 inch.

PART 3 - EXECUTION

3.1 INSPECTION

A. Verify that supports and openings are ready to receive joists.

B. Verify sufficient end bearing area.

C. Beginning of installation means acceptance of existing conditions.

3.2 PREPARATION

A. Coordinate placement of bearing items.

3.3 INSTALLATION

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

B. Place joists true to line and level.

C. Provide temporary bracing to position joists in place until permanently secured.

D. Place permanent bridging, bracing, and anchors to maintain joists straight and in correct position before installation of decking or inducing loads.

E. Do not field cut joists.

F. Place headers and supports to frame openings required.

G. Frame openings between joists with lumber.

H. Coordinate placement of decking with work of this Section.

3.4 TOLERANCES

A. Framing Members: 1/2 inch maximum from true position.

3.5 FIELD QUALITY CONTROL

A. The plywood web joist manufacturer's design engineer or his authorized representative shall visit the site to inspect the work. Verity and certify that joist sizes and materials are as required, that connections are properly executed, and that structural integrity of materials has been maintained.

END OF SECTION

SECTION 061739 – OPEN-WEB WOOD CHORD TRUSSES

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes: Complete design, furnishing and installation of open web wood chord steel rod web trusses for roof framing, as indicated, and as necessary to complete the work.

B. Related Sections
   1. 051200 - Structural Steel Framing: Supporting structure.
   2. 061000 - Rough Carpentry: Plywood decking.
   3. 061500 - Wood Decking: Solid lumber decking
   4. 061733 – Wood I-Joists: Plywood web joists.

C. Drawings, the provisions of the Agreement, the General Conditions, and Division 1 specification sections apply to all work of this Section.

D. Substitutions: Substitute products will be considered only under the terms and conditions of Section 016000.

1.2 REFERENCES

A. American Society for Testing and Materials (ASTM):
   1. A307 - Carbon Steel Threaded Standard Fasteners.
   2. A653: Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated by the hot-Dip Process.

B. International Building Code (IBC).

1.3 SUBMITTALS

A. Make submittals in accordance with Section 013300.

B. Shop Drawings:
   1. Indicate standard designations, configuration, sizes, spacing, and locations of trusses, truss coding, bridging, connections, attachments, cambers, and attachment details.
   2. Reference dimensions to gridlines and layout working points indicated in the documents.
   3. Prepare shop drawings under the seal of a professional structural engineer registered in the State of Washington.

C. Calculations: Submit design calculations for open web trusses to the Authority Having Jurisdiction and to Structural Engineer, and provide two informational copies to the Architect for the project records. Calculations shall bear the seal of a professional structural engineer registered in the State of Washington.

D. Quality Control Submittals: Certification: Submit written certification that the open web wood chord trusses have been designed to meet the specified requirements.

1.4 QUALITY ASSURANCE

A. Design: Structural design of the wood chord trusses shall be by a Structural Engineer Licensed to practice in the State of Washington.

B. Code Approvals: Trusses shall be designed and manufactured to comply with the International Building Code.

C. Regulatory Requirements: Comply with building department requirements for review of truss shop drawings.

D. Design of the trusses shall comply with the loading requirements indicated on the Structural Drawings, and the Architectural requirements indicated.

1.5 DELIVERY, STORAGE, AND HANDLING

A. In accordance with Section 016000.

B. Store open web trusses in a vertical position and protected from the weather.

1.6 WARRANTY

A. Submit in accordance with Section 017700.

B. The products, when correctly installed and maintained, shall be warranted free from manufacturing errors or defects in workmanship and material, and shall be warranted to perform as designed for the normal and expected life of the building.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Open Web Truss Members: Style as indicated on the Drawings.

B. Lumber: In accordance with Section 061000.

2.2 CONNECTORS:

A. Plywood Connectors: Plywood in accordance with Section 061000.

B. Steel Connectors: Hot-dipped galvanized steel sheet, ASTM A653; die-stamped with integral teeth.

C. Truss Bridging: Type, size and spacing as indicated on approved shop drawings.

D. Bolts, Nuts and Washers: ASTM A307.

2.3 FABRICATION

A. Fabricate trusses to achieve structural and architectural requirements indicated.

B. Tolerances
   1. Length bearing to bearing: ± 1/4"
   2. Depth ± 1/4"

C. Provide chord extensions and braces as indicated.

D. Identification: Each of the trusses shall be identified by a stamp indicating the truss series, manufacturer's name, plant number, and date of manufacture.

2.4 SOURCE QUALITY CONTROL

A. Trusses shall be inspected for compliance with specifications and manufacturer's standards for structural integrity, under manufacturer's ongoing program for observation by an independent inspection agency.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Prior to starting work, carefully inspect installed work of other trades and verify that such work is complete to the point where work of this Section may properly commence. Notify the Architect in writing of conditions detrimental to the proper and timely completion of the work.

B. Do not begin installation until all unsatisfactory conditions are resolved. Beginning work constitutes acceptance of site conditions and responsibility for defective installation caused by prior observable conditions.

3.2 ERECTION

A. Erect open web trusses in accordance with the Structural Drawings.

B. During erection, provide temporary bracing for induced loads and stresses to keep the trusses straight and plumb as required and to assure adequate lateral support for the individual trusses and the entire system until the sheathing material has been applied.

C. Coordinate placement of anchorages construction for securing bearing plates and angles.

3.3 FIELD QUALITY CONTROL

A. After completion of installation and prior to enclosing the trusses, notify the manufacturer's representative for review of installation.

END OF SECTION

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:
   1. Wood standing and running trim.
   2. Custom casework.
   3. Plastic laminate.
   4. Wood veneers.
   5. Shop finishing.
   6. Option for providing pre-manufactured modular casework for the back-of-house areas only.

B. Related Sections:
   1. 061000 - Rough Carpentry: Blocking for finish carpentry.
   2. 081400 - Wood Doors: Flush doors.
   3. 087100 - Door Hardware.
   4. 087300 - Door and Hardware Installation.
   5. 099000 - Painting: Field applied stains and finish coatings.
   6. 123200 - Manufactured Wood Casework

C. Drawings, the provisions of the Agreement, the General Conditions, and Division 1 specification sections apply to all work of this Section.

D. Substitutions: Substitute products will be considered only under the terms and conditions of Section 016000.

1.2 REFERENCES

A. American National Standards (ANSI)
   1. ANSI A208.1 - Standard for Particleboard
   2. ANSI A208.2 - Standard for Medium Density Fiberboard (MDF)

B. American Society for Testing and Materials (ASTM)
   1. C1036 Standard Specification for Flat Glass
   2. E84 Test Method for Surface Burning Characteristics of Building Materials

C. American Plywood Association (APA)

D. Architectural Woodwork Institute (AWI): Architectural Woodwork Quality Standards, Guide Specifications and Quality Certification Program (Current Edition).

E. Business Institutional Furniture Manufacturer's Association (BIFMA)

F. West Coast Lumber Inspection Bureau (WCLB): Standard Grading Rules No. 16.

G. U.S. Product Standard (PS) PS 1 Product Standard for Construction and Industrial Plywood.

1.3 DEFINITIONS

A. Exposed Portions of Casework: Those surfaces visible when doors and drawers are closed, including edges of doors and drawers, edges of cabinet boxes visible between doors and drawers, backs of hinged doors, interiors behind glass doors, and interiors in open cabinets.

B. Semi-Exposed Portions of Casework: Those areas not defined as exposed, but visible when solid (not glazed) doors and drawers are opened.

C. Concealed Portions of Casework: All remaining areas not defined as exposed or semi-exposed.

1.4 SUBMITTALS

A. Make submittals in accordance with Section 013300.

B. Shop Drawings. Indicate materials, components, profiles and configurations, dimensions, fastening methods, jointing details, colors and finishes, and accessories. Details shall be at a minimum scale of 1-1/2 inch per foot. Show all scribe pieces and transitions to adjacent work.

C. Samples:
   1. Solid Wood and Veneer Wood with Transparent Finish: Submit a minimum of 3 - 12 inch long samples representative of the maximum range of color and graining to be expected for each species, cut, and finish combination specified.
   2. Fiberboard Component: Submit 6 inch corner of a fiberboard cube; show jointing and finishing techniques; include paint finish.

D. Product Literature:
   1. Submit literature for a sample of each hardware component proposed.
   2. Particle Board and MDF Materials: Literature verifying materials are formaldehyde free.

1.5 QUALITY ASSURANCE

A. Fabricator: A minimum of 5 years experience in the fabrication of custom architectural woodwork of the type specified. The Fabricator shall be approved by the Architect.

B. All custom Architectural Woodwork shall be under the responsibility of a single fabricator.

C. Qualifications of Installers: Use only journeyman finish carpenters who are thoroughly trained and skilled in the work, and who are completely familiar with the materials and quality standards specified. No allowance will be made for lack of skill on the part of workmen.

D. All interior primers, adhesives, coatings and sealants shall comply with the most recent version of Rule 1168 of the South Coast Air Quality Management District.

E. Standards:
   1. Custom casework shall conform to AWI Architectural Woodwork Quality Standards Section 400 "custom" grade, unless otherwise indicated.
   2. Pre-manufactured modular casework shall conform to AWI Architectural Quality Standards Section 1600, unless otherwise indicated.

1.6 DELIVERY, STORAGE AND HANDLING

A. In accordance with 016000, and as follows:
   1. Do not deliver wood materials to the building until "wet" work such as gypsum wallboard work has been completed.
   2. Store materials indoors in ventilated area with a minimum temperature of 60 degrees F., and a maximum humidity of 55%.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Lumber:
   1. Transparent Finish Lumber:
      a. General: AWI Grade I; species and cut as indicated.
      b. Wall Paneling at Lobby: Western Red Cedar; Grade “A Clear;” vertical grain; tongue and groove; V-groove one side; 15% maximum moisture content.
   2. Opaque Finish Lumber: AWI Grade II Poplar.
   3. Concealed Framing Lumber: AWI Grade II pine, fir, hemlock, or other species as approved.
   4. Moisture Content: Optimum moisture content per AWI recommendations unless specified otherwise..

B. Plywood:
   1. Typical Plywood: APA rated in accordance with PS 1; 3/4 inch thick AC exterior grade unless indicated or specified otherwise; touch sanded where plastic laminate veneers are to be applied.
   2. Hardwood-Faced Plywood at Exposed-Edge Conditions:
      a. Columbia Forest Products (800-547-1791); “Europly Plus”;
      b. 100% birch interior plies; 11 plies at 1/2 inch thickness; 15 plies at 3/4 inch thickness.
      c. No added urea formaldehyde;
      d. Face Veneers: AWI Grade A; Yellow Birch, Select White, plain sliced.

C. Wood Veneer Flitches:
   1. Proprietary reconstituted veneer.
   2. Manufacturer: Materials Inc (Hackensack, NJ; 201-968-0101)
   3. Product: Ecozero Tabu Series, model number as scheduled on the Drawings.

D. Particle Board: ANSI A208.1; grade M-2 (medium density); formaldehyde free. Provide quality assurance stamp or manufacturer's certifications as required by local jurisdictional code authorities.

E. Medium Density Fiberboard (MDF): ANSI A208.2 Class MD (medium density); exterior glue; formaldehyde free.

F. Pre-finished Board: Low pressure melamine over particle board, MDF, or hardboard core; formaldehyde free; colors as selected from manufacturer's standard.

G. Plastic Laminate:
   1. Brands and colors as scheduled on Drawings.
   2. Exposed: NEMA LD-3; general and vertical grade,
   3. Backing Sheets: NEMA LD-3; backing grade; undecorated.

H. Solid Surfacing:
   1. "Ironbridge" by Cambria. (866-226-2742). Color as selected by Architect.
   2. Fabricate solid surface elements to the configurations indicated in accordance with the manufacturer’s recommendations.

2.2 ACCESSORY MATERIALS

A. Cabinet Hardware:
   1. Pulls: 4 inch wire pulls; brushed chrome finish.
   2. Drawer Slides: Full extension ball bearing; clear zinc finish; rail mount; Accuride, or approved; load rating as required for the application.
      a. Light Duty Rating (drawers 12 inches wide or less): Accuride 2632; 65 lb BIFMA load rating
      b. Medium Duty Rating(drawers 32 inches wide or less): Accuride 7432; 100 lb BIFMA load rating.
      c. Heavy Duty Rating (drawers 42 inches wide or less): Accuride 3640; 200 lb BIFMA load rating.
   3. Drawer Locks: Olympus Lock or approved; 5 pin tumbler cylinder locks; ANSI Grade 1; configuration to suit condition; keyed alike as directed, and masterkeyed. Furnish two keys for keyed alike group, and four masterkeys; finish to match pulls.
   4. Hinges: RPC #374 5-knuckle hinges, satin chrome.
   5. Catch: EPCO 1000.
   6. Shelf Clips: Double pin, locking, Allen Fields/PX Industries #55036, satin chrome.
   7. Locker Hasps: Real Lock #RL-8051, www.realock.com.
   8. Wiring Grommets: Rockler #22899 Medium Sized Multi Slot Oval Grommet, Black.

B. Closet Hardware:
   1. Closet Rod: Knape & Vogt # 770 5; 1-5/16 inch diameter; chrome finish.
   2. End Flanges: Knape & Vogt # 764/766; chrome finish.

C. Wall Shelf Hardware:
   1. Brackets: Knape & Vogt # 185 Anochrome finish; length as appropriate for shelving indicated.
   2. Standards: Knape & Vogt # 85 Anochrome finish.

D. Counter Support Brackets:
   1. Manufacturer/Source
      a. Oodles of Parts Plus (Patchogue, NY; 800-286-5471)
      b. A&M Hardware Inc. (Manheim PA; 888-647-0200)
      c. Steelcase
      d. Herman Miller
   2. Bracket: "Work Station Bracket"; 1/8" steel; 24" x 24" size unless otherwise indicated; right and left hand configuration as appropriate; prime paint finish.

E. Contact Bond Adhesive: Water based low VOC.

2.3 STANDING AND RUNNING TRIM FABRICATION

A. Shop fabricate all trim to the shapes indicated.

B. Assemble built-up sections. All glue lines shall be free of squeeze-out where transparent finishes are to be applied.

C. Tolerances for overall assembly dimensions shall be within 1/32 of an inch.

D. Shop fit and assemble to the greatest extent possible.

E. Back or kerf cut all trim greater than 2 inch in width, except terminate before exposed ends.

F. Fabricate trim from solid lumber.

2.4 CASEWORK FABRICATION

A. General Fabrication Requirements:
   1. Fabricate to the configurations indicated, unless approved otherwise on the shop drawings.
   2. Provide openings in casework for the incorporation of all electrical and mechanical components. Openings for all plumbing equipment shall be cut from templates obtained from the plumbing equipment installer.
   3. Provide concealed access to casework electrical fixtures and wiring.
   4. Unless indicated or approved otherwise, provide adjustable base to provide level installation which accommodates variations in floor levelness.
   5. Shop assemble casework to the greatest practical extent
   6. Adjustable Shelves: All casework shelves shall be adjustable, unless otherwise noted. Provisions for shelf adjustment shall be by drillings at 2 inches on center in the cabinet body for the placement of shelf support brackets. Provide 4 supports for each shelf. Drillings shall be in straight even lines.
   7. Provide all hardware, fasteners, and exposed trim.
   8. Provide openings with wiring grommets at locations indicated. When not indicated, provide openings with wiring grommets along countertops with knee spaces underneath. Space at 36 inches maximum, with a minimum of one opening per knee space.
   9. Provide counter supports 36” o.c. at work counters.

B. Plastic Laminate Casework Construction:
   1. Fabricate casework in accordance with AWI standard section 400; custom grade.
   2. Design: AWI Flush Overlay design, unless indicated otherwise. Joint between exposed doors, drawer faces, and countertop edges shall be 1/8 inch plus or minus 1/16.
   3. Exposed Surfaces: Plastic laminate clad with 3mm PVC edging; provide hardwood trim at locations indicated.
   4. "Inside" Exposed Surfaces of Shelving Units and Cabinets without Doors: Plastic laminate finished board, with exposed edges banded with plastic laminate self edging or PVC tape to match face color.
   5. Semi-Exposed Surfaces: Prefinished board, unless indicated otherwise.
   6. Provide vertical grade plastic laminate, except use general purpose grade at countertops.
   7. Backs of Doors and Drawers: Prefinished board.
   8. Particle board shall be minimum 3/4" thick unless indicated otherwise. Shelves shall be 1" thick, minimum.

C. Transparent Finish Wood Casework Construction:
   1. Fabricate transparent finish wood casework in accordance with AWI standard section 400; "Premium" grade.
   2. Fabricate wood casework with wood veneer over medium density particle board. Provide solid wood edging at veneer panels.
   3. Veneers shall be as follows:
      a. Random match veneers.
      b. Provide no veneer end joints within each panel.
      c. Provide grain direction as indicated.
   4. Where veneers are indicated to be single piece or slip matched leaves for each panel, adjoining panels shall be end matched and/or slip matched as appropriate.

D. Plastic Laminate Countertops:
   1. Fabricate countertops from particle board and general purpose grade plastic laminate in the shapes indicated.
   2. Where countertops are indicated with sinks, use exterior grade plywood in lieu of particle board.

E. Wall and Closet Shelf Fabrication:
   1. Fabricate from plastic laminate finished particle board; edge banded with matching plastic laminate edging unless indicated otherwise.
   2. Provide minimum 3/4 inch thick shelves up to 30” wide, except provide thicker shelves as required to support the loads and spans indicated without significant deflection.

F. Hardware:
   1. Unless otherwise shown or specified, all drawers shall be equipped with standard full extension slides.
   2. Install hardware straight and true and in perfect alignment horizontally and vertically with adjacent casework and hardware.
   3. Carefully fit and securely attach cabinet hardware in accordance with manufacturers' printed instructions, and exercise caution not to mar or injure finish surfaces.

2.5 SOLID SURFACING

A. Fabricate solid surfacing countertops and other elements to detail in accordance with the manufacturer's recommendations. Include back and side splashes.

B. Seal joints with Dupont SCS 1752 silicone sealant.

2.6 SHOP FINISHING

A. Shop finish all architectural woodwork wood surfaces.

B. Sand all exposed and semi-exposed wood surfaces smooth, always sanding in the direction of the wood grain where applicable.

C. Sand all exposed transparent finish wood surfaces to AWI "Premium " grade standards. Sand all semi-exposed transparent or opaque finish wood surfaces to AWI "Custom" grade standards.

D. Fill all depressions and imperfections with color matched putty, except imperfections shall not exceed AWI Premium grade standards.

E. Transparent Finish Coating: Spray apply in accordance with AWI finishing system, Premium Grade Waterborne Conversion Varnish; satin sheen.

2.7 FIBERBOARD COMPONENT FABRICATION

A. Fabricate fiberboard components to the shapes indicated.

B. Adhesively bond all joints. Mechanically secure with set finishing nails or counter sunk screws.

C. Fill all depressions with sandable non-shrink putty, and sand smooth with adjacent surfaces. Sand all joints smooth to create a monolithic appearance for each element.

D. Sand all exposed painted surfaces to AWI "Custom" grade standards.

E. Fabricate elements in the shop to the greatest extent possible. Fabricate to allow for field installation of the elements with concealed fastening systems.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Prior to starting work, carefully inspect installed work of other trades and verify that such work is complete to the point where work of this Section may properly commence. Notify the Architect in writing of conditions detrimental to the proper and timely completion of the work.

B. Do not begin installation until all unsatisfactory conditions are resolved. Beginning work constitutes acceptance of site conditions and responsibility for defective installation caused by prior observable conditions.

3.2 PREPARATION

A. Coordinate the installation of blocking and other supports required for the installation of architectural woodwork elements.

3.3 STANDING AND RUNNING TRIM INSTALLATION

A. Jointing: Make all joints to conceal shrinkage; miter all exterior corners; cope all interior corners, miter or scarf all end-to-end joints; install all trim pieces as long as possible, jointing only where solid support is obtained. Make no joints closer than 4 feet to corners.

B. Lengths of Material: Use random lengths and show typical joint locations on shop drawings. The minimum length shall be 8 feet, except where short lengths are required by installation conditions.

C. Fastening:
   1. Install all items straight, true, level, plumb, and firmly anchored in place; where blocking or backing is required, coordinate as necessary with other trades to ensure placement of all required backing and blocking in a timely manner.
   2. Fasten trim with finish nails or screws of proper dimension to hold the member firmly in place without splitting the wood.
   3. On exposed finish work, set all nails and screws and putty.
   4. Align exposed fasteners for uniform pattern; random or "shotgun" patterns will not be accepted.

D. Select and arrange standing and running trim so that abutting members have a similar grain and color match to the greatest extent possible.

3.4 CASEWORK INSTALLATION

A. Coordinate casework installation with work of other trades for final electrical and mechanical connections.

B. Install all casework accurately, plumb, square, and level, and permanently secured in precise position as indicated on the Drawings. Casework shall be scribed to adjacent surfaces as follows:
   1. Countertops and splashes to wall surfaces.
   2. Cabinet endwalls and other exposed surfaces to walls.
   3. Cabinet bases to floors.

C. The casework installation shall be made complete with all required fastenings, clip angles, braces, anchors, adjustable levelers, and other fittings as required to render the work rigid and secure.

D. All fasteners securing casework shall be in concealed or semi-concealed locations, unless approved otherwise.

E. Avoid damaging finished surfaces. Repair or replace all damaged materials and surfaces in a manner approved by the Architect.

F. Upon completion of work, and in the Architect's presence, demonstrate hardware to work freely as intended.

3.5 FIBERBOARD COMPONENT INSTALLATION

A. Unless indicated otherwise, install all items straight, true, level, plumb; firmly anchor in position.

B. Install with concealed fasteners. Set all exposed fasteners, fill with sandable non-shrink filler, and sand smooth.

3.6 CLEANING UP

A. Keep the premises in a neat, safe, and orderly condition at all times during execution of this portion of the work, free from accumulation of sawdust, cut-ends, and debris.

B. At the end of each working day, or more often if necessary, thoroughly sweep and/or vacuum surfaces. Remove the refuse to the area of the job site set aside for its storage.

END OF SECTION

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes: Pre-applied and post-applied sheet membrane foundation waterproofing that forms an integral bond to poured concrete for the following applications:
   1. Vertical Applications: Membrane applied against face of foundation and elevator pit walls;

B. Related Sections
   1. 030013 - Concrete: Substrate; single sided forming systems.
   2. 312000 - Earth Moving: Soil preparation.

C. Drawings, the provisions of the Agreement, the General Conditions, and Division 1 specification sections apply to all work of this Section.

D. Substitutions shall be in accordance with Section 016000.

1.2 SYSTEM DESCRIPTION

A. Below Grade Waterproofing:
   1. Below grade waterproofing shall form a continuous barrier protecting the foundation from water penetration.
   2. Vertical waterproofing shall be applied continuously over smooth formed concrete.

1.3 REFERENCE STANDARDS

A. American Society for Testing and Materials (ASTM):
   1. C836 - Standard Specification for High Solids, Cold Liquid-Applied Elastomeric Waterproofing Membrane for Use with Separate Wearing Course
   2. D412 - Standard Test Methods for Rubber Properties in Tension
   3. D570 - Standard Test Method for Water Absorption of Plastics
   4. D903 - Standard Test Method for Peel or Stripping Strength of Adhesive Bonds
   5. D1434 - Standard Test Method for Determining Gas Permeability Characteristics of Plastic Film and Sheeting
   6. D1876 - Standard Test Method for Peel Release of Adhesives (T-Peel)
   7. D1970 - Standard Specification for Self-Adhering Polymer Modified Bituminous Sheet Materials Used as Steep Roofing Underlayment for Ice Dam Protection
   8. D3767 - Standard Practice for Rubber - Measurements of Dimensions
   9. D5385 - Standard Test Method for Hydrostatic Pressure Resistance of Waterproofing Membranes
   10. E96 - Standard Test Methods for Water Vapor Transmission of Materials
   11. E154 - Standard Test Methods for Water Vapor Retarders Used in Contact with Earth Under Concrete Slabs, on Walls, or as Ground Cover

1.4 SUBMITTALS

A. Make submittals under provisions of Section 013300.

B. Manufacturer's product data and installation instructions.

C. Shop Drawings: Submit as necessary to describe installation sequences and special conditions, including slab penetrations, joints, and sand cushion.

D. Warranty Draft: Prior to commencement of installation of waterproofing system, submit draft of manufacturer's warranty for Architect's review of terms.

1.5 QUALITY ASSURANCE

A. Installer: A firm which has at least 3 years experience in work of the type required by this section.

B. Materials: For each type of material required for the work of this section, provide primary materials which are the products of one manufacturer.

C. 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 this work with related and adjacent work. Agenda for meeting shall include review of special details and flashing.

D. Schedule Coordination: Schedule work such that membrane will not be left exposed to weather for longer than that recommended by the manufacturer.

1.6 DELIVERY, STORAGE AND HANDLING

A. Deliver materials in labeled packages. Store and handle in strict compliance with manufacturer's instructions. Protect from damage from weather, excessive temperature and construction operations. Remove and dispose of damaged material in accordance with applicable regulations.

1.7 PROJECT CONDITIONS

A. Perform work only when existing and forecasted weather conditions are within the limits established by the manufacturer of the materials used. Proceed with installation only when the substrate construction and preparation work is complete and in condition to receive sheet membrane waterproofing.

1.8 WARRANTY

A. Sheet Membrane Waterproofing: Provide written five year material warranty issued by the membrane manufacturer upon completion of work.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Composite HDPE/Bentonite Membrane: Composite membrane consisting of a 20-mil- thick, HDPE geomembrane liner bonded to up to 1.0 lb/sq. ft. layer of bentonite clay granules, with a spun polypropylene facing.
   1. Basis of Design Product: Tremco, Inc., Paraseal LG.
   2. Puncture Resistance, ASTM E 154: Not less than 155 lbf (689 N).
   3. Tensile Strength, ASTM D 412: Not less than 4,000 psi (28 MPa).
   4. Elongation, ASTM D 412: Not less than 500 percent.
   5. Vapor Permeance, ASTM E 96: Not greater than 0.03 perms.
   6. Resistance to Hydrostatic Head, ASTM D 5385: 230 feet (70 m).
   7. Color: Gray/black.

B. Accessory Materials
   1. Granular Bentonite: Sodium bentonite clay containing a minimum of 90 percent montmorillonite (hydrated aluminum silicate), with a minimum of 90 percent passing a No. 20 sieve.
      a. Basis of Design Product–Tremco, Inc., Paragranular
   2. Bentonite Mastic: Trowelable consistency, bentonite compound, specifically formulated for application at joints and penetrations.
      a. Basis of Design Product – Tremco, Inc., Paramastic
   3. Termination Bar: Extruded-aluminum or formed-stainless-steel bars with upper flange to receive sealant.
      a. Basis of Design Product – Tremco, Inc., Paraseal Paraterm Bar
   4. Plastic Protection Sheet: Polyethylene sheeting complying with ASTM D 4397; thickness recommended by waterproofing manufacturer to suit application but at least 6 mils thick.
   5. Cement Grout Patching Material: Manufacturer's recommended grout mix compatible with substrate being patched.
   6. Tapes: Waterproofing manufacturer's recommended tape for joints between sheets, membranes, or panels. Use with recommended adhesive bonding primer.
   7. Reinforced Overlap Seam Tape: Reinforced, rubberized-asphaltic waterproofing seam tape 4-inch wide by 60 mils thick for sealing membrane overlaps.
      a. Basis of Design Product – Tremco, Inc., Permanent Seam Tape

8. Non-Reinforced Overlap Tape: Non-reinforced, adhesive tape of partially cross-linked polymeric elastomers 2 by 1/8 inch (50 by 3.2 mm) for molding form-fit seals around contours and for taping seams within overlaps.
    a. Basis of Design Product – Tremco, Inc., Para JT
9. Bentonite Laminate Tape: Laminate of bentonite sandwiched between a netting and non-woven fabric for wrapping through-concrete imbeds and other detailing.
    a. Basis of Design Product – Tremco, Inc., Parastick ‘n’ Dry
10. Waterstops: Flexible, reinforced, bentonite-laminate of bentonite sandwiches between a netting and non-woven fabric for wrapping through-concrete imbeds and other detailing.
    a. Basis of Design Product – Tremco, Inc., Superstop
11. Joint Sealants: Termination Seals:
12. Single component, high performance, medium-modulus, low-VOC, UV-stable, non-sag polyurethane sealant.
    a. Basis of Design Product: Tremco Inc.; Dymonic 100.

C. Drainage Panel: Manufactured composite subsurface drainage panels consisting of a nonwoven, needle-punched polypropylene facing laminated to one side of a studded, non-biodegradable, polystyrene drainage core.
    1. Basis of Design: Tremco, TREMDrain TotalDrain or approved.

PART 3 - EXECUTION

3.1 EXECUTION

A. The installer shall examine conditions of substrates and other conditions under which this work is to be performed and notify the Contractor, in writing, of circumstances detrimental to the proper completion of the work. Do not proceed with work until unsatisfactory conditions are corrected.

3.2 INSTALLATION, GENERAL

A. Install waterproofing and accessories according to manufacturer's written instructions. Protect bentonite material from wetting prior to permanent placement.

B. Install a continuous layer of waterproofing membrane with ends and edges lapped a minimum of 4 inches. Stagger end joints, seal laps and treat fastener penetrations in accordance with manufacturer’s written instructions.

C. Apply granular bentonite around penetrations in horizontal surfaces and changes in plane according to manufacturer's details.

D. Apply bentonite mastic at changes of plane, construction joints in substrate, projections, and penetrations.

E. Protect waterproofing from damage and wetting during construction. Repair punctures, tears, and cuts.

3.3 INSTALLATION, VERTICAL APPLICATIONS

A. Substrates shall be smooth and sound.

B. Strictly comply with installation instructions in manufacturer’s published literature, including but not limited to, the following:
    1. Apply membrane with the HDPE film facing the soil. Remove the release liner and fasten membrane along uncoated edge to substrate with large head nails or as otherwise recommended by manufacturer.
    2. Apply succeeding sheets by overlapping the previous sheet 3 inches along the uncoated edge of the membrane. Side laps shall be firmly rolled to ensure a tight seal.
    3. Overlap the ends of the membrane 3 inches. Apply lapping tape centered over the end lap and roll firmly to ensure a tight seal. Remove release liner.

3.4 PROTECTION

A. Protect membrane in accordance with manufacturer's recommendations until placement of concrete. Inspect for damage just prior to placement of concrete and make repairs in accordance with manufacturer's recommendations.

END OF SECTION

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:
   1. Thermal batt insulation.
   2. Rigid board perimeter insulation.

B. Related Sections:
   1. 098100 - Acoustic Insulation.
   2. 312000 - Earth Moving: Backfilling; coordination with installation of rigid board perimeter insulation at building foundation.

C. Drawings, the provisions of the Agreement, the General Conditions, and Division 1 specification sections apply to all work of this Section.

D. Substitutions: Substitute products will be considered only under the terms and conditions of Section 016000.

1.2 REFERENCES

A. American Society for Testing and Materials (ASTM):
   1. C518 - Test Method for Steady-State Heat Flux Measurements and Thermal Transmission Properties by means of the Heat Flow Meter Apparatus.
   2. C578 - Rigid, Cellular Polystyrene Thermal Insulation.
   3. C612 - Specification for Mineral Fiber Block and Board Thermal Insulation.
   4. C665 - Mineral Fiber Blanket Thermal Insulation for Light Frame Construction and Manufactured Housing.
   5. D1621 - Test Method for Compressive Properties of Rigid Cellular Plastics.
   6. E84 - Test Method for Surface Burning Characteristics of Building Materials.

1.3 SUBMITTALS

A. Make submittals under provisions of Section 013300.

B. Product Data: Submit manufacturer's product data and installation instructions for each type of insulation.

1.4 QUALITY ASSURANCE

A. Code Verification: Prior to installation of fire safing systems obtain approval from the jurisdictional Code authorities for the systems and applications proposed.

B. All interior primers, adhesives, coatings and sealants shall comply with the most recent version of Rule 1168 of the South Coast Air Quality Management District.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Unfaced Batt and Blanket Insulation: ASTM C665, Type I; preformed unfaced glass fiber roll; flame spread of 25 or less and smoke developed of 50 or less when tested in accordance with ASTM E84; formaldehyde free; Owens Corning “Eco-Touch Pink;” Johns Manville Corp. "Thermal-SHIELD Unfaced Fiber Glass Commercial Insulation;” or approved.

B. Thermal Batt Insulation (Faced):
   1. Standard: ASTM C665, Type III, Class A; preformed glass fiber roll with foil scrim kraft face.
   2. Flame Spread: 25 or less when tested in accordance with ASTM E84.
   3. Smoke Development: 50 or less when tested in accordance with ASTM E84.
   4. Approved Products:
      a. Flame-Resistant Foil Insulation (FSK-25) by CertainTeed Corporation, Valley Forge, PA.
      b. Thermal-Shield FSK Flame Resistant Insulation by Johns Manville, Denver, CO.

c. Flame Spread 25 Insulation by Owens-Corning, Toledo, OH.

C. Rigid Extruded Polystyrene Board:
1. Standard: ASTM C578, Type IV; extruded cellular polystyrene.
2. Thermal Resistance: Minimum "R" per inch of 5 when tested in accordance with ASTM C518 at 75 degrees F. mean temperature.
3. Compressive Strength: Minimum 25 psi when tested in accordance with ASTM D1621.
4. Water Absorption: 0.10 to 0.15 percent when tested in accordance with ASTM C272.
5. Thickness/R-value: 1 inch, R-5.
6. Size: 24 inch width, 96 inch length, with square edges.
7. Approved Products:
a. Styrofoam by The Dow Chemical Company (Midland, MI; 800-441-4369)
b. Foamular 250 by Owens Corning, (Toledo, OH; 800-438-7465).]

2.2 ACCESSORIES

A. Impaling Pins: 12 gage pins; length as required with mounting plates for adhesive mounting; include retainer shields.

B. Separate Vapor Barrier for Unfaced Batt Insulation: Foil scrim kraft FSK 25; flame spread of 25 or less and a smoke developed of 50 or less when tested in accordance with ASTM E84.

C. Related Accessories: Provide other accessories, not specifically described, as required for a complete installation.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Verify adjacent materials are secure, properly spaced, dry, and ready to receive installation.

B. Verify mechanical and electrical services within spaces to insulated have been installed and tested.

C. Prior to starting work, carefully inspect installed work of other trades and verify that such work is complete to the point where work of this Section may properly commence. Notify the Architect in writing of conditions detrimental to the proper and timely completion of the work.

D. Do not begin installation until all unsatisfactory conditions are resolved. Beginning work constitutes acceptance of site conditions and responsibility for defective installation caused by prior observable conditions.

3.2 INSTALLATION - BATT INSULATION

A. At Contractor’s option, install pre-faced batt insulation OR unfaced batt insulation with separate vapor barrier.

B. Install batt insulation in accordance with manufacturer's instructions.Install insulation without gaps or voids.

D. Trim insulation neatly to fit spaces. Use batts free of damage.

E. Seams and Edges:
1. Tape seal all vapor barrier seams in pre-faced insulation.
2. Tape seal vapor barrier to adjacent construction at perimeter edges.
3. Tape and seal tears or cuts in vapor barrier.

F. Mechanical Fastening:
1. At locations where no support framing is present, provide metal impaling pins and retainers.
2. Mechanically or adhesively bond the retaining pins to the substrate in accordance with the manufacturer's recommendations.
3. Space pins at maximum 24 inches on center along the edges and within the field of the batt. Place edge pins within 6 inches from the edge of the batt.

G. Pack batt insulation in shim spaces at perimeter of window assembly to maintain continuity of thermal barrier.

B. Separate Vapor Barrier Installation:
   1. Install separate vapor barrier over unfaced insulation.
   2. Install vapor barrier toward warm side of building spaces.
   3. Vapor barrier shall be continuous. Lap joints in vapor barrier 2 inches, except provide tape sealed joints at locations where vapor barrier will remain exposed in the finished work.
   4. Tape seal vapor barrier to adjacent construction at perimeter edges.
   5. Tape and seal tears or cuts in vapor barrier.

H. R value Schedule:
   1. Provide batt insulation in sufficient thickness to provide the minimum R-values indicated on the drawings.

3.3 INSTALLATION - RIGID BOARD PERIMETER INSULATION

A. Use rigid extruded polystyrene insulation. Coordinate with Section 312000 for installation of rigid perimeter insulation.

B. Install perimeter insulation vertically and horizontally with tight butt joints at locations detailed.

C. Minimum vertical height: As detailed.

D. Minimum horizontal width: 24 inches.

END OF SECTION

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:
   1. Air barrier and weather barrier systems.
   2. Filler and membrane systems required to seal joints and penetrations to form a continuous air barrier assembly.
   3. Flexible flashing.
   4. Drainage material.
   5. Related air barrier accessories and components.

B. Related Sections:
   1. 061000 - Rough Carpentry: Sheathing substrate.
   2. 061643 - Gypsum Sheathing: Solid sheathing substrate.
   3. 076200 - Sheet Metal Flashing and Trim: Flexible flashing provided with separate sheet metal flashing systems.

C. Drawings, the provisions of the Agreement, the General Conditions, and Division 1 specification sections apply to all work of this Section.

D. Substitutions: Substitute products will be considered only under the terms and conditions of Section 016000.

1.2 DEFINITIONS

A. Air Barrier: An air barrier is an assembly of interconnected components within the exterior envelope of a building which prevents air flow across the assembly, and which is intended to prevent excess moisture transfer across the assembly driven by air pressure differentials.

1.3 SYSTEM DESCRIPTION

A. All voids within air barrier systems shall be closed to prevent air flow across the assembly.

B. The following elements provided under the work of other Sections shall be considered integral parts of the air barrier assembly:
   1. Concrete foundation.
   2. Roof membrane. Plumbing vents and roof drains shall not be considered penetrations.
   3. Exterior windows and doors.

C. For the work of this Section, air barrier systems shall consist of the following:
   1. Air/moisture barrier system as specified herein.
   2. Connective seal from foundation wall to the building paper base layer.
   3. Connective seal of air/moisture barrier system to roof membrane.
   4. Sealing of penetrations in the building exterior building air barrier envelope, including windows. doors, plumbing elements, electrical elements, and mechanical components, including duct penetrations at rooftop mechanical unit.

1.4 SUBMITTALS

A. Make submittals in accordance with Section 013300.

B. Product Data: Catalog cuts and installation instructions for specified manufactured products.

1.5 QUALITY ASSURANCE

A. Applicator: Work of this section shall be performed by a single applicator, unless specifically approved otherwise by the Architect.

B. Pre-Installation Conference:
   1. Administer pre-installation conference in accordance with Section 013119.
   2. Schedule meeting prior to installation of air barrier components.
   3. Discuss air barrier components and sequence of installation.
   4. Discuss all joints and penetrations and proposed methods for sealing.

5. Identify and discuss all special conditions.
6. Require the attendance of the local manufacturer's representative.

1.6 DELIVERY, STORAGE, AND HANDLING

A. In accordance with Section 016000.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Air/Moisture Barrier System: Vaproshield, LLC (Gig Harbor, WA; 866-731-7663);
   1. Weather Resistive Barrier at Exterior Wall Assemblies: "Wrapshield SA".
   2. Weather Resistive Barrier at Ceiling/Roof Assemblies: "WrapShield IT"
   3. Flashing:
      a. Liquid Flashing: "VaproLiqui-Flash".
      b. Sheet Flashing: VaproFlashing
   4. Tape: VaproShield "VaproTape," single or double sided, as applicable.
   5. Adhesive: VaproShield "VaproAdhesive."
   6. Manufacturer and product are specified for construction, quality, performance and/or appearance. Provide specified product or approved equal. Alternate products shall meet or exceed the following requirements:

Construction	Triple layer spunbond polypropylene
Water Vapor Transmission	308.9 grams/m2/24hrs (50 perms)
Air Permeability	0.0095 L/s/m2 or 0.0019 cmf/ft2

B. Flexible Seal: Ethylene Propylene Diene Terpolymer (EPDM) black membrane, reinforced or non-reinforced, nominal 0.045 inch thick; complete with manufacturer's recommended splicing materials.

C. Weather-Resistive Barrier Sealant: Single component silicone gun grade sealant; Vaproshield "VaproBond", or Dow "758".

D. Building Wrap Adhesive: Adhere building wrap to concrete and steel.
   1. Products acceptable to air barrier manufacturer.
   2. Westech Aerosol Corporation; WT-MP13 Multi-Purpose Clear Spray Adhesive.

E. Window Corners - Building Wrap Preformed Window and Door Corners: Preformed window and door flashing at rough opening corners
   1. Products acceptable to air barrier manufacturer
   2. VaproShield; Factory Formed Corners
   3. Fortifiber Building Systems Group; Moistop Corner Shield

F. W.R.B. Base of Wall Transition, Penetration Wraps and Flashing:
   1. Products acceptable to air barrier manufacturer
   2. VaproShield; VaproFlashing SA Self-Adhered
   3. SAM 5 - VaproShield; WrapShield SA Self-Adhered

G. SPF (Sprayed Polyurethane Foam) Sealant: As specified in Section 072119, as indicated on the Drawings, and as acceptable to air barrier manufacturer.

H. Sheet Metal Closures:
   1. Minimum 24 gage prefinished galvanized steel.
   2. Custom fabricated to fit the conditions.

I. Accessories: Provide surface conditioners, primers, mastic, tape, and other accessories as specified by or acceptable to the manufacturer of each product.

J. Fasteners: Copolymer coated galvanized steel, or stainless steel.

2.2 FLEXIBLE FLASHING

A. Butyl Rubber Flashing: Composite, self-adhesive, flashing product consisting of a pliable, butyl rubber compound, bonded to a high-density polyethylene film, or spunbonded polyolefin to produce an overall thickness of not less than 0.025 inch (0.6 mm).
   1. Products acceptable to air barrier manufacturer
   2. SAM 2 - VaproShield; 3” (or 4”) VaproTape
   3. SAM 4:
      a. EternaBond; EternaBond WebSeal
      b. SureFlash; Sure Flash Transition Tape

B. Rubberized-Asphalt Flashing: Composite, self-adhesive, flashing product consisting of a pliable, rubberized-asphalt compound, bonded to a high-density polyethylene film, or spunbonded polyolefin to produce an overall thickness of not less than 0.040 inch (1.0 mm).
   1. Products acceptable to air barrier manufacturer
   2. SAM 1 - Grace; Perm-a-Barrier
   3. SAM 5 - Henry; Blueskin TWF

C. S.A.M. High Temperature - Composite, self-adhesive, flashing product consisting of a pliable, butyl rubber compound, bonded to a polyethylene facer to produce an overall thickness of not less than 0.020 inch (0.5 mm).
   1. Products acceptable to air barrier manufacturer
   2. Butyl Rubber Flashing: SAM-HT - Grace; Grace Ultra Butyl

D. Primer for Flexible Flashing: Product recommended in writing by flexible flashing manufacturer for substrate.

E. Nails and Staples: Product recommended in writing by flexible flashing manufacturer and complying with ASTM F 1667.

F. Quickflash Device - Flashing Panels: Used at electrical boxes and piping penetration.
   1. Products acceptable to air barrier manufacturer
   2. Quickflash Weatherproofing Products

2.3 RAIN SCREEN ACCESSORIES

A. Furring - Drainage Material: Product shall maintain a continuous open space between water-resistive barrier and exterior cladding to create a drainage plane and shall be used under siding.
   1. Products acceptable to air barrier manufacturer
   2. Metal Hat Channel
   3. Pressure Treated 1x4

2.4 CONDUIT

A. Conduit: Flexible steel reinforced PVC coated for electrical wire
   1. Products acceptable to air barrier manufacturer
   2. Delikon; YF-707

2.5 SILL PANS

A. Metal L-angle:
   1. 5/8” min. upstand extending ½” min. above bottom edge of window. 1”x1”x1/8” anodized aluminum L-angle.

B. Liquid Applied Sill Pan
   1. Liquid Applied Flashing Products acceptable to air barrier manufacturer
   2. VaproShield; VaproLiqui-Flash

C. Sill Pan Accessories:
   1. Shims per Envelope Consultant:
   2. Atlas Supply; Plastic horseshoe shims
   3. Grove Products; Grove Structural Shims

PART 3 - EXECUTION

3.1 EXAMINATION

A. Prior to starting work, carefully inspect installed work of other trades and verify that such work is complete to the point where work of this Section may properly commence. Notify the Architect in writing of conditions detrimental to the proper and timely completion of the work.

B. Do not begin installation until all unsatisfactory conditions are resolved. Beginning work constitutes acceptance of site conditions and responsibility for defective installation caused by prior observable conditions.

3.2 INSTALLATION

A. Coordinate work with other trades as necessary to form a continuous weather-resistive barrier envelope for the building.

B. Air Barrier Installation – Wall Assemblies:
   1. Apply single layer of weather-resistive barrier over solid exterior substrates in accordance with the manufacturer's recommendations.
   2. Tape seal all joints and penetrations with manufacturer's recommended tape.
   3. Coordinate installation of windows, metal head and subsilll flashings lapped into flexible flashings, and other wall penetrations with the installation of flexible flashing and weather-resistive barrier.
   4. Secure with staples as recommended by manufacturer.
   5. Sequence with installation of flexible flashing and metal flashing elements as shown and as necessary to form a continuous air and moisture barrier.

C. Air Barrier Installation – Ceiling/Roof Assemblies:
   1. Mechanically attach air barrier sheets horizontally to underside of wood furring attached to underside of roof joists.
   2. Complete detail work at all openings, building transitions and penetrations prior to field applications allowing for laps with release film temporarily left in place as needed.
   3. Install mechanically attached air barrier sheet complete and continuous to furring in a sequential manner, with minimal 6 inches overlaps.
   4. Stagger all end lap seams a minimum of 12 inches (30.48 cm) and seal the overlaps with flashing tape.

D. Flexible Flashing:
   1. Install flexible flashing as indicated and as specified below.
   2. Trim flexible flashing so that it will not be exposed in the finished work.
   3. Coordinate installation of flexible flashing with installation of weather-resistive barrier and sheet metal flashing elements.
   4. Install in accordance with the manufacturer's recommendations for each condition.
   5. Provide flexible flashing as indicated and in the following locations to seal joints and penetrations between weather-resistive barrier base layer and the following:
      a. Concrete foundation walls.
      b. Roof membrane.
      c. Pipe, conduit, and electrical box penetrations.
      d. Window and door frames.
   6. Provide flexible flashing at parapet tops as necessary to link to the weather-resistive sheet membrane layers on both sides of the parapet walls.
   7. Provide flexible flashing to seal the joint between sheet metal closure angles and weather-resistive barrier base layer.
   8. Provide materials separation where required and do not lap or place flexible flashing in direct contact with roofing membrane.

E. Foam Sealant:
   1. Seal holes in electrical boxes, including around wire openings.
   2. Seal penetrations which cannot be sealed with flexible flashing.
   3. Provide lightgage sheet metal angle edge trim at gypsum board edges to receive sealant.

F. Special Construction:
   1. Provide custom fabricated sheet metal enclosures around recessed light fixtures and similar elements which penetrate building weather-resistive barrier assemblies.
   2. Mechanical Curbs:
      a. Rigid insulation boards at equipment curbs are installed as a part of the roofing subcontract.
      b. Foam seal joints between rigid insulation boards. Cut boards as necessary to allow foam penetration between the boards.
      c. Foam seal joints between rigid insulation board and adjacent curb construction.
      d. After installation of rooftop mechanical unit and ducts, foam seal the joint between the rigid insulation boards and the ducts.

3.3 DRAINAGE MATERIAL INSTALLATION

A. Install drainage material over building wrap and flashing to comply with manufacturer's written instructions.

B. Attach building wrap weather barrier to wood or exterior sheathing with plastic capped nails every 12” to 18” on vertical stud line with wood stud framing.

C. Attach building wrap weather barrier to steel framing, insulated sheathing board or exterior gypsum with screws and washers every 12” to 18” on vertical stud line with stud framing.

END OF SECTION

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:
   1. Sheet metal siding, including related sheet metal flashing, and accessories directly related to the sheet metal siding system.

B. Related Sections:
   1. 061000 – Rough Carpentry: Wood framing and sheathing.
   2. 061643 - Gypsum Sheathing.
   3. 076100 - Sheet Metal Roofing.
   4. 076200 - Sheet Metal Flashing and Trim: Requirements for related sheet metal flashing and trim.

C. Drawings, the provisions of the Agreement, the General Conditions, and Division 1 specification sections apply to all work of this Section.

D. Substitutions: Substitutions will be considered only under the terms and conditions of Section 016000.

1.2 REFERENCES

A. American Society for Testing and Materials (ASTM):
   1. A653 - Steel Sheet, Zinc Coated, (Galvanized), or Zinc-Iron Alloy Coated by the Hot Dip Process.
   2. C518 - Test Method for Steady-State Thermal Transmission Properties by means of the Heat Flow meter.
   3. D1621 - Test Method for Compressive Properties of Rigid Cellular Plastics.
   4. D2842 - Test Method for Water Absorption of Rigid Cellular Plastics.

B. Sheet Metal and Air Conditioning Contractors National Association (SMACNA): Architectural Sheet Metal Manual, Fifth Edition 1993.

1.3 SYSTEM DESCRIPTION

A. System shall be designed and installed to preclude uncontrolled passage of water through the sheet metal siding assembly.

1.4 PERFORMANCE CRITERIA

A. Wind Uplift: As required by ASCE 7 for wind loads as indicated on the Structural Drawings.
   1. Panel system shall be ASTM E1592 tested under the supervision of an ANSI or ISO/IEC accredited laboratory and the laboratory shall issue the test report. Test data based on ASTM E330 is not acceptable.
   2. Deflection Limits: Withstand wind loads with deflections no greater than 1/180 of the span.

B. Air Infiltration: 0.01 cfm/lf, maximum at a static difference of 6.24 psf when tested with sidelap sealant per ASTM E283.

C. Water Penetration Under Static Pressure: No leakage at 20 psf when tested with sidelap sealant per ASTM E331.

D. Thermal Movements: Accommodate thermal movement without buckling, joint opening, failure of connections, or other detrimental effects, through the following temperature changes:
   1. 120 degrees F, ambient.
   2. 180 degrees F, surface.

1.5 SUBMITTALS

A. Make submittals in accordance with Section 013300.

B. Product Data: Submit for all materials and proprietary systems proposed for the work.

C. Shop Drawings:
   1. Indicate material profile, jointing pattern, jointing details, fastening methods, flashings, penetrations, and installation details.
   2. Include manufacturer's installation instructions for manufactured items incorporated in work.

D. Samples: Submit a minimum of 3 samples of each proposed siding type, with finish, color, and texture proposed for the work.

1.6 QUALITY ASSURANCE

A. Installer: Company specializing in sheet metal siding installation with minimum three years documented experience in installations of type and scope similar to that of this project.

1.7 DELIVERY, STORAGE, AND HANDLING

A. Store products in accordance with Section 016000.

B. Stack preformed and prefinished material to prevent twisting, bending, or abrasion, and to provide ventilation.

C. Protect stored materials from heat and direct sunlight.

D. Prevent contact with materials during storage which may cause discoloration or staining.

1.8 WARRANTY

A. Furnish warranties in accordance with Section 017700.

B. Prior to acceptance of work, furnish written two year warranty covering repairs required to maintain metal siding system and associated flashing in watertight condition. Warrant installed system against defects due to faulty materials and workmanship.

C. Furnish non-prorated 5 year warranty covering loss of film integrity, color change, and chalking. Finish on installed materials shall not show a color change greater than 5 NBS color units, per ASTM D2244, and shall not show chalking in excess of 8, per ASTM D659.

PART 2 - PRODUCTS

2.1 SHEET METAL SIDING SYSTEMS

A. Lower Walls: AEP Flex Series 1.2 FX40-12, 22 gage, “Leaf Green”.

B. Upper Walls: AEP Span Flush Panel, 22 gage, “Light Stone”

C. Soffit Panels: Match color and configuration of upper walls; provide vented panels at the upper and lower eaves of the shed roof.

D. Fascia Cladding: AEP Span Flush Panel, 22 gage, “Midnight Bronze”.

2.2 SHEET MATERIALS

A. Galvanized Steel: 24 gage core steel with ASTM A653 G90 galvanized coating; flat surface smooth (non-embossed) texture. Provide thicker gauge as necessary to meet wind load requirements indicated on the Structural Drawings at a maximum deflection of L/120.

B. Finish: Minimum 70 percent resin Kynar 500 or Hylar 5000 fluoropolymer system; standard color as selected by the Architect.

C. Protective Backing Paint: Manufacturer's standard wash coat finish.

2.3 ACCESSORY MATERIALS

A. Fasteners:
   1. Concealed Clip System: Panel clip with pre-drilled holes attachment holes at one end and panel hook at other end, sized to fit panels.
      a. Product: AEP Span; Flex Series Flush Mount Clip.
         1) Material: 18 gauge (.0438 Min.), 40ksi yield min., G90 galvanized, material in conformance with ASTM A-653 Class G90.
         2) Panel clips to be of proper design to resist uplift forces and reduce permanent deflection of panel assembly under design loads.
   2. Direct Fastener Applications: In compliance with manufacturer's instructions for conditions.
   3. Exposed Applications: Galvanized steel with soft neoprene washers, factory prefinished to match metal siding color.

B. Sealant: As recommended by the siding manufacturer for the application.

C. Air Barrier System: As specified in Section 072700

D. Touch-up Paint: Manufacturer's special color-matched material, formulated for retouching fluoropolymer finishes.

2.4 FABRICATION

A. Cut and form in accordance with approved shop drawings, using recognized sheet metal practices. Perform cutting with clean, sharp properly aligned shearing tools; do not saw or file edges of sheets.

B. Form pieces in longest practical lengths.

C. Fabricate flashing and sheet metal in accordance with the requirements specified in Section 076200.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Prior to starting work, carefully examine installed work of other trades and verify that such work is complete to the point where work of this section may properly commence, Notify the Architect in writing of conditions detrimental to the proper and timely completion of the work.

B. Do not begin installation until all unsatisfactory conditions are resolved. Beginning work constitutes acceptance of site conditions and responsibility for defective installation caused by prior observable conditions.

C. Verify that install of air barrier system is complete and in conformance with Section 072700.

D. Verify that substrate is clean, dry, and smooth, free of depressions, waves, and projections. Verify that items required to penetrate panel system are solidly set.

3.2 SHEET METAL SIDING INSTALLATION

A. Install metal siding as indicated and in accordance with manufacturer's instructions.

B. Install flashing and sheet metal elements as single continuous lengths to the greatest extent possible. Install in accordance with the requirements specified in Section 076200.

C. Install each siding panel as a single continuous piece. Install systems to allow for expansion of the panels.

D. Install Flex Series panels with concealed clip system, Install all panels system with concealed fasteners unless otherwise allowed by the Architect.

E. Except as otherwise indicated, seal all lapped joints. Prevent squeeze-out of sealants. Immediately remove all excess exposed materials.

F. Touch-up all scratched and damaged surfaces with matching material. Replace all components which cannot be touched up or otherwise repaired with new conforming materials.

END OF SECTION

SECTION 076100 - SHEET METAL ROOFING

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:
   1. Standing seam metal roofing, including sheet metal flashing, gutters and downspouts, and accessories directly related to the metal roofing system.
   2. Underlayment at metal roof assembly.

B. Related Sections:
   1. 061000 - Rough Carpentry: Roof Sheathing.
   2. 074216 - Sheet Metal Siding
   3. 076200 - Sheet Metal Flashing and Trim: Flashing for built-up roofing; copings; materials specified under this Section.

C. Drawings, the provisions of the Agreement, the General Conditions, and Division 1 specification sections apply to all work of this Section.

D. Substitutions: Substitutions will be considered only under the terms and conditions of Section 016000.

1.2 REFERENCES

A. American Society for Testing and Materials (ASTM):
   1. A653 - Steel Sheet, Zinc Coated, (Galvanized), or Zinc-Iron Alloy Coated by the Hot Dip Process.
   2. D659 - Method for Evaluating Degree of Chalking of Exterior Paints.
   3. D2244 - Method for Instrumental Evaluation of Color Differences of Opaque Materials.

B. Sheet Metal and Air Conditioning Contractors National Association (SMACNA): Architectural Sheet Metal Manual.

1.3 PERFORMANCE CRITERIA

A. Wind Uplift: Class 90 per UL 580
   1. Panel system shall be ASTM E1592 tested under the supervision of an ANSI or ISO/IEC accredited laboratory and the laboratory shall issue the test report.
   2. Deflection Limits: Withstand wind loads with deflections no greater than 1/180 of the span.

B. Air Infiltration: Tested in accordance with ASTM E1680.
   1. 0.022 cfm per linear foot of joint at static test pressure differential of 12.00 psf.

C. Water Infiltration Under Static Pressure: Tested with sidelap sealant per ASTM E1646.
   1. No leakage through panel joints at 20.00 psf.

D. Water Penetration: No leakage through panel sideseams and endlaps after six hours when tested according to ASTM E2140 at a static water pressure head of 6.00 inches.

E. Thermal Movements: Accommodate thermal movement without buckling, joint opening, overstressing components, failure of connections, or other detrimental effects, through the following temperature changes:
   1. 120 degrees F, ambient.
   2. 180 degrees F, material surface.

1.4 SUBMITTALS

A. Make submittals in accordance with Section 013300.

B. Product Data: Submit for all materials and proprietary systems proposed for the work. Include published literature on UL wind uplift classification for roofing system, if available.

C. Shop Drawings:
   1. Indicate material profile, jointing pattern, jointing details, fastening methods, flashings, penetrations, and installation details.
   2. Include manufacturer's installation instructions for manufactured items incorporated in work.

D. Samples: Submit a minimum of 3 samples of roofing material, with finish and texture proposed for the work.

1.5 QUALITY ASSURANCE

A. Installer: Company specializing in sheet metal roofing installation with minimum three years documented experience in installations of type and scope similar to that of this project.

B. Pre-Installation Meeting: In accordance with Section 013119.
   1. Administer a pre-roofing meeting prior to starting the work of this Section.
   2. Require in attendance the following parties:
      a. Owner
      b. Architect
      c. General Contractor
      d. Roofing Installer
      e. Sheet Metal Installer
      f. Roofing manufacturer's representative
   3. Agenda: Review field conditions, procedures, details, anchorage methods including details of fixed and sliding connections, provisions for thermal movement, and sequence of construction. Discuss and determine responsibility for protection of the work during and after construction, and subsequent maintenance of the roofing system.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Store products in accordance with Section 016000.

B. Stack preformed and prefinished material to prevent twisting, bending, or abrasion, and to provide ventilation.

C. Protect stored materials from heat and direct sunlight.

D. Prevent contact with materials during storage which may cause discoloration or staining.

1.7 ENVIRONMENTAL REQUIREMENTS

A. Do not apply waterproofing during inclement weather or when air temperature is below 40 degrees F.

1.8 GUARANTEE/WARRANTY

A. Furnish in accordance with Section 017700.

B. Installer Guarantee: Furnish guarantee from the installer that metal roofing system will be watertight under all weather conditions, for a minimum period of 2 years from the date of Substantial Completion.

C. Manufacturer’s Warranty: Furnish manufacturer’s warranty against defects in materials.

D. Finish Warranty: Furnish non-prorated 25 year warranty covering loss of film integrity, color change, and chalking. Finish on installed materials shall not show a color change greater than 5 NBS color units, per ASTM D2244, and shall not show chalking in excess of 8, per ASTM D659.

PART 2 - PRODUCTS

2.1 SHEET METAL ROOFING SYSTEM

A. Manufacturer - AEP Span

B. Product: "Design Span hp".

C. Roofing System: System shall consist of cleat retained standing seam metal roofing pans; flat panel; seam height 1-3/4".
   1. Panel Width:
      a. Roofing: 16" nominal width.
      b. Window Shading Device: 12” nominal width.
   2. Provide factory notching for turn-under at the eave locations.

2.2 SHEET MATERIALS

A. Galvanized Steel: 24 gage core steel with ASTM A653 G90 galvanized coating; flat surface.

B. Finish: Minimum 70 percent resin Kynar 500 or Hylar 5000 fluoropolymer system, standard color as selected by the Architect.

C. Protective Backing Paint: Manufacturer's standard wash coat finish.

2.3 ACCESSORY MATERIALS

A. Fasteners:
   1. Exposed Applications: Galvanized steel with soft neoprene washers, factory prefinished to match roofing color.
   2. Nailers, Cleats, and Other Concealed Applications: Hot dip galvanized; sizes as recommended by the roofing materials manufacturer.

B. Underlayment: AEP Span “Underlayment HT” self-adhesive high-temperature resistant sheet.

C. Sealant: As recommended by the manufacturer of the roofing materials.

D. Touch-up Paint: Manufacturer's special color-matched material, formulated for retouching fluoropolymer finishes.

E. Snow Guards:
   1. Manufacturer: Sno-Gem, Inc. (McHenry IL; 888-766-4367).
   2. Snow Guard Device: "Sno-Gem."
   3. Material: Manufacturer's standard polycarbonate, color to match roofing material for each application.
   4. Adhesive: "Sure Bond" SB-190, clear silicone adhesive.

2.4 FABRICATION

A. Fabricate cleats and starter strips from minimum 20-gage galvanized steel sheet material, unless recommended otherwise by the metal roofing manufacturer.

B. Apply strippable film for protection during shipping, fabrication and installation].

C. Cut and form in accordance with approved shop drawings, using recognized sheet metal practices. Perform cutting with clean, sharp properly aligned shearing tools; do not saw or file edges of sheets.

D. Form pieces in longest practical lengths.

E. Fabricate flashing and sheet metal, including gutters, in accordance with the requirements specified in Section 076200.

2.5 EXAMINATION

A. Prior to starting work, carefully examine installed work of other trades and verify that such work is complete to the point where work of this section may properly commence, Notify the Architect in writing of conditions detrimental to the proper and timely completion of the work.

B. Do not begin installation until all unsatisfactory conditions are resolved. Beginning work constitutes acceptance of site conditions and responsibility for defective installation caused by prior observable conditions.

C. Verify that substrate is clean, dry, and smooth, free of depressions, waves, and projections. Verify that items required to penetrate roof are solidly set.

2.6 ROOFING INSTALLATION

A. Underlayment:
   1. Apply underlayment shingle fashion to form a continuous weather barrier.
   2. Remove protective backing in accordance with manufacturer’s instructions and apply to roof sheathing.
   3. Beginning at the eaves, apply underlayment from the low point to the high point of the roof, running the roll horizontally. The lap edge seams should be hand rolled to ensure maximum adhesion.
   4. Lap each layer a minimum of 6 inches; provide minimum 6 inch side laps.

B. Perform metal roofing work in accordance with roofing manufacturer's instructions.

C. Install starter strips, edge strips, flashing receivers, valley liners, and cleats before starting installation of roofing sheets; nail cleats at 12 inches on center, using two nails per cleat, or, where cleats are continuous, space nails two per foot.

D. Install each roofing pan as a single continuous piece. Install systems to allow for expansion of the panels.

E. Install ridge caps, valley pans, and other flashing and sheet metal as single continuous lengths to the greatest extent possible.

F. Conceal fasteners wherever possible.

G. Seal all joints, except for factory sealed standing seams; seal intersections of standing seams.

H. Snow Guards:
   1. Lay out distribution pattern prior to installation.
   2. Comply with manufacturer's recommendations for environmental requirements.
   3. Install to each roof, in regular pattern 12 inches above eave edge, two per panel, maximum 12 inches o.c.; diamond (diagonal) orientation.
   4. Spread adhesive evenly across base of snow guard with toothed spreading tool, ensuring there are no voids which would create air pockets. Comply with manufacturer's additional recommendations as appropriate for installation to embossed surfaces.
   5. Place snow guard in position and apply light even pressure perpendicular to roof surface. Tool squeeze-out and remove excess adhesive.
   6. Apply uniform bead of adhesive around snow guard perimeter.
   7. Protect and cure in accordance with manufacturer's recommendations.

I. Install cap flashings into receivers and secure with color matched neoprene gasketed screws at maximum 24" o.c.

J. Touch-up all scratched and damaged surfaces with matching material. Replace all components which cannot be touched up or otherwise repaired with new conforming materials.

END OF SECTION

SECTION 076200 - SHEET METAL FLASHING AND TRIM

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:
   1. Sheet metal flashing and trim.
   2. Requirements for flashing and sheet metal provided in other Sections.

B. Related Sections:
   1. 061000 - Rough Carpentry: Wood blocking, nailers, and grounds.
   2. 076100 - Sheet Metal Roofing: Requirements for flashing associated with metal roofing.
   3. 084113 - Aluminum-Framed Storefronts, Entrances and Windows: Flashing provided as part of the window and storefront system.

C. Drawings, the provisions of the Agreement, the General Conditions, and Division 1 specification sections apply to all work of this Section.

D. Substitutions: Substitute products will be considered only under the terms and conditions of Section 016000.

1.2 REFERENCES

A. American Society for Testing and Materials (ASTM)
   1. A167 - Stainless and Heat-Resisting Chromium-Nickel Steel Plate, Sheet, and Strip.
   2. A653 - Steel Sheet, Zinc Coated, (Galvanized), or Zinc-Iron Alloy Coated by the Hot Dip Process.
   3. B32 - Solder Metal
   4. B209 - Aluminum and Aluminum-Alloy Sheet and Plate.

B. Federal Specifications (FS): FS SS-C-153 - Cement, Bituminous, Plastic.

C. Sheet Metal and Air Conditioning Contractors National Association (SMACNA): Architectural Sheet Metal Manual, Sixth Edition 2003.

1.3 SYSTEM DESCRIPTION

A. Provide flashing and trim systems to prevent water leakage to the building interior.

B. Fastening systems shall allow for the thermal movement of the materials without buckling, loosening, and leakage.

1.4 SUBMITTALS

A. Make submittals in accordance with Section 013300.

B. Product Data: Catalog cuts and installation instructions for manufactured products.

C. Shop Drawings: Indicate materials, gages, profiles, jointing patterns, jointing details, fastening methods, and installation details.

D. Samples: Submit three samples representative of finish and color of prefinished flashing materials.

1.5 QUALITY ASSURANCE

A. Applicator: Company specializing in sheet metal flashing work with 5 years minimum experience.

B. Unless indicated or specified otherwise, perform work in accordance with the recommendations of SMACNA.

C. Pre-Installation Conference: Attend pre-installation conference as specified in Section 013119.

1.6 DELIVERY, STORAGE, AND HANDLING

A. In accordance with Section 016000.

B. Stack material to prevent twisting, bending, and abrasion, and to provide ventilation.

C. Prevent contact with materials during storage which may cause discoloration, staining, or damage.

1.7 GUARANTEE

A. Submit in accordance with Section 017700.

B. Furnish guarantee from the installer of each system that metal flashings will properly shed water to the roof or to the building exterior, under all weather conditions, for a minimum period of two years from the date of Substantial Completion. Leaks due to failure of flashing materials, and due to improper installation shall be promptly repaired at no expense to the Owner, and that watertightness of the repair will be demonstrated to the Owner.

C. For coil-coated sheet metal materials, furnish from the coatings installer non-prorated 20-year warranty against failure of film integrity, and against fade and chalking.

PART 2 - PRODUCTS

2.1 SHEET MATERIALS

A. Prefinished Galvanized Steel Sheet:
   1. ASTM A653 steel sheet with G90 galvanized coating or ASTM A792 steel sheet with AZ60 aluminum/zinc coating; 24 gage unless noted otherwise; factory prefinished with 70 percent resin Kynar 500 or Hylar 5000 coating, standard color as selected by the Architect .
   2. Manufacturers:
      a. AEP-Span, Dallas TX; (214-827-1740; 800-527-2503).
      b. Centria, Moon Township PA (800-759-7474).
      c. Copper Sales, Inc., Minneapolis, MN (612-545-1604; 800-426-7737).

B. Stainless Steel: ASTM A167; Type 302 or 304.

2.2 ACCESSORIES

A. Fasteners:
   1. Furnish bonded stainless steel / neoprene sealing washers for exposed applications.
   2. Finish exposed fasteners to match material being fastened.
   3. Material:
      a. Galvanized Steel Sheet: Use galvanized steel or stainless steel.
      b. Stainless Steel: Use stainless steel fasteners
   4. Use screws when fastening into wood or sheet metal.
   5. Use expansion anchors or drive pins when fastening into concrete or masonry.

B. Sealants:
   1. Bedding Sealant: Butyl Rubber Type - One of the Following:
      a. "Butyl Sealant" by Tremco, Inc. Sealant/Weatherproofing Division; Beachwood, OH; 800-321-7906; 216-292-5000)
      b. "BP-400" by Adco Global, Inc. (800-248-4010).
   2. Lap and Joint Sealant: Polyurethane Sealant - One of the Following:
      a. "Chem-Calk 900" by Bostik Construction Products (Huntington Valley, PA; 800-221-8726; 215-674-5600).
      b. "Dynatrol I" by Pecora Corp. (Harleysville, PA; 800-664-7903; 215-799-7528).
      c. "Sonolastic NP I" by Sonneborn/ChemRex (Shakopee, MN; 800-433-9517; 952-496-6000).

C. Solder: ASTM B32.

D. Cold Galvanizing Compound: ZRC Worldwide, "ZRC Cold Galvanizing Compound," or approved product meeting the requirements of FS DOD-P-21035.

E. Flexible Boot Pipe Flashing: Portals Plus (708/766-5240; 800/774-5240) "Alumi-Flash" with EPDM boots, or approved; sized to match pipe diameter; split type with sealing hardware where necessary for installation at penetrating items which cannot be disconnected for top access. Furnish stainless steel draw bands, adapters, connection hardware, and sealants as necessary for a complete and weather tight installation.

F. Flexible Flashing: "Grace Ultra," by W.R. Grace (800-354-5414), or approved.

G. Plastic Cement: FS SS-C-153, Type I-asphaltic base cement.

2.3 FABRICATION

A. General Requirements:
   1. Field measure site conditions prior to fabricating work.
   2. Form sections true to shape, accurate in size, square, and free from distortion or defects.
   3. Fabricate cleats and starter strips of same material as sheet; interlockable with sheet.
   4. Form pieces in longest practical lengths, except as limited by expansion joint requirements.
   5. Non-Moving Joints: Shop fabricate to the greatest practical extent.
      a. Solder all non-moving shop fabricated joints in steel and stainless steel flashing; [weld all non-moving joints in aluminum flashing and trim;]
      b. Prefinished Galvanized Steel: Lap joints 1 inch, minimum; accurately cut and fit as necessary to maintain profile; embed contact surfaces in sealant; rivet with stainless steel or color matched coated steel pop rivets at 3 to 4 inches o.c.
   6. Hem exposed edges on underside 1/2 inch; miter and seam corners.
   7. Shop fabricate corner sections with non-moving corner joints and 18 inch long legs.
   8. Fabricate vertical faces with bottom edge formed outward 1/4 inch and hemmed to form drip.
   9. Form seams lapped in the direction of water flow.

B. Fabricate all flashing to detail, in accordance with referenced SMACNA Architectural Sheet Metal Manual details, and as specified below. Use minimum 24 gage prefinished galvanized steel sheet unless indicated or specified otherwise.
   1. Coping Caps: Fabricate with slotted holes at 24 inches on center for fastening at the back; lap joints per Table 3-1.
   2. Gutters: Prefinished galvanized steel; SMACNA Figure 1-2, Style A or F; 4 inch width unless indicated otherwise; provide straps or ferrules at 36 inches on center per Fig 1-14; expansion joints at maximum 50 feet in accordance with Figure 1-5.
   3. Downspouts: Prefinished galvanized steel; SMACNA Figure 1-32; 3" x 4" rectangular (Figure 1-32B).
   4. Lead Drain Flashing: Dimension for minimum 12 inches between edge of drain and edge of flashing, all around; furnish in one continuous piece, including at drain/overflow locations. Furnish to roofer for installation in the roofing system at the drains.
   5. Pipe Penetrations: SMACNA plate Fig 4-15, B or C as applicable; provide two piece flashing at 4-15B. Provide flexible boot pipe flashing at the locations indicated. Furnish to roofer for installation in the roofing system.
   6. Drain Screens: Fabricate removable screens from 1/4 inch hardware cloth, formed and soldered into a ball shape with a smaller cylindrical base for insertion into the drain. Provide for all drainage outlets in gutters.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Prior to starting work, carefully inspect installed work of other trades and verify that such work is complete to the point where work of this Section may properly commence. Notify the Architect in writing of conditions detrimental to the proper and timely completion of the work.

B. Do not begin installation until all unsatisfactory conditions are resolved. Beginning work constitutes acceptance of site conditions and responsibility for defective installation caused by prior observable conditions.

3.2 INSTALLATION

A. Coordinate and sequence flashing installation with the work of other Sections. Furnish flashing to other trades as necessary for installation as a part of the work of other Sections.

B. Use flexible flashing in locations indicated, and under all copings and curb flashings.

C. Install starter and edge strips, and continuous cleats before starting installation.

D. Fastening:
   1. Secure flashings using continuous cleats whenever possible. Use exposed fasteners only at the backside of copings, and at other locations not exposed to public view, unless otherwise approved by the Architect.
   2. Fit flashings tight in place. Make corners square, surfaces true and straight in planes, and lines accurate to profiles.
   3. Insert counterflashings into receivers to form tight fit; where snap fit is not provided, secure in place with stainless steel sheet metal screws, 16" o.c., maximum. Stagger counterflashing joints with receiver joints
   4. Insert flashings into reglets to form tight fit; secure in place.

E. Make watertight connections between scuppers and adjacent roofs, walls, and flashings. Seal all laps.

F. Lap joints in longitudinally sloped copings in shingle fashion to shed water. Use longest practical lengths on coping runs.

G. Joints:
   1. Install metal flashings (including embedded flashings and reglets) with provision for plus or minus 1/16 inch thermal movement at each end; provide expansion joints at 12'-0" o.c., maximum.
   2. Seal concealed lap joints in with two parallel beads of butyl sealant; use butyl sealant where bedding sealant is indicated or required.

H. Install splashblocks under downspout outlets.

3.3 FIELD TESTING

A. Upon request of the Architect, demonstrate that installation is completely watertight by hosing with water as directed.

END OF SECTION

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes: Firestopping systems for sealing penetrations through fire-rated construction.

B. Related Sections:
   1. 014500 – Quality Control: Requirements for Owner paid inspections.
   2. 078500 - Fire Rated Joint Assemblies: Fire rated fillers at fire rated building joint assemblies
   3. Division 22 Mechanical: Penetrating elements.
   4. Division 23 Electrical: Penetrating elements.

C. Drawings, the provisions of the Agreement, the General Conditions, and Division 1 specification sections apply to all work of this Section.

1.2 REFERENCES

A. American Society for Testing and Materials (ASTM):
   1. E119 - Method for Fire Tests of Building Construction and Materials.
   2. E814 - Methods for Fire Tests of Through-Penetration Fire Stops.

B. Underwriters Laboratories (UL): 1479 - Fill, Void or Cavity Materials and Through-Penetration Firestop Systems.

1.3 SYSTEM DESCRIPTION

A. Each firestopping system shall be selected to maintain fire rating of the assembly in which it is used.

B. Firestopping systems shall be resilient as necessary to accommodate differential movement between assemblies.

C. Where firestopping is used to seal penetrations through floors with waterproof membranes, system shall be selected for compatibility with membrane material.

1.4 QUALITY ASSURANCE

A. Code Verification: Prior to installation of fire stopping systems obtain approval from the jurisdictional code authorities for the fire stopping systems and applications proposed.

B. Firestopping: Tested in accordance with ASTM E119, ASTM E814, or UL 1479 to meet the hourly fire ratings of the construction being sealed. Provide F rated assemblies, except where T rated assemblies are required by the code authority.

C. Firestopping systems shall be UL assemblies.

D. All interior primers, adhesives, coatings and sealants shall comply with the most recent version of Rule 1168 of the South Coast Air Quality Management District.

E. Subcontractor Qualifications: Firestopping work shall be performed by a single firestopping subcontractor, specializing in the installation of firestopping systems.

F. The firestopping systems shall be subject to Owner paid inspection.

G. Develop and maintain a system to quickly and easily identify each firestop assembly in the Project. The system shall include a graphic picture of each fire rated assembly being used. Make the system readily available to the Building Inspector, the Architect, [and the Owner paid inspector.

1.5 DELIVERY, STORAGE, AND HANDLING

A. In accordance with Section 016000.

1.6 ENVIRONMENTAL CONDITIONS

A. Environmental Requirements: Comply with manufacturer's recommendations.

B. Maintain maximum ventilation to remove volatile emissions produced during the installation process.

PART 2 - PRODUCTS

2.1 FIRESTOPPING SYSTEMS

A. Systems meeting the requirements specified and suitable for the conditions indicated.
   1. Metacaulk.
   2. Tremco Inc.
   3. Hilti USA.
   4. Grace Construction Products.
   5. Specified Technologies, Inc.
   6. 3M.

B. Electrical Box Inserts:
   1. Manufacturer: Rectorseal (Houston TX; 713-263-8001; 800-231-3345).
   2. Fire Rated Pads: "BioFireshield LECTRA-STOP"; 1/4 inch thick intumescent pads; sized to fit electrical boxes; classified by UL; minimum 2 hour rating.

C. Systems with sodium silicate shall not be used.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Prior to starting work, carefully inspect installed work of other trades and verify that such work is complete to the point where work of this Section may properly commence. Notify the Architect in writing of conditions detrimental to the proper and timely completion of the work.

B. Do not begin installation until all unsatisfactory conditions are resolved. Beginning work constitutes acceptance of site conditions and responsibility for defective installation caused by prior observable conditions.

3.2 INSTALLATION OF FIRESTOPPING

A. Provide firestopping at mechanical, electrical, and plumbing penetrations through fire rated floors, walls, and ceilings, and other locations as indicated on the Drawings.

B. Install firestopping in accordance with the manufacturer's recommendations and as necessary to meet the specified fire rating requirements.

C. Where firestopping is used to seal around penetrations through waterproof membranes, install to maintain integrity of waterproof barrier.

D. For sealing electrical boxes, coordinate installation with Division 16. Comply with manufacturer's recommendations for preparation and installation. Install in locations as required by Code for protection of openings through fire rated partitions.

3.3 CLEANING

A. Trim excess material flush with adjacent surface.

B. Remove spills, leave area in undamaged, clean condition.

END OF SECTION

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:
   1. Cleaning and preparation of joint surfaces.
   2. Sealant and backing materials.

B. Related Sections:
   1. 076200 - Sheet Metal Flashing and Trim: Sealants, furnished and installed as part of flashing and sheet metal work.
   2. 088000 - Glazing: Glazing sealants.
   3. 098100 - Acoustic Insulation: Acoustical sealant.

C. Drawings, the provisions of the Agreement, the General Conditions, and Division 1 specification sections apply to all work of this Section.

D. Substitutions: Substitute products will be considered only under the terms and conditions of Section 016000.

1.2 REFERENCES

A. American Society for Testing and Materials (ASTM):
   1. C1193 - Guide for Use of Joint Sealants.

1.3 SUBMITTALS

A. Make submittals in accordance with Section 013300.

B. Product Data: Submit for each sealant material used. Include manufacturer's surface preparation and installation instructions.

C. Samples:
   1. For custom colors, request color selection from the Architect prior to sample submittal.

1.4 QUALITY ASSURANCE

A. Installers: Use only skilled workmen specially trained in the techniques of sealing, and familiar with the published recommendations of the manufacturers of the sealants being used.

B. Verify that sealants are compatible with the substrates and accessory materials provided under other Sections. Send examples of adjacent materials to the Type S sealant manufacturer for compatibility testing. Notify Architect of evidence of incompatibility.

C. All interior primers, adhesives, coatings and sealants shall comply with the most recent version of Rule 1168 of the South Coast Air Quality Management District.

1.5 ENVIRONMENTAL CONDITIONS

A. Unless recommended otherwise by the manufacturer, install sealant systems as follows:
   1. Do not apply sealant when ambient temperatures are below 40 degrees F, or expected to fall below 40 degrees F before sealant cure is complete.
   2. Do not apply sealant to substrates or accessories that are moist.

1.6 GUARANTEE

A. Furnish guarantees in accordance with Section 017700.

B. Furnish a 2 year installer's guarantee covering defects in installation.

C. Furnish Type S sealant manufacturer's standard 5 year warranty.

PART 2 - PRODUCTS

2.1 SEALANTS

A. Type S1 - Silicone, single-component, nonsag, plus 25 percent and minus 25 percent movement capability, nontraffic-use, neutral-curing silicone joint sealant; ASTM C 920, Type S, Grade NS, Class 25, Use NT
   1. Dow Corning “758 Weather Barrier Sealant”

B. Type S2 - Neutral Cure Silicone Sealants:
   1. Dow Corning, 790 Silicone Building Sealant, or "795 Silicone Structural Glazing and Weatherproofing Sealant."
   2. Pecora "890 Architectural Silicone Sealant."
   3. Spectrem 3 by Tremco Incorporated.
   4. General Electric Co. "Ultrapruf II SCS-2900."

C. Type S3 – Silicone, single-component, nonsag, plus 50 percent and minus 50 percent movement capability, nontraffic-use, neutral-curing silicone joint sealant; ASTM C 920, Type S, Grade NS, Class 50, Use NT
   1. Dow Corning “795 Silicone Building Sealant”

D. Type AB - Air Barrier Sealant: Silicone, single-component, nonsag, plus 25 percent and minus 25 percent movement capability, nontraffic-use, neutral-curing silicone joint sealant; ASTM C 920, Type S, Grade NS, Class 25, Use NT
   1. Dow Corning; 758 Weather Barrier Sealant
   2. VaproShield; VaproBond Sealant

E. Type P: ASTM C920, Type M, grade NS, Class 25; Tremco "Dymeric," Chem-Calk 500, Pecora "Dynatrol II," Sonneborn "Sonalastic NP-II", PRC "Permapol RC-2," or approved.

F. Type PT - ASTM C920, Type M, Grade P, class 25; Tremco "THC 900", Sonneborn/ChemRex "Sonolastic SL 2", Sika Corporation; Sikaflex-2c SL; Pecora "Urexpan NR-200", or approved; standard colors as selected.

G. Type A: ASTM C834; Tremco "Acrylic Latex Caulk," Pecora "AC-20," Sonneborn/ChemRex "Sonolac," or approved; standard colors to match adjacent construction.

H. Type SM: Mildew Resistant Silicone Sealant: USDA approved; Dow Corning 786 by Dow Chemical, 898 Silicone” by Pecora (800-523-6688), Sonolastic Omniplus by Sonneborn/ChemRex, Sanitary 1702 Silicone Sealant by GE Silicones / General Electric Company, or approved; clear color.

2.2 COMPRESSIBLE FOAM TAPE

A. Precompressed self-adhesive open cell polyurethane foam tape; grey or black color; "Greyflex" by Emseal Joint Systems, Ltd., "Will-Seal" by Illbruck., or approved.

B. Precompressed prefaced self-adhesive open cell polyurethane foam tape; "Seismic Colorseal" by Emseal Joint Systems, Ltd., or approved.

C. Furnish tape in thickness recommended by the manufacturer for widths of joints to be filled.

2.3 ACCESSORY MATERIALS

A. Primer: Non-staining type, recommended by sealant manufacturer to suit application.

B. Joint Cleaner: Non-corrosive and non-staining type, recommended by sealant manufacturer; compatible with joint forming materials.

C. Backer Rod: Closed or open cell foam as recommended by the sealant manufacturer for the application; round profile; thickness approximately 130 percent of joint width.

D. Bond Breaker: Pressure sensitive tape recommended by sealant manufacturer to suit application.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Prior to starting work, carefully inspect installed work of other trades and verify that such work is complete to the point where work of this Section may properly commence. Notify the Architect in writing of conditions detrimental to the proper and timely completion of the work.

B. Do not begin installation until all unsatisfactory conditions are resolved. Beginning work constitutes acceptance of site conditions and responsibility for defective installation caused by prior observable conditions.

C. Verify joint dimensions and conditions are acceptable to receive the work of this Section.

3.2 PREPARATION

A. Clean and prepare joints in accordance with manufacturer's instructions. Remove any loose materials and other foreign matter which might impair adhesion of sealant.

B. Apply masking tightly around joints to protect adjacent surfaces from excess sealant.

C. Prime as required for proper bond to substrate materials.

D. Backing Materials:
   1. Place backer rod to achieve proper sealant width/depth ratios and to prevent sealant sag.
   2. Use bond breaker where there is insufficient depth to use joint filler.

3.3 COMPRESSIBLE FOAM TAPE INSTALLATION

A. Install in accordance with manufacturer's recommendations.

B. Install sufficiently deep to accommodate the installation of the Type P sealant.

3.4 INSTALLATION

A. Perform work in accordance with ASTM C1193, unless specified otherwise or recommended otherwise by the sealant manufacturer.

B. Apply sealant within recommended temperature ranges.

C. Joint Profile:
   1. Sealant beads shall have a sectional width to depth ratio of 2 to 1, unless specified otherwise or recommended otherwise by the sealant manufacturer.

D. Tooling:
   1. Tool joints concave, unless indicated or specified otherwise. Finish to uniform profile and depth, free of air pockets, embedded matter, ridges, and sags.

3.5 CLEANUP

A. Clean adjacent surfaces free of excess sealant as the work progresses. Use cleaning agents recommended by the sealant manufacturer.

B. Upon completion, remove and dispose of masking.

3.6 PROTECTION

A. Protect sealant in joints subject to dirt, moisture, and traffic during the sealant curing process. Protection shall be able to resist traffic while remaining securely in position.

3.7 SCHEDULE

A. Type S1: Provide at interior side of all windows and door openings in exterior walls as part of continuous weather barrier.

B. Type S2: Provide at all exterior window perimeter joints, unless specified otherwise; colors as selected from manufacturer's complete line for each type of sealant.

C. Type S3: Provide at all exterior and interior storefront assembly joints, unless specified otherwise; colors as selected from manufacturer's complete line for each type of sealant.

D. Type AB: Provide at exterior air barrier joints and air barrier material laps, unless specified otherwise.

E. Type P: Provide at all exterior joints associated with masonry and concrete, unless specified otherwise; custom colors to match the Architect's samples.

F. Type PT: Provide at all exterior and interior horizontal joints subject to traffic and abrasion, unless specified otherwise; standard colors as selected from manufacturer's complete line of pre-formulated colors.

G. Type A: Provide at all interior joints, unless specified otherwise.

H. Type SM: Provide at joints around countertops in wet areas.

END OF SECTION

SECTION 081113 – HOLLOW METAL DOORS AND FRAMES

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:
   1. Rolled steel doors and frames.
   2. Knock-down steel frames.
   3. Accessories.

B. Related Sections:
   1. 081400 - Wood Doors: Doors for metal frames.
   2. 083100 – Access Doors and Panels
   3. 087100 - Door Hardware.
   4. 087300 - Door and Hardware Installation: Installation of doors and related hardware.
   5. 088000 - Glazing: Glazing in doors and frames.
   6. 092200 - Lightgage Metal Support Framing: Bracing for frame installation.
   7. 099000 - Painting: Field painting of doors and frames.

C. Drawings, the provisions of the Agreement, the General Conditions, and Division 1 specification sections apply to work of this Section.

D. Substitutions: Substitute products will be considered only under the terms and conditions of Section 016000.

1.2 REFERENCES

A. American National Standards Institute (ANSI): A250.8 - SDI-100 Recommended Specifications for Standard Steel Doors and Frames.

B. American Society for Testing and Materials (ASTM)
   1. A366 - Specification for Steel, Carbon, Cold Rolled Sheet, Commercial Quality.
   2. A569 - Specification for Steel, Carbon (0.15 Maximum Percent), Hot Rolled Sheet and Strip, Commercial Quality.
   3. A653 - Specification for Steel Sheet, Zinc-coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by Hot-Dip Process.

C. International Building Code (IBC)

D. National Fire Protection Association (NFPA): NFPA 80 - Fire Doors and Windows.

E. Steel Door Institute (SDI): SDI-105 - Recommended Erection Instructions for Steel Frames.

1.3 SUBMITTALS

A. Make submittals in accordance with Section 013300.

B. Product Literature: Submit manufacturer's published literature for doors and frames.

C. Shop Drawings:
   1. Frames: Indicate configuration, anchor types and spacings, location of cutouts for hardware, reinforcement, and finish.
   2. Doors: Indicate elevations, internal reinforcement, closure method, and cutouts for hardware, glazing and louvers.

1.4 QUALITY ASSURANCE

A. Conform to requirements of ANSI A250.8.

B. Regulatory Requirements:
   1. Installed frame and door assembly shall conform to NFPA 80 for fire rated class indicated.

1.5 DELIVERY, STORAGE AND HANDLING

A. In accordance with Section 016000.

B. Protect doors and frames with factory installed protective packaging. Maintain protective packaging until installation commences.

PART 2 - PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS

A. Members of the Steel Door Institute and of the National Association of Architectural Metal Manufacturers, subject to compliance with the specified requirements.

2.2 MATERIALS

A. Steel Sheet: Cold rolled ASTM A366, or hot rolled pickled and oiled sheet conforming to ASTM A569.

2.3 DOORS

A. ANSI A250.8; Seamless.

B. Minimum 18 gage face sheets for interior doors; minimum 16 gage face sheets for exterior doors.

C. Core:
   1. Interior Doors: Vertical steel stiffeners with sound deadening fill between stiffeners, or resin impregnated kraft paper honey comb core.
   2. Exterior Doors: Polystyrene or polyurethane foam core.

D. Provide continuously welded seamless edges.

E. Close top edges of exterior doors flush with steel filler cap; seal joints watertight.

F. Cut mortises for butts using appropriate templates; universal non-handed preparation of doors is not acceptable.

2.4 WELDED FRAMES

A. Design: Double rabbet, unless indicated otherwise; fully welded. Fabricate frames with throat dimensions as indicated.

B. Gages:
   1. Exterior Frames: Minimum 14 gage.
   2. Interior Frames: Minimum 16 gage for frames of door openings up to and including 4 feet in width; 14 gage for frames greater than 4 feet in width.

2.5 ACCESSORIES

A. Glazing Stops: Rolled steel channel shape, butted corners; prepared for countersink style tamperproof screws.

2.6 FINISH

A. Exterior Units:
   1. A60 hot dip galvannealed coating conforming to ASTM A653.
   2. Include reinforcing and other internal components.
   3. Use zinc rich primer to touch-up galvanized coatings damaged during fabrication or handling.
   4. Shop prime galvanized surfaces with Sherwin Williams "DTM Wash Primer B71Y00001 "; self-crosslinking acrylic primer; color similar but not identical to finish coat. One coat in compliance with manufacturer's instructions for surface preparation and application.
   5. Shop finish primed surfaces with Sherwin Williams "Acrolon 218 HS Acrylic Polyurethane"; 2 coats in compliance with manufacturer's instructions

B. Interior Units: Manufacturer's standard rust inhibitive primer.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Prior to starting work, carefully inspect installed work of other trades and verify that such work is complete to the point where work of this Section may properly commence. Notify the Architect in writing of conditions detrimental to the proper and timely completion of the work.

B. Do not begin installation until unsatisfactory conditions are resolved. Beginning work constitutes acceptance of site conditions and responsibility for defective installation caused by prior observable conditions.

3.2 INSTALLATION OF FRAMES

A. Install frames in accordance with SDI-105 and in accordance with labeling requirements.

B. Coordinate with wall construction for anchor placement.

C. Coordinate installation of glass and glazing.

D. Install accessories.

E. Install roll formed steel reinforcement channels between two abutting frames. Anchor to structure and floor.

F. Installation Tolerances; Maximum Diagonal Distortion: 1/16 inch measured with straight edge, corner to corner.

G. Door and hardware installation is specified in Section 087300.

END OF SECTION

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:
   1. Wood doors.
   2. Door accessories.

B. Related Sections:
   1. 064000 - Architectural Woodwork: Wood door frames.
   2. 081113 - Hollow Metal Doors and Frames: Steel frames.
   3. 087100 - Door Hardware.
   4. 087300 - Door and Hardware Installation.
   5. 088000 - Glazing: Vision lites.
   6. 099000 - Painting: Finish coatings.

C. Drawings, the provisions of the Agreement, the General Conditions, and Division 1 specification sections apply to work of this Section.

D. Substitutions: Substitute products will be considered only under the terms and conditions of Section 016000.

1.2 REFERENCES

A. Architectural Woodwork Institute (AWI): Architectural Woodwork Quality Standards, Guide Specifications, and Quality Certification Program; current edition.

B. International Building Code (IBC)

C. NFPA 80 - Fire Doors and windows.

1.3 SUBMITTALS

A. In accordance with Section 013300.

B. Product Data: Submit manufacturer's product literature for each type of door.

C. Shop Drawings: Indicate door sizes and thickness, materials, stile and rail reinforcement, internal blocking for hardware attachment, cutouts for glazing and louvers, louver details and glazing stops.

D. Samples: Submit two 8 x 10 inch samples of each transparent finish species and finish combination proposed.

1.4 QUALITY ASSURANCE

A. Regulatory Requirements:
   1. Installed frame and door assembly shall conform to NFPA 80 for fire rated class indicated.

1.5 DELIVERY, STORAGE, AND PROTECTION

A. In accordance with Section 016000.

B. Package, deliver, and store doors in accordance with AWI requirements.

1.6 WARRANTY

A. Furnish manufacturer's standard warranty under provisions of Section 017700.

PART 2 - PRODUCTS

2.1 DOORS

A. Stile and Rail Type Doors:
   1. AWI Section 1400, Premium grade.
   2. Furnish veneered stiles and rails with solid stock wood molded profiles, unless approved otherwise; MDF, glued up lumber or laminated veneer core.

3. Face Veneer:
   a. For Transparent Finish: Yellow Birch (Betula alleghaniensis), AWI Select White "Grade AA", all sapwood; free of mineral stains; limited figure; plain sawn, veneer panels random matched.
   b. Paint Grade Veneer: Medium density overlay or paint grade birch.
4. Where indicated, provide flat panels; minimum 3/8 inch thickness.
5. Where indicated, provide factory preglazing with 1/2 inch insulating tempered glass units as specified in 088000.
6. At transparent finish doors, edges and panel and stile and rail moldings shall be solid stock wood to match face veneer; no finger joints will be permitted.
7. 1-3/4 inch thick, unless indicated otherwise.

B. Solid Core Flush Doors:
1. AWI Section 1300, PC-5 or PC-7 (5 or 7 ply construction; bonded core); Premium grade.
2. Core: Solid particleboard, unless required otherwise for fire labeling requirements.
3. Furnish labeled doors as required to meet the hourly fire rating indicated.
4. Face Veneer: As scheduled:
   a. For Transparent Finish: Yellow Birch (Betula alleghaniensis), AWI Select White "Grade AA", all sapwood; free of mineral stains; limited figure; plain sawn, veneer panels random matched
   b. Paint Grade Veneer: Medium density overlay or paint grade birch.
5. 1-3/4 inch thick, unless scheduled otherwise.
6. At transparent finish doors, edges shall be wood to match face veneer; no finger joints will be permitted except at paint grade doors.

2.2 ACCESSORIES

A. Glass Stops: Wood type, except as required to conform to labeling requirements; finished to match door finish.

2.3 FABRICATION

A. Fabricate doors to the configurations indicated, in accordance with the AWI standards specified.

B. Bevel lock and hinge edges 1/8 inch in 2 inches on single acting doors.

C. Bond edge banding to solid core with hot melt or RF cured adhesive.

D. Prefit and premachine doors in accordance with AWI 1300-S-6. Premachine for hardware specified in Section 087100, and locate as specified in Section 087300.

E. Doors shall be factory prefinished as scheduled to match Architect's sample, as follows:
1. Transparent Finish: AWI System TR-8 Premium Grade UV Cured Acrylated Polyurethane, TR-4 Premium Grade Conversion Varnish, or TR-7 Polyester.
2. Opaque Finish: AWI System OP-8 Premium Grade UV Cured Acrylated Polyurethane, OP-4 Premium Grade Conversion Varnish, or OP-7 Polyester.

F. Provide metal astragals to meet fire rating requirements for double fire doors. Finish to match door.

G. Factory pre-glaze doors.

H. Flush Door Blocking: For flush doors, provide solid lock blocks and special blocking as required for the hardware components specified elsewhere. Blocking for fire rated doors shall meet the door manufacturer's labeling requirements.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Install doors as specified in Section 087300.

3.2 INSTALLATION TOLERANCES

A. Maximum Diagonal Distortion: 1/16 inch measured with straight edge, corner to corner.

3.3 ADJUSTING AND CLEANING

A. Adjust for smooth and balanced door movement.

END OF SECTION

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:
   1. Non-rated access doors and frames and accessories.

B. Related Sections:
   1. 087100 – Door Hardware: Lockset and keying for access door.
   2. 092200 – Lightgage Metal Support Systems: Framing of openings for access doors.
   3. 092900 - Gypsum Board: Finishes for concealed access doors.
   4. 099000 - Painting: Field paint finish.

C. Drawings, the provisions of the Agreement, the General Conditions, and Division 1 specification sections apply to work of this Section.

D. Substitutions: Substitute products will be considered only under the terms and conditions of Section 016000.

1.2 SUBMITTALS

A. Make submittals in accordance with Section 013300.

B. Product Data. Include sizes, types, finishes, scheduled locations, and details of adjoining work.

1.3 QUALITY ASSURANCE

A. Where an access door is required in fire rated construction, the access door assembly shall be labeled by Underwriter's Laboratory, Warnock Hersey, or any other testing laboratory approved by the local code authorities, to meet the hourly fire resistance rating of the construction in which the access door is installed.

PART 2 - PRODUCTS

2.1 WALL AND CEILING ACCESS DOORS

A. Acceptable Manufacturers:
   1. Milcor LP. (Lima OH; 800-441-6899).
   2. The Williams Brothers Corporation of America (Front Royal, VA; 800-255-5515).
   3. Nystrom Products Co. (Minneapolis MN; 612-781-7850).
   4. Karp Associates, Inc. (Maspeth NY;718-784-2105).
   5. JL Industries (Bloomington, MN; 612-835-6850)

B. Door Types:
   1. Non Rated Concealed Drywall Access Door:
      a. Flush type design, with integral attachment flange and drywall bead for flush installation.
      b. Minimum 16 gage frame; minimum 14 gage door panel.
      c. Fully concealed pin type hinges or continuous piano hinge, 175 degree opening.
      d. Latches: Screw driver operated cam type.
      e. Key operated cylinder lock where indicated.

C. Sizes: Approximately 12" x 12" size for hand access, 22" x 22" size for man entry, unless indicated otherwise; furnish custom sizes as necessary.

D. Finish: Galvanized steel with wiped coat finish; prime units with manufacturer's standard primer to receive paint coatings as specified in Section 099000. Provide stainless steel access doors at restrooms, and other moist locations.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Prior to starting work, carefully inspect installed work of other trades and verify that such work is complete to the point where work of this section may properly commence. Notify the Architect in writing of conditions detrimental to the proper and timely completion of the work.

B. Do not begin installation until unsatisfactory conditions are resolved. Beginning work constitutes acceptance of site conditions and responsibility for defective installation caused by prior observable conditions.

C. Verify rough openings for door and frame are correctly sized and located.

3.2 INSTALLATION

A. Install access doors of sizes and in locations as indicated. Provide access doors for access to balancing and fire dampers, trap primers, valves, fans, terminal units, and other equipment requiring periodic inspection through finished walls and ceilings, whether indicated or not. Coordinate access requirements with other trades.

B. Provide concealed access doors at all gypsum board assemblies.

C. Install frames plumb and level in wall and ceiling openings, with plane of door surface in accurate alignment with plane of wall or ceiling surface.

D. Secure rigidly in place in accordance with manufacturer's instructions.

END OF SECTION

SECTION 083323 - OVERHEAD COILING DOORS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:
   1. Overhead coiling doors.
   2. Support framing.

B. Related Sections:
   1. Division 26 - Electrical: Installation of key operated push button station, conduit, and wiring; connection of alarm and detection system to fire rated door assemblies.

C. Drawings, the provisions of the Agreement, the General Conditions, and Division 1 specification sections apply to work of this Section.

D. Substitutions: Substitute products will be considered only under the terms and conditions of Section 016000.

1.2 SYSTEM DESCRIPTION

A. Overhead coiling door assembly includes curtain, curtain guides, brackets, counterbalance, hood, motor or manual operators as specified, push button card-reader stations, steel structural supports and other accessories required for a complete installation.

1.3 SUBMITTALS

A. Make submittals in accordance with Section 013300.

B. Product Data: Submit manufacturer's complete product literature indicating specified items and method of installation.

C. Shop Drawings:
   1. Indicate details and dimensions of installation, including tracks, supports, connection points and details, and locations of operating components.
   2. Shop Drawings of framing support system shall be stamped by an Engineer licensed to practice in the State of Washington.

1.4 QUALITY ASSURANCE

A. Installers: Trained and authorized by the door manufacturer.

B. Pre-Installation Conference:
   1. Conduct in accordance with Section 013119.
   2. Require in attendance the General Contractor, the Architect, the overhead door subcontractor, the electrical subcontractor, the lightgage metal framing subcontractor, and others as may be affected by the work of this Section.
   3. Agenda: Address coordination, existing conditions, switch locations, connection points, baffle installation, access requirements, motor locations, and field testing procedures.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. The Overhead Door Corporation is specified as the standards of approval. Similar and equal products from Cornell Iron Works, Inc. McKeon Rolling Door Company, Cookson Company and Wayne-Dalton Corporation may be submitted for approval.

2.2 PREMANUFACTURED DOOR ASSEMBLIES

A. Motorized Insulated Non-Rated Doors:
   1. Overhead Door “Stormtite 625” Heavy Duty Insulated Rolling Door; motorized operation.
   2. Motor Operator: Heavy duty gear head motor operator; 3 phase power; verify voltage.

3. Curtain: Galvanized steel curtain with polyurethane insulated slats; manufacturer's high-performance factory-applied powder coat finish.
4. Reversing footpiece; provide concealed self-winding electrical cord reel; located directly above connection point on bottom-bar.
5. Weatherstripping at exterior doors.
6. Key operated switch, constant pressure (spring return) type, labeled "OPEN" and "CLOSE," with center off position; keyed cylinder to be furnished under Section 087100.

2.3 SUPPORT FRAMING

A. Provide tube steel framing as indicated to support the overhead coiling doors.

B. The support framing shall be Contractor designed.

C. Provide bracing, attachments, and anchors to adjacent structure to maintain the installation firmly in position.

D. Framing shall be designed to accommodate deflection from the structure above without transmission of the load to the structure below.

E. Design framing system to meet the seismic requirements City of Seattle Building Code.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Prior to starting work, carefully inspect installed work of other trades and verify that such work is complete to the point where work of this Section may properly commence. Notify the Architect in writing of conditions detrimental to the proper and timely completion of the work.

B. Do not begin installation until unsatisfactory conditions are resolved. Beginning work constitutes acceptance of site conditions and responsibility for defective installation caused by prior observable conditions.

C. Verify that openings are prepared with headers level, jambs plumb, floor level, without projections, and are correctly dimensioned to receive door.

3.2 INSTALLATION

A. Install door assemblies as indicated in accordance with manufacturer's installation instructions and approved shop drawings.

3.3 FIELD QUALITY CONTROL

A. Verify that moving parts operate smoothly, coiling doors are free from warp, twists, or distortion, doors remain in required position, and safety features function properly.

B. Repair damage to overhead coiling doors to match manufacturer's original finish. Replace components which cannot be properly repaired.

3.4 ADJUST

A. Adjust mechanism so moving parts operate smoothly.

END OF SECTION

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:
   1. Stick framed aluminum storefront system.
   2. Aluminum and glass entrances.
   3. Aluminum-framed windows

B. Related Sections:
   1. 079200 - Joint Sealants: Perimeter sealants.
   2. 088000 - Glazing: Glass and glazing.

C. Drawings, the provisions of the Agreement, the General Conditions, and Division 1 specification sections apply to all work of this Section.

D. Substitutions: Substitute products will be considered only under the terms and conditions of Section 016000.

1.2 REFERENCES

A. American Society for Testing and Materials (ASTM):
   1. A123 - Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products.
   2. B209 - Aluminum and Aluminum Alloy Sheet and Plate.
   3. B221 - Aluminum Alloy Extruded Bars, Rods, Wire, Shapes, and Tubes.
   4. E283 - Rate of Air Leakage through Exterior Windows, Curtain Walls, and Doors.
   5. E330 - Structural Performance of Exterior Windows, Curtain Walls, and Doors by Uniform Static Air Pressure Difference.
   6. E331 - Test Method for Water Penetration of Exterior Windows, Curtainwalls, and Doors by Uniform Static Air Pressure Difference.

B. Architectural Aluminum Manufacturer's Association (AAMA).
   1. 101-08 Voluntary Specifications for Aluminum Prime Windows and Sliding Glass Doors.

1.3 SYSTEM DESCRIPTION

A. Performance:
   1. System shall provide for expansion and contraction caused by a cycling temperature range of -20°F to +160°F without causing detrimental effects to components, sealing systems, and surrounding construction.
   2. Design system with provisions to drain moisture to the exterior of the system.
   3. Air Infiltration:
      a. Fixed Glazing: Limit air infiltration through assembly to 0.06 cfm/sf of assembly surface area, measured at a reference differential pressure across assembly of 6.24 psf as measured in accordance with ANSI/ASTM E283
      b. Swing Door: Limit to 1 cfm/ft of perimeter crack around pair of doors, measured at a reference differential pressure across assembly of 1.57 psf, as measured in accordance with ANSI/ASTM E283.
   4. Water Infiltration; Storefront System: No water penetration at a test pressure of 6.24 lb/sf when measured in accordance with ASTM E331.

B. Thermal Performance; Exterior Storefront, Windows and Entrance Systems:
   1. Glazing system shall have been tested by the manufacturer in accordance with NFRC Standard 100-91and certified in accordance with Washington State Energy Code Section 131as capable of achieving a U factor of:
      a. Fixed Window Units: 0.38 maximum, for vision areas, including frames and glazing.
      b. Operable Window Units: 0.40 maximum, for vision areas, including frames and glazing.
      c. Entrance Doors: 0.60 maximum, for vision areas, including frames and glazing.
   2. Test shall have been performed with glazing equivalent to that specified for vision glass in Section 088000, or with glass from which system performance requirements may be reasonably extrapolated, if written agreement is obtained from the jurisdictional authority.

C. System Structural Design:
   1. Design and size members to withstand loads as required by the jurisdictional code authorities.
   2. Limit mullion deflection to 1/175, or flexure limit of glass with full recovery of glazing materials, whichever is less.

D. Dynamic Movement: System shall accommodate the following without damage to system components or performance.
   1. Movement within the system.
   2. Application and release of design live loads.
   3. ±5/8" maximum deflection of structural support framing between head and sill.

E. Profiles: Framing member profiles, as indicated in the Drawings, indicate proportions and intent. Minor variations in profiles, assemblies, and connections which are indicated on the shop drawings will be accepted, provided that, in the opinion of the Architect, they do not substantially alter the intended appearance.

1.4 SUBMITTALS

A. Make submittals in accordance with Section 013300.

B. Shop Drawings: Include wall opening dimensions, component dimensions, tolerances required, hardware, anchorages and fasteners, relationship to adjacent construction, and installation details.

C. Samples:
   1. Submit one sample of each type of extrusion; 12 inch minimum length
   2. Finish Sample: Submit three samples, minimum 2"x4", of aluminum finished with system and color proposed for the finished work.

D. Quality Control Submittals:
   1. Certification: Submit certification that the aluminum storefront and stair systems have been designed to meet the specified requirements.

1.5 QUALITY ASSURANCE

A. Installer Qualifications: Company authorized by system manufacturer, one installer for total system.

1.6 DELIVERY, STORAGE, AND HANDLING

A. In accordance with Section 016000.

1.7 GUARANTEE AND WARRANTY

A. Furnish in accordance with Section 017700.

B. Manufacturer's Warranty: Furnish three year written warranties executed to the Owner, from the manufacturers of the storefront and aluminum window systems, against defects in materials and workmanship.

C. Installer's Guarantee: Furnish three year written guarantee against defects in installation.

PART 2 - PRODUCTS

2.1 STOREFRONT SYSTEMS

A. Manufacturers:
   1. Basis of Design: Kawneer Co. Inc. (Kent WA; 206/872-2555).
   2. Acceptable Manufacturers: Arcadia, EFCO.

B. Framing System: Kawneer Trifab VG 451T, 2 x 4-1/2 inch extruded aluminum section; thermally improved frame, center set design.

C. Furnish spacers and adapters as necessary for a complete installation.

2.2 DOORS

A. Swinging Entry Doors:
   1. Kawneer Company, Inc.
   2. "500T Insulpour Thermal Entrance" or similar by acceptable manufacturer;
   3. Heavy duty aluminum/glass type; outswinging; 10 inch high bottom rail.

2.3 WINDOWS

A. Manufacturers:
   1. Basis of Design: Kawneer Co. Inc. (Kent, WA; 206/872-2555).
   2. Acceptable Manufacturers: Arcadia, EFCO.

B. Windows shall include perimeter trims, stools, accessories, shims and anchors, and perimeter sealing of window units.
   1. Kawneer Series AA4325 Ultra Thermal Windows
   2. Outswing Casement and Fixed Frame Windows
   3. 3-1/4" frame depth
   4. AW-PG80-C

2.4 MATERIALS

A. Extruded Aluminum: ANSI/ASTM B221; 6063-T5 Alloy and Temper.

B. Sheet Aluminum: ASTM B209, minimum .019 inch thickness for flashings, minimum .062 inch thick for brake formed trim applications.

C. Thermal Barrier: Structural thermal break made with glass-reinforced nylon strips, (closed cell PVC foam strips) installed by the window manufacturer in the frame and vent members.

D. Fasteners: Aluminum, nonmagnetic stainless steel or other materials to be non-corrosive and compatible with aluminum window members, trim, hardware, anchors, and other components.

E. Anchors, Clips, and Accessories: Aluminum, nonmagnetic stainless steel, or zinc-coated steel or iron complying with ASTM B 633 for SC 3 severe service conditions; provide sufficient strength to withstand design pressure indicated.

F. Glazing: Furnished under Section 088000. Provide shop glazed units at Contractor's option.

G. Miscellaneous Accessories: Furnish reinforcing, attachment hardware, aluminum flashings, and other items as necessary.

2.5 DOOR HARDWARE

A. Door Hardware:
   1. Security Enhancement Options, including armored strike retrofit, lockguard, and security strobe.
   2. Weatherstripping: Hard-backed poly pile in door and/or frame. Meeting stile of each leaf shall have a double line of hard-backed poly-pile astragal.
   3. Sill Sweeps: Brush strip, concealed.
   4. Exit Indicator.
   5. Remaining hardware is specified in Section 087100.

2.6 WINDOW HARDWARE

A. General: Provide manufacturer's standard hardware fabricated from aluminum, stainless steel, or other corrosion-resistant material compatible with aluminum; designed to smoothly operate, tightly close, and securely lock aluminum windows, and sized to accommodate sash weight and dimensions.

B. Casement Window Typical Hardware:
   1. Locking
      a. Cast White Bronze Cam Locks
      b. Single Handle Multi-Point Locks
      c. Access Control Locks
   2. Hinging
      a. 4-Bar Hinges

b. Limit Stop
c. Butt Hinges
d. Friction Adjusters

3. Other
   a. Roto Operator
   b. Pole Ring
   c. Pole

2.7 FABRICATION

A. Field verify openings prior to fabrication.

B. Fabricate frames allowing for shim spacing around perimeter of assembly, yet enabling installation.

C. Rigidly fit joints and corners. Accurately fit and secure corners tight. Make corner joints flush, hairline, and weatherproof. Seal joints with sealant.

D. Provide drainage holes to allow water to flow to exterior.

E. Prepare components to receive anchorage devices. Fabricate anchorage items.

F. Form bent components accurately to line, without deformation of component profiles. Fabricate in lengths consistent with finisher's capacity to handle bent shapes. Prefit all clips and mating components to ensure secure fit at time of assembly.

G. Fabricate custom extrusions, closures, and sheet materials to the shapes indicated; fabricate for attachment with concealed fasteners to the greatest possible extent.

H. Provide internal reinforcement in mullions with members to maintain rigidity. Provide reinforcing at all door strike jambs.

I. Fabricate storefront system to accommodate hardware using templates furnished from Section 087100. Provide weatherstripping and seals at exterior doors.

J. Provide plastic backing plates at jambs to receive sealant and backing rod.

2.8 FINISHES

A. Finish for Exposed Aluminum Surfaces - Color Anodized Finish: Apply at all aluminum framing member surfaces exposed to view in installed position, and to all sheet metal flashings.
   1. Conform to AA-M12C22A42.
   2. Architectural Class I, etched, medium matte, colored anodic coating, 0.7 mil thickness.
   3. Color: Black.Concealed Steel Items: Galvanized in accordance with ANSI/ASTM A123 to oz/sf.

C. Apply two coats of bituminous paint to concealed aluminum and steel surfaces in contact with cementitious or dissimilar materials.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Verify wall openings are ready to receive work of this Section.

B. Notify Architect of unacceptable conditions, prior to installation. Do not install window units until such conditions have been corrected.

3.2 INSTALLATION

A. Install frames and hardware in accordance with manufacturer's instructions.

B. Align frames plumb and level, free of warp or twist. Maintain dimensional tolerances, aligning with adjacent work.

C. Install under sill aluminum flashings. Seal all frame joints, and penetrations in flashings.

D. Sub-Sills:
   1. Provide extruded aluminum sub-sills in accordance with manufacturer's installation instructions and as specified below.
   2. Provide manufacturer's standard end dams and splice plates sealed into position. End dams and splice plates shall match the height of the sub-sill back.
   3. Seal joint between end dam and jamb.
   4. Fasten the sub-sill securely to the sill construction. Cap seal tops of fasteners.
   5. Fasten the storefront framing into the sub-sill. Use manufacturer's standard interlocking anchors which engage the sub-sill and allow fastening of the storefront without penetrating the horizontal pan of the sub-sill.

E. Install water diverters.

F. Compensation Heads:
   1. Provide compensation channels at head conditions in accordance with manufacturer's installation instructions and as specified below.
   2. Provide manufacturer's standard end caps sealed into position. End caps shall match the height of the compensation channel and shall be pre-finished to match the framing at exposed locations.
   3. Provide interlocking mullion anchors at vertical tubes.

G. Provide plastic backing plates at jambs to receive sealant and backing rod.

H. Doors:
   1. Install closers and doors for uniform clearances and smooth operation.
   2. Coordinate with Division 16, and other trades as necessary for installation of barrier free entrance operators.

I. Perimeter sealant is provided under Section 079200.

3.3 ADJUSTING

A. Set clearances and adjust operating hardware for smooth operation.

B. Closers:
   1. Set manual closers at exterior entrances to pounds spring tension at the pull handles.
   2. Set initial opening force to 5 pounds and time delay at barrier free entrances to 15 seconds, unless otherwise directed.

3.4 FIELD QUALITY CONTROL

A. After completion of all glazing and sealing work, hose test all exterior glazed storefront and window systems. Notify Architect a minimum of 72 hours prior to hose testing.

B. All areas which exhibit water penetration to the inside of the building shall be repaired, resealed, and retested until watertightness can be demonstrated.

3.5 CLEANING

A. Remove protective material from prefinished aluminum surfaces.

B. Wash down exposed surfaces using a solution of mild detergent in warm water, applied with soft, clean wiping cloths. Take care to remove dirt from corners. Wipe surfaces clean.

END OF SECTION

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 08 Hollow Metal Doors and Frames
   2. Section 08 Wood Doors
   3. Section 08 Aluminum Entrances and Storefronts
   4. Section 28 Electronic Security and Safety

1.2 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 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. Seattle Building Code

B. NFPA80 – Fire Doors and Windows

C. NFPA101 – Life Safety Code

D. NFPA105 – Smoke and Draft Control Door Assemblies

E. ANSI A117.1 - Accessible and Usable Buildings and Facilities

F. BHMA – Builders Hardware Manufacturers Association

G. DHI – Door Hardware Institute

1.4 SUBMITTALS

A. Hardware schedule: Submit digital copies of schedule. Organize vertically formatted schedule into Hardware Sets with index of doors and headings, indicate complete designations of every item required for each door or opening. Include the following:
   1. Type, style, function, size, quantity and finish of hardware items.
   2. Name, part number and manufacture of each item.
   3. Fastenings and other pertinent information.
   4. Explanation of abbreviations, symbols and codes contained in schedule.
   5. Door and frame sizes, materials 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.

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.

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
      b. Automatic operators: Two years
      c. Exit Devices, Electrical: One year
      d. Exit Devices, Mechanical: Three years
      e. Locksets, L Series: Three years
      f. Locksets, ND Series: Ten years

1.7 MAINTENANCE

A. Maintenance tools:
   1. Furnish complete set of special tools required for maintenance and adjustment of hardware, including changing of cylinders.

PART 2 - PRODUCTS

2.1 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
Locksets & Deadlocks	Schlage (SCH)	Best, Sargent
Exit Devices & Mullions	Von Duprin (VON)	Precision, Sargent
Electric Strikes	Von Duprin (VON)	Trine, SDC
Power Supplies	Von Duprin (VON)	Precision, Sargent
Cylinders & Keying	Schlage (SCH)	Best, Sargent
Door Closers	LCN (LCN)	Norton, 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.
   2. Provide standard-weight 4 ½ x 4 ½ for 1 ¾" thick doors up to 3'5". Provide heavy-weight 5 x 4 ½ on doors 36" and over.
   3. Exterior outswing doors to have non removable (NRP) pins.
   4. Pin tips, flat button, finish to match leaves.
   5. Interior doors over 36" – Heavy weight.
   6. Interior doors up to 36" – Standard weight.

2.4 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. Extra Heavy Duty Cylindrical Locks and Latches: Schlage ND Series
   1. Provide cylindrical locks conforming to ANSI A156.2 Series 4000, Grade 1.
   2. UL listed for A label and lesser class single doors up to 4ft x 8ft.
   3. Meets A117.1 Accessibility Codes.
   4. Provide solid steel rotational stops to control excessive rotation of lever.

5. Provide completely refunctionable lockset that allows lock function to be changed to over twenty other common functions by swapping easily accessible parts.
6. Provide locks with standard 2-3/4 inches (70 mm) backset, unless noted otherwise, with 1/2 inch latch throw. Provide proper latch throw for UL listing at pairs.
7. Provide locksets with separate anti-rotation thru-bolts, and no exposed screws.
8. Provide independently operating levers with two external return spring cassettes mounted under roses to prevent lever sag.
9. Provide standard ASA strikes unless extended lip strikes are necessary to protect trim.
10. Lever Trim: Solid cast levers without plastic inserts and wrought roses on both sides.
    a. Lever Design: Schlage Rhodes

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. 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 4010/4110 Series
1. Provide door closers conforming to ANSI/BHMA A156.4 Grade 1 requirements by BHMA certified independent testing laboratory. ISO 9000 certify closers. Stamp units with date of manufacture code.
2. Provide door closers with fully hydraulic, full rack and pinion action with cast aluminum cylinder.
3. Closer Body: 1-1/2 inch (38 mm) diameter with 11/16 inch (17 mm) diameter heat-treated pinion journal and full complement bearings.
4. Hydraulic Fluid: Fireproof, passing requirements of UL10C, and all weather requiring no seasonal closer adjustment for temperatures ranging from 120 degrees F to -30 degrees F.
5. Spring Power: Continuously adjustable over full range of closer sizes, and providing reduced opening force as required by accessibility codes and standards.
6. Hydraulic Regulation: By tamper-proof, non-critical valves, with separate adjustment for latch speed, general speed, and back check.
7. Pressure Relief Valve (PRV) Technology: Not permitted.
8. Provide stick on templates, special templates, drop plates, mounting brackets, or adapters for arms as required for details, overhead stops, and other door hardware items interfering with closer mounting.

2.9 AUTOMATIC OPERATORS

A. Electro-Hydraulic Automatic Operator: LCN 4600 Series
1. Provide low energy automatic operator units with hydraulic closer complying with ANSI/BHMA A156.19.
2. Hydraulic Fluid: Fireproof, passing requirements of UL10C, and requiring no seasonal closer adjustment for temperatures ranging from 120 degrees F to -30 degrees F.
3. 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
4. Provide units with on/off switch for manual operation, motor start up delay, vestibule interface delay, electric lock delay, and door hold open delay.
5. 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.

6. Provide drop plates, brackets, or adapters for arms as required for details.
7. Provide hard-wired actuator switches for operation as specified.
8. Provide weather-resistant actuators at exterior applications.
9. 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.
10. 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.
11. Provide units with vestibule inputs that allow sequencing operation of two units, and SPDT relay for interfacing with latching or locking devices.

2.10 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.

2.11 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

2.12 KEYING REQUIREMENTS

A. All keyed cylinders shall be subject to a new Schlage Masterkey system.

B. Provide a factory registered keying system, complying with guidelines in ANSI/BHMA A156.28, incorporating decisions made at keying conference.

C. Cylinders to be furnished with visual key control with key code. Stamped on the face of the keys and marked on the back or side of the cylinders.

D. Initiate and conduct key conference with Owner to determine correct keyway(s) and structure. Owners written approval required prior to ordering product.

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. Initial Adjustment: Adjust and check each operating item of door hardware and each door to ensure proper operation or function of every unit. Replace units that cannot be adjusted to operate as intended. Adjust door control devices to compensate for final operation of heating and ventilating equipment and to comply with referenced accessibility requirements.

B. Occupancy Adjustment: Approximately three to six months after date of Substantial Completion, Installer's Architectural Hardware Consultant must examine and readjust each item of door hardware, including adjusting operating forces, as necessary to ensure function of doors and door hardware.

3.4 DEMONSTRATION

A. Demonstrate electrical, electronic and pneumatic hardware system including adjustment and maintenance procedures.

3.5 PROTECTION/CLEANING

A. Cover installed hardware, protect from paint, cleaning agents, weathering, carts/barrows, etc. Remove covering materials and clean hardware just prior to substantial completion. Clean adjacent wall, frame and door surfaces soiled from installation/reinstallation process.

3.6 DOOR HARDWARE SCHEDULE

A. The intent of the hardware specification is to specify the hardware for interior and exterior doors, and to establish a type, continuity, and standard of quality. However, it is the door hardware supplier’s responsibility to thoroughly review existing conditions, schedules, specifications, drawings, and other Contract Documents to verify the suitability of the hardware specified.

B. Discrepancies, conflicting hardware, and missing items are to be brought to the attention of the architect with corrections made prior to the bidding process. Omitted items not included in a hardware set should be scheduled with the appropriate additional hardware required for proper application.

C. Hardware items are referenced in the following hardware schedule. Refer to the above specifications for special features, options, cylinders/keying, and other requirements.

3.7 DOOR HARDWARE GROUPS

HW SET: 00

1	EA		DOOR CONTACT - WORK OF DIVISION 28			
	EA		O.H. DOOR HDWE BY OTHERS			

HW SET: 01

1	EA	PIVOT SET	7226 SET		612	IVE
1	EA	INTERMEDIATE PIVOT	7226 INT		612	IVE
1	EA	ELEC PANIC HARDWARE	QEL-35A-L-06		612	VON
1	EA	FSIC RIM CYLINDER W/ CONST. CORE	20-057 ICX		612	SCH
1	EA	FSIC CORE	23-030		606	SCH
1	EA	SURF. AUTO OPERATOR	4642 WMS FLUSH CEILING MOUNT		US10	LCN
2	EA	ACTUATOR, TOUCH	8310-818T		630	LCN
1	EA	FLOOR STOP	FS438		612	IVE
1	EA	DOOR SWEEP	8197D		D	ZER
1	EA	THRESHOLD	545A		A	ZER
1			CARD READER - WORK OF DIVISION 28			
1	EA		DOOR CONTACT - WORK OF DIVISION 28			
1			POWER SUPPLY - WORK OF DIVISION 28			
1	EA		WEATHERSTRIP BY DOOR/FRAME MANUFACTURER			

DOOR NORMALLY CLOSED AND LOCKED. VALID CREDENTIAL WILL MOMENTARILY RETRACT LATCH AND ALLOW ACTIVATION OF ACTUATOR. ACTIVATING ACTUATOR WILL ACTIVATE AUTOMATIC OPERATOR. DOOR CONTACT (DC) SIGNALS MONITORING SYSTEM. FREE EGRESS AT ALL TIMES.

HW SET: 02

3	EA	HINGE	5BB1 4.5 X 4.5 NRP		630	IVE
1	EA	STOREROOM LOCK	ND80RD RHO		626	SCH
1	EA	SURFACE CLOSER	4111 SCUSH		689	LCN
1	EA	KICK PLATE	8400 10" X 2" LDW B-CS		630	IVE
1	EA	RAIN DRIP	142AA		AA	ZER
1	EA	GASKETING	488SBK PSA		BK	ZER
1	EA	DOOR SWEEP	8197AA		AA	ZER
1	EA	THRESHOLD	655A		A	ZER
1	EA		DOOR CONTACT - WORK OF DIVISION 28			

DOOR NORMALLY CLOSED AND LOCKED. DOOR CONTACT (DC) SIGNALS MONITORING SYSTEM. FREE EGRESS AT ALL TIMES.

HW SET: 03

3	EA	HINGE	5BB1 4.5 X 4.5 NRP		630	IVE
1	EA	STOREROOM LOCK	ND80RD RHO		626	SCH
1	EA	ELECTRIC STRIKE	6211 FSE		630	VON
1	EA	SURFACE CLOSER	4111 SCUSH		689	LCN
1	EA	KICK PLATE	8400 10" X 2" LDW B-CS		630	IVE
1	EA	RAIN DRIP	142AA		AA	ZER
1	EA	GASKETING	488SBK PSA		BK	ZER
1	EA	DOOR SWEEP	8197AA		AA	ZER
1	EA	THRESHOLD	545A		A	ZER
1			CARD READER - WORK OF DIVISION 28			
1	EA		DOOR CONTACT - WORK OF DIVISION 28			
1			POWER SUPPLY - WORK OF DIVISION 28			

DOOR NORMALLY CLOSED AND LOCKED. VALID CREDENTIAL WILL UNLOCK ELECTRIC STRIKE. STRIKE WILL LOCK UPON LOSS OF POWER. DOOR CONTACT (DC) SIGNALS MONITORING SYSTEM. FREE EGRESS AT ALL TIMES.

HW SET: 04

3	EA	HINGE	5BB1 4.5 X 4.5 NRP		630	IVE
1	EA	PANIC HARDWARE	LD-98-NL-OP-110MD		626	VON
1	EA	FSIC RIM CYLINDER W/ CONST. CORE	20-057 ICX		626	SCH
1	EA	FSIC CORE	23-030		626	SCH
1	EA	ELECTRIC STRIKE	6111 FSE		630	VON
1	EA	90 DEG OFFSET PULL	8190 HD 10"		630	IVE
1	EA	SURFACE CLOSER	4111 SCUSH		689	LCN
1	EA	KICK PLATE	8400 10" X 2" LDW B-CS		630	IVE
1	EA	RAIN DRIP	142AA		AA	ZER
1	EA	GASKETING	488SBK PSA		BK	ZER
1	EA	DOOR SWEEP	8197AA		AA	ZER
1	EA	THRESHOLD	655A		A	ZER
1			CARD READER - WORK OF DIVISION 28			
1	EA		DOOR CONTACT - WORK OF DIVISION 28			
1			POWER SUPPLY - WORK OF DIVISION 28			

DOOR NORMALLY CLOSED AND LOCKED. VALID CREDENTIAL WILL UNLOCK ELECTRIC STRIKE. STRIKE WILL LOCK UPON LOSS OF POWER. DOOR CONTACT (DC) SIGNALS MONITORING SYSTEM. FREE EGRESS AT ALL TIMES.

HW SET: 05

3	EA	HINGE	5BB1 4.5 X 4.5 NRP		630	IVE
1	EA	STOREROOM LOCK	ND80RD RHO		626	SCH
1	EA	ELECTRIC STRIKE	6211 FSE		630	VON
1	EA	OH STOP	100S		689	GLY
1	EA	SURF. AUTO OPERATOR	4642 WMS FLUSH CEILING MOUNT		689	LCN
2	EA	ACTUATOR, TOUCH	8310-852T		630	LCN
1	EA	KICK PLATE	8400 10" X 2" LDW B-CS		630	IVE
1	EA	RAIN DRIP	142AA		AA	ZER
1	EA	GASKETING	488SBK PSA		BK	ZER
1	EA	DOOR SWEEP	8197AA		AA	ZER
1	EA	THRESHOLD	545A		A	ZER
1			CARD READER - WORK OF DIVISION 28			
1	EA		DOOR CONTACT - WORK OF DIVISION 28			
1			POWER SUPPLY - WORK OF DIVISION 28			

DOOR NORMALLY CLOSED AND LOCKED. VALID CREDENTIAL WILL MOMENTARILY UNLOCK ELECTRIC STRIKE AND ALLOW ACTIVATION OF ACTUATOR. DEPRESSING ACTUATOR WILL ACTIVATE AUTOMATIC OPERATOR. ELECTRIC STRIKE LOCKS UPON LOSS OF POWER. DOOR CONTACT (DC) SIGNALS MONITORING SYSTEM. FREE EGRESS AT ALL TIMES.

HW SET: 06

3	EA	HINGE	5BB1 4.5 X 4.5 NRP		630	IVE
1	EA	FIRE EXIT HARDWARE	98-NL-F		626	VON
1	EA	FSIC RIM CYLINDER W/ CONST. CORE	20-057 ICX		626	SCH
1	EA	FSIC CORE	23-030		626	SCH
1	EA	SURFACE CLOSER	4111 SCUSH		689	LCN
1	EA	KICK PLATE	8400 10" X 2" LDW B-CS		630	IVE
1	EA	RAIN DRIP	142AA		AA	ZER
1	EA	GASKETING	488SBK PSA		BK	ZER
1	EA	DOOR SWEEP	8197AA		AA	ZER
1	EA	THRESHOLD	655A		A	ZER
1	EA		DOOR CONTACT - WORK OF DIVISION 28			

DOOR NORMALLY CLOSED AND LOCKED. DOOR CONTACT (DC) SIGNALS MONITORING SYSTEM. FREE EGRESS AT ALL TIMES.

HW SET: 07

3	EA	HINGE	5BB1 4.5 X 4.5 NRP		630	IVE
1	EA	PANIC HARDWARE	LD-98-L-E996-06-FSE		626	VON
1	EA	FSIC RIM CYLINDER W/ CONST. CORE	20-057 ICX		626	SCH
1	EA	FSIC CORE	23-030		626	SCH
1	EA	SURFACE CLOSER	4111 EDA		689	LCN
1	EA	KICK PLATE	8400 10" X 2" LDW B-CS		630	IVE
1	EA	FLOOR STOP	FS438		626	IVE
1	EA	RAIN DRIP	142AA		AA	ZER
1	EA	GASKETING	488SBK PSA		BK	ZER
1	EA	DOOR SWEEP	8197AA		AA	ZER
1	EA	THRESHOLD	545A		A	ZER
1			CARD READER - WORK OF DIVISION 28			
1	EA		DOOR CONTACT - WORK OF DIVISION 28			
1			POWER SUPPLY - WORK OF DIVISION 28			

DOOR NORMALLY CLOSED AND LOCKED. VALID CREDENTIAL WILL UNLOCK LEVER. LEVER WILL LOCK UPON LOSS OF POWER. DOOR CONTACT (DC) SIGNALS MONITORING SYSTEM. FREE EGRESS AT ALL TIMES.

HW SET: 08

3	EA	HINGE	5BB1 4.5 X 4.5		652	IVE
1	EA	STOREROOM LOCK	ND80RD RHO		626	SCH
1	EA	ELECTRIC STRIKE	6211 FSE		630	VON
1	EA	SURFACE CLOSER	4011		689	LCN
1	EA	KICK PLATE	8400 10" X 2" LDW B-CS		630	IVE
1	EA	WALL STOP	WS406/407CCV		630	IVE
1	EA	GASKETING	488SBK PSA		BK	ZER
1			CARD READER - WORK OF DIVISION 28			
1	EA		DOOR CONTACT - WORK OF DIVISION 28			
1			POWER SUPPLY - WORK OF DIVISION 28			

DOOR NORMALLY CLOSED AND LOCKED. VALID CREDENTIAL WILL UNLOCK ELECTRIC STRIKE. STRIKE WILL LOCK UPON LOSS OF POWER. DOOR CONTACT (DC) WILL SIGNAL MONITORING SYSTEM. FREE EGRESS AT ALL TIMES.

HW SET: 09

3	EA	HINGE	5BB1 4.5 X 4.5 NRP		652	IVE
1	EA	STOREROOM LOCK	ND80RD RHO		626	SCH
1	EA	ELECTRIC STRIKE	6211 FSE		630	VON
1	EA	SURFACE CLOSER	4111 SCUSH		689	LCN
1	EA	KICK PLATE	8400 10" X 2" LDW B-CS		630	IVE
1	EA	GASKETING	488SBK PSA		BK	ZER
1			CARD READER - WORK OF DIVISION 28			
1	EA		DOOR CONTACT - WORK OF DIVISION 28			
1			POWER SUPPLY - WORK OF DIVISION 28			

DOOR NORMALLY CLOSED AND LOCKED. VALID CREDENTIAL WILL UNLOCK ELECTRIC STRIKE. STRIKE WILL LOCK UPON LOSS OF POWER. DOOR CONTACT (DC) WILL SIGNAL MONITORING SYSTEM. FREE EGRESS AT ALL TIMES.

HW SET: 10

3	EA	HINGE	5BB1 4.5 X 4.5 NRP		652	IVE
1	EA	STOREROOM LOCK	ND80RD RHO		626	SCH
1	EA	SURFACE CLOSER	4111 EDA		689	LCN
1	EA	KICK PLATE	8400 10" X 2" LDW B-CS		630	IVE
1	EA	WALL STOP	WS406/407CCV		630	IVE
1	EA	GASKETING	488SBK PSA		BK	ZER

HW SET: 11

3	EA	HINGE	5BB1 4.5 X 4.5		652	IVE
1	EA	PASSAGE SET	ND10S RHO		626	SCH
1	EA	SURFACE CLOSER	4011		689	LCN
1	EA	KICK PLATE	8400 10" X 2" LDW B-CS		630	IVE
1	EA	WALL STOP	WS406/407CCV		630	IVE
1	EA	GASKETING	488SBK PSA		BK	ZER

HW SET: 12

3	EA	HINGE	5BB1 4.5 X 4.5 NRP		652	IVE
1	EA	STOREROOM LOCK	ND80RD RHO		626	SCH
1	EA	SURFACE CLOSER	4111 SCUSH		689	LCN
1	EA	KICK PLATE	8400 10" X 2" LDW B-CS		630	IVE
1	EA	GASKETING	488SBK PSA		BK	ZER

HW SET: 13

3	EA	HINGE	5BB1 4.5 X 4.5		652	IVE
1	EA	PASSAGE SET	ND10S RHO		626	SCH
1	EA	OH STOP	100S		689	GLY
1	EA	SURFACE CLOSER	4011 ST-1544 X 4020-18		689	LCN
1	EA	KICK PLATE	8400 10" X 2" LDW B-CS		630	IVE
1	EA	GASKETING	488SBK PSA		BK	ZER

HW SET: 14

3	EA	HINGE	5BB1 4.5 X 4.5		630	IVE
1	EA	PRIVACY INDICATOR LOCK	L9056R 06A 09-544 L283-722		626	SCH
1	EA	SURFACE CLOSER	4011		689	LCN
1	EA	KICK PLATE	8400 10" X 2" LDW B-CS		630	IVE
1	EA	MOP PLATE	8400 4" X 1" LDW B-CS		630	IVE
1	EA	WALL STOP	WS406/407CCV		630	IVE
1	EA	GASKETING	488SBK PSA		BK	ZER

HW SET: 15

3	EA	HINGE	5BB1 4.5 X 4.5		652	IVE
1	EA	STOREROOM LOCK	ND80RD RHO		626	SCH
1	EA	KICK PLATE	8400 10" X 2" LDW B-CS		630	IVE
1	EA	WALL STOP	WS406/407CCV		630	IVE
1	EA	GASKETING	488SBK PSA		BK	ZER

HW SET: 16

3	EA	HINGE	5BB1 4.5 X 4.5		652	IVE
1	EA	PASSAGE SET	ND10S RHO		626	SCH
1	EA	ELECTRIC STRIKE	6211 FSE	✓	630	VON
1	EA	OH STOP	100S		689	GLY
1	EA	SURF. AUTO OPERATOR	4631 X ST-3110	✓	689	LCN
2	EA	ACTUATOR, TOUCHLESS	8310-810S	✓	630	LCN
1	EA	KICK PLATE	8400 10" X 2" LDW B-CS		630	IVE
1	EA	GASKETING	488SBK PSA		BK	ZER
1			POWER SUPPLY - WORK OF DIVISION 28			

DOOR NORMALLY CLOSED AND LEVER UNLOCKED. DEPRESSING ACTUATOR WILL UNLOCK ELECTRIC STRIKE AND ACTIVATE AUTOMATIC OPERATOR. ELECTRIC STRIKE LOCKS UPON LOSS OF POWER. FREE EGRESS AT ALL TIMES.

HW SET: 17

3	EA	HINGE	5BB1 4.5 X 4.5		652	IVE
1	EA	STOREROOM LOCK	ND80RD RHO		626	SCH
1	EA	ELECTRIC STRIKE	6211 FSE		630	VON
1	EA	OH STOP	100S		689	GLY
1	EA	GASKETING	488SBK PSA		BK	ZER
1			CARD READER - WORK OF DIVISION 28			
1			POWER SUPPLY - WORK OF DIVISION 28			

DOOR NORMALLY CLOSED AND LOCKED. VALID CREDENTIAL WILL UNLOCK ELECTRIC STRIKE. STRIKE WILL LOCK UPON LOSS OF POWER. FREE EGRESS AT ALL TIMES.

HW SET: 18

3	EA	HINGE	5BB1 4.5 X 4.5		652	IVE
1	EA	CLASSROOM LOCK	ND70RD RHO		626	SCH
1	EA	SURFACE CLOSER	4011		689	LCN
1	EA	KICK PLATE	8400 10" X 2" LDW B-CS		630	IVE
1	EA	WALL STOP	WS406/407CCV		630	IVE
1	EA	GASKETING	488SBK PSA		BK	ZER

HW SET: 19

1	EA	SLIDING DOOR	OFFICESLIDE SYSTEM, SECTION 08 34 00			ADS

HW SET: 20

3	EA	HINGE	5BB1 4.5 X 4.5		652	IVE
1	EA	PASSAGE SET	ND10S RHO		626	SCH
1	EA	WALL STOP	WS406/407CCV		630	IVE
1	EA	GASKETING	488SBK PSA		BK	ZER

HW SET: 21

3	EA	HINGE	5BB1 4.5 X 4.5		652	IVE
1	EA	ENTRANCE LOCK	ND53RD RHO		626	SCH
1	EA	OH STOP	100S		689	GLY
1	EA	GASKETING	488SBK PSA		BK	ZER

END OF SECTION

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:
   1. Installation of hardware specified in Section 087100.
   2. Installation of wood doors.
   3. Installation of hollow metal doors.

B. Related Sections:
   1. 081113 - Hollow Metal Doors and Frames.
   2. 081400 - Wood Doors.
   3. 083100 - Access Doors and Panels.
   4. 087100 - Door Hardware.

C. Drawings, the provisions of the Agreement, the General Conditions, and Division 1 specification sections apply to all work of this Section.

1.2 REFERENCES

A. Hollow Metal Manufacturer's Association (HMMA): 840 - Installation and Storage of Hollow Metal Doors and Frames.

B. National Fire Protection Association (NFPA): 80 - Fire Doors and Windows.

C. American National Standards Institute (ANSI): A250.8 - SDI-100 Recommended Specifications for Standard Steel Doors and Frames.

D. The Door and Hardware Institute (DHI): Recommended Locations for Architectural Hardware for Standard Steel Doors and Frames.

E. The Door and Hardware Institute (DHI): Recommended Locations for Architectural Hardware for Wood Flush Doors.

1.3 QUALITY ASSURANCE

A. Installers of doors and finish hardware shall be skilled mechanics experienced in this type of work.

B. Fire rated doors and hardware shall be installed in accordance with the labeling requirements.

1.4 ENVIRONMENTAL CONDITIONS

A. Do not subject wood doors to abnormal heat, dryness, or humidity, or sudden changes thereof. Condition doors to average prevailing humidity prior to hanging.

PART 2 - PRODUCTS

2.1 DOORS, FRAMES, AND HARDWARE

A. Doors, frames and hardware are specified in other sections.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Prior to starting work, carefully inspect installed work of other trades and verify that such work is complete to the point where work of this Section may properly commence. Notify the Architect in writing of conditions detrimental to the proper and timely completion of the work.

B. Do not begin installation until all unsatisfactory conditions are resolved. Beginning work constitutes acceptance of site conditions and responsibility for defective installation caused by prior observable conditions.

3.2 DOOR INSTALLATION

A. Install doors in accordance with the door manufacturer's printed instructions.

B. Install doors plumb and square in associated frames maintaining specified clearances.

C. Except where specified otherwise in the respective door sections, maintain clearances of 1/8 inch at jambs and heads, 1/8 inch at meeting stiles for pairs of doors, and 1/2 inch from bottom of door to top of decorative floor finish or covering, except where threshold is shown or scheduled provide 1/4-inch clearance from bottom of door to top of threshold.

D. Install hollow metal doors in accordance with ANSI A250.8 and HMMA 840.

E. Install fire rated doors in accordance with NFPA 80.

F. Install doors to operate freely, but not loosely, free from hinge bound conditions, sticking or binding. Do not install in frames which would hinder operation of doors.

G. Ensure doors are free from rattling when in latched position.

3.3 FINISH HARDWARE INSTALLATION

A. Install hardware plumb, level and true to line in accordance with manufacturer’s templates, printed instructions and Project conditions.

B. Install fire rated hardware in accordance with NFPA 80.

C. Where cutting and fitting is required on substrates to be field painted or similarly finished, install, fit, remove and store hardware prior to finishing. Reinstall hardware after finishing operations are completed.

D. Do not install surface mounted items until finishes have been completed on the substrate.

E. For substrates which are not factory prepared for hardware:
   1. Mortise work to correct size and location without gouging, splintering or causing irregularities in exposed finish work.
   2. Fit faces of mortised components snug and flush without excessive clearance.

F. Hardware Locations: The following is a general listing and may contain items which do not apply to this Project.
   1. Butt Hinges:
      a. Top: 5 inches from inside head of frame down to top of hinge.
      b. Bottom: 10 inches from finish floor to bottom of hinge.
      c. Intermediate: Equally spaced between top and bottom hinges.
   2. Pivots:
      a. Top and Bottom: According to manufacturer’s templates.
      b. Intermediate: Equally spaced between top and bottom pivots.
   3. Locksets and Latchsets: 38 inches from finish floor to centerline of knob or lever.
   4. Dummy Trim: Backset and height to match locks and latches.
   5. Deadlocks and Deadlatches: 48 inches from finish floor to centerline of cylinder.
   6. Push/Pull Latches: 45 inches from finish floor to centerline of latchbolt.
   7. Exit Devices: 38 inches from finish floor to centerline of cross bar or touch bar.
   8. Emergency Access Door Stops: 60 inches from finish floor to centerline to stop.
   9. Door Closers:
      a. Degree of door swing as indicated in Hardware Schedule approved by Architect, or if not indicated, locate to permit maximum door swing.
      b. Locate on interior side of exterior doors.
      c. Locate on stair side of doors at stairways.
      d. Locate on room side for doors in public areas, corridors and other similar areas.
   10. Push/Pull Bar Sets:
      a. Horizontal push bar centered at 42 inches above finish floor, extending full width from centerline to centerline of door stiles extending full width with bar ends centered at 4 inches from each edge of door.

b. Vertical pull bar centered on door stile centerline at 4 inches from door edge with top mounting at 45 inches above finish floor and equipped with stud to pass through door for concealed set screw mounting of push bar on opposite side.

11. Push Plates and Pulls (Back to Back): Centerline 42 inches above finish floor. Center plate between door edge and glazed opening, or 2 inches from plate edge to door edge if door is not glazed. Pull centered in relationship to plate size.
12. Door Pulls (Mounted Independently): Centerline of grip at 42 inches above finish floor, centered between door edge and glazed opening, or centerline of pull 3 inches from door edge if door is not glazed.
13. Push Plates (Mounted Independently): Centerline 45 inches above finish floor, centered between door edge and glazed opening, or 2 inches from plate edge to door edge if door is not
14. Combination Push/Pull Plates: Bottom edge 40 inches above finish floor, centered between door edge and glazed opening, or 2 inches from plate edge to door edge if door is not glazed.
15. Wall Stops: Place on adjacent wall at height to contact knob, lever or pull.
16. Floor Stops and Floor Stop/Holders: Place to permit maximum swing of door and to prevent door hardware from hitting wall. Place within 3 inches of latch edge of door, and out of foot traffic.
17. Overhead Stops or Holders: Degree of door swing as indicated in Hardware Schedule approved by Architect, or if not indicated, locate to permit maximum door swing.
18. Kick Plates and Armor Places: Mount on push side, 1/8 inch above bottom edge and centered.
19. Key Cabinet: At location directed by Owner.
20. Weatherstripping: Where 2 sets of weatherstripping are scheduled at acoustically sealed doors, install as follows. Trim seals accurately and butt tightly to minimize gaps.

3.4 ADJUSTMENT AND CLEANING

A. Adjust and check each operating item of hardware and each door to ensure proper operation of function of every unit.

B. Lubricate moving parts with graphite type lubricant unless otherwise recommended by the hardware manufacturer.

C. Ensure weatherstripping and seals do not inhibit closing and positive latching of door.

D. Replace defective materials or units which cannot be adjusted to operate as intended. Reinstall items found improperly installed.

E. Replace or re-hang doors which are hinge bound and do not swing or operate freely.

F. Remove and replace doors which are warped, twisted or which are not in true planes.

G. Replace factory finished doors damaged during installation. Refinish or replace field finished doors damaged during installation.

H. Prior to date of Substantial Completion, readjust and relubricate hardware items as necessary.

3.5 FINAL ADJUSTMENT

A. Wherever hardware installation is made more than 30 calendar days prior to date of Substantial Completion of a space or area, return to the work during the week prior to acceptance or occupancy and make a final check and adjustment of all hardware items in such space or area. Clean and lubricate operating items as necessary to restore proper function and finish of hardware and doors. Adjust door control devices to compensate for final operation of heating and ventilating equipment, spring power, back check, closing and latching speeds, and handicap requirements.

B. Instruct Owner's personnel in proper adjustment of hardware during the final adjustment of hardware.

END OF SECTION

SECTION 088000 - GLAZING

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:
   1. Glass and glazing for aluminum entrances, storefronts, and curtain wall.
   2. Glass for wood and hollow steel doors.
   3. Glazing schedule at the end of the Section.

B. Related Sections:
   1. 081113 - Hollow Metal Doors and Frames: Doors and frames to receive glazing.
   2. 081400 - Wood Doors: Doors to receive glazing.
   3. 084113 - Aluminum-Framed Entrances and Storefronts: Metal framing and glazing materials.

C. Drawings, the provisions of the Agreement, the General Conditions, and Division 1 specification sections apply to all work of this Section.

D. Substitutions: Substitute products will be considered only under the terms and conditions of Section 016000.

1.2 REFERENCES

A. American National Standard (ANSI): Z97.1 - Performance Specifications and Test Methods for Safety Glazing Materials in Buildings.

B. American Society for Testing and Materials (ASTM):
   1. C1036 - Standard Specification for Flat Glass.
   2. C1048 - Standard Specification for Heat Treated Flat Glass, Kind HS, Kind FT (Coated and Uncoated).
   3. E773 - Test Method for Seal Durability of Sealed Insulating Glass Units.
   4. E774 - Specifications for Sealed Insulating Glass Units.

C. Glass Association of North America (GANA): Glazing Manual.

D. National Fire Protection Association (NFPA): NFPA 80 - "Standard for Fire Doors and Windows, 1999 Edition."

E. National Fenestration Rating Council Inc. (NFRC).

1.3 SUBMITTALS

A. Make submittals in accordance with Section 013300.

B. Submittals specified in this Section may be incorporated into submittal specified in other Sections, where glass is to be provided in those Sections.

C. Product Data: Submit product data on glass, glazing materials, and insulating glass system.

D. Shop Drawings: Show size and thicknesses of glass, proposed "bites" in frames, sizes and locations of blocking, spacers, beads, stops, and edge treatments. Note quality, type, and strength of each light.

E. Warranty: Submit draft of manufacturer's and fabricator's warranty for Architect's review. Draft of warranties shall be submitted concurrent with glass analysis submittal and shall include all specified inclusions.

1.4 QUALITY ASSURANCE

A. Comply with pertinent recommendations in the GANA "Manual of Glazing."

B. Qualifications of Glass Manufacturer: Provide glass produced by a nationally recognized manufacturer of high efficiency glass.

C. Qualifications of Glazers: Provide personnel thoroughly trained and experienced in the skills required, and at least one person completely familiar with the referenced standards and the requirements of this Work, who shall personally direct installation of glazing materials.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Comply with applicable provisions of Section 016000.

B. Provide cushions at edges of glass to prevent impact damage during shipment and storage.

C. Keep vacuum cups free from foreign material that could scratch glass.

D. Comply with insulating unit fabricators requirements for limits on exposure to reduced barometric pressure during shipment.

1.6 WARRANTY

A. Submit warranties under provisions of Section 017700.

B. Replacement Guarantee:
   1. Provide new conforming glass units to replace glass units which break for a period of one year.
   2. Units broken by impact, fire, earthquake, or similar events which exceed the design loads and conditions are not subject to this requirement.
   3. Do not include probability for glass breakage based on specified statistical glass breakage analysis factor.
   4. Include all labor and materials for replacement of failed unit(s). Replacement shall include coordination with the Owner, immediate provision for maintaining openings secure and weathertight, timely ordering and fabrication of replacement items as required, installation, and cleaning.

C. Reflective Coating Warranty: Furnish ten year warranty from the glass manufacturer agreeing to replace glass units which have defective reflective coating. Defective coating is defined as peeling, discoloration, or other forms of deterioration to the reflective coating.

D. Insulating Glass Unit Warranty:
   1. Furnish ten year manufacturer's warranty, including coverage of units for seal failure, interpane dusting or misting, and replacement of same, under provisions of Section 017700.
      a. Vertical Applications: Ten years.

PART 2 - PRODUCTS

2.1 GLASS

A. Furnish the following glass in combinations as scheduled at the end of this Section:
   1. Clear Glass: ASTM C1036, Type I, class 1 (clear), quality Q3 glazing select.

2.2 ACCESSORIES

A. Setting Blocks: Neoprene; 70-90 Shore A durometer hardness; 4 inches long x 1/4 high x width as required for application indicated.

B. Weather Glazing Sealant: Compatible with insulating glass seal.

C. Glazing Tape (Interior): Norton "V-980," PTI "303," or approved. Size: 1/8 inch by 1/2 inch.

D. Glazing Gaskets for Existing Storefronts: "Santoprene," silicone, or EPDM glazing beads, for a complete weatherproof seal; premolded or welded corners; Furnish shapes compatible with existing storefront systems.

2.3 FABRICATION

A. Insulating Glass Units:
   1. Dual lite units fabricated from glass as scheduled; 1/2 inch nominal airspace; dual seal system.
   2. Twin seals; polyisobutylene primary seal and silicone secondary seal. Outer seal shall be compatible with glazing system.

3. Spacer Bar: Mill finish aluminum; fill with desiccant; corners shall be partially miter cut and bent (not cut through), or formed with corner keys ultrasonically soldered in place.
4. Certified through the Insulating Glass Certification Council (IGCC) in accordance with ASTM E773 and E774; certified to level CBA.
5. Each piece shall bear certification number, date, and manufacturer's identification mark.
6. Assembly of insulating units shall be by a fabricator approved by the glass materials manufacturer.

B. Tempered and Heat Strengthened Glass:
1. Tempered Glass: ASTM C1048, FT; glass which has been heat treated to strengthen glass in bending to not less than 4 times the annealed strength; certified safety glass in accordance with ANSI Z97.1.
2. Heat Strengthened Glass: ASTM C1048, HS ; glass which has been heat treated to strengthen glass in bending to not less than 2 times annealed strength.
3. Fabricate tempered and heat strengthened glass units so that principle distortion will be in the horizontal direction in the finished installation.
4. Unless otherwise approved by the building official, provide manufacturer's label on each light, indicating type and thickness of glass.
5. Comply with IBC para 2406.2 requirements for identification and labeling of safety-glazing materials in hazardous locations subject to human impact loads.
6. Fabrication Process: Horizontal (roller-hearth) process with roll-wave distortion parallel to bottom edge of glass as installed, unless otherwise indicated.

C. Low E Coating: High performance type; applied by using sputtered deposition technology.
1. Basis of Design: PPG (Pittsburgh PA; 412-434-2858) "Solarban 60."
2. Acceptable Substitution: Viracon (Otawana MN; 800-533-2080) "Solarscreen 2000."

D. Edge Treatment:
1. Glass Edges to be Exposed in the Finished Work: Pencil edge, polished.
2. Glass Edges Indicated for Exposed Silicone Sealant Treatment: Ground edge, seamed.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Prior to starting work, carefully inspect installed work of other trades and verify that such work is complete to the point where work of this section may properly commence. Notify the Architect in writing of conditions detrimental to the proper and timely completion of the work.

B. Do not begin installation until all unsatisfactory conditions are resolved. Beginning work constitutes acceptance of site conditions and responsibility for defective installation caused by prior observable conditions.

C. Verify surfaces of glazing channels or recesses are clean, free of obstructions, and ready for work of this Section.

3.2 PREPARATION

A. Clean contact surfaces and wipe dry.

B. Seal frame corner joints, and other leakage points with sealant. At insulating glass units the sealant shall be compatible with the seal of the unit. Do not plug weep holes.

C. Prime surfaces scheduled to receive sealant, unless otherwise recommended by the sealant manufacturer.

3.3 INSTALLATION

A. Setting Blocks: Place setting blocks in frames for support of glass. Place at quarter points unless approved otherwise.

B. Set glass tightly in position with proper clearances in accordance with the referenced standards.

C. Perimeter glass clearances within setting frame shall be in accordance with GANA recommendations, and as required by the glass manufacturer to provide for wind, earthquake drift, and thermal expansion.

D. Unless specified otherwise, glaze units with gaskets furnished with the framing systems specified in other sections.

E. Glazing for Interior Non-Rated Doors and Windows, Where Gaskets Are Not Furnished:
   1. Glaze with glazing tape.
   2. Pre-measure and cut tapes to required lengths; adhere to fixed stops, setting horizontal tape at heads and sills before vertical tape.
   3. Install tape with tight butt joints; no overlaps will be accepted. Set tape with straight lines level with frame sight line.
   4. Position glass, uniformly sealing against tape. Install inside removable stops and place tape in stops forming a uniform seal against glass, level with sight lines.

F. Adjust glazing materials to form a uniform sight line.

3.4 CLEANING

A. Clean excess glazing materials from adjacent finished surfaces.

B. Remove labels after work is completed.

3.5 GLASS TYPE SCHEDULE

A. The following are the glass types as indicated on the Drawings:
   1. GL-1:
      a. Insulating glass unit with 1/2 inch air space between two panes of glass as follows:
         1) Exterior Pane: 1/4 inch clear glass with low e coating on #2 surface.
         2) Interior Pane: 1/4 inch clear glass.
      b. Performance as follows:
         1) Visible Light Transmittance: 70%
         2) Winter U value: .29
         3) Shading Coefficient: .44.
         4) SHGC: .38
   2. GL-2: Nominal 1/4 inch clear glass.

B. Provide tempered safety glass when located in the following areas:
   1. In all hinged and sliding glazed doors, except where wire glass is required to meet fire rating requirements.
   2. Glass whose nearest vertical edge is within 24 inches of a door opening, and whose bottom edge is less than 60 inches above the floor or walking surface.
   3. Glass units larger than 9 square feet in area, whose bottom edge is within 18 inches of a floor or walking surface which is in turn within 36 inches measured horizontally from the glass unit.

C. Provide tempered or heat strengthened panes to meet specified stress analysis requirements.

3.6 GLASS LOCATION SCHEDULE

A. As indicated on the drawings.

END OF SECTION

SECTION 089100 - LOUVERS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes: Exterior architectural stationary metal louvers.

B. Related Sections:
   1. 061000 – Rough Carpentry: Support framing
   2. 079200 - Joint Sealants: Perimeter joint fillers.

C. Drawings, the provisions of the Agreement, the General Conditions, and Division 1 specification sections apply to all work of this Section.

D. Substitutions: Substitute products will be considered only under the terms and conditions of Section 016000.

1.2 REFERENCES

A. Air Movement and Control Association (AMCA)

1.3 QUALITY ASSURANCE

A. Manufacturer: Company specializing in manufacture of AMCA certified louvers with minimum three years experience.

B. Structural Design: Design louvers and anchorage systems to resist wind loads as indicated on the structural drawings, but in no case less than 25 psf acting perpendicular to the plane of the louver assembly, without permanent deformation or damage. Design for a maximum deflection of 1/180 the span.

1.4 SUBMITTALS

A. Make submittals in accordance with Section 013300.

B. Shop Drawings. Show louver configurations, and details indicating relation to adjacent construction.

C. Submit product data on preassembled louvers describing design and performance characteristics, free area, materials, and finishes.

D. Certification: Submit certification that the louver systems have been designed to meet the structural requirements specified.

1.5 PROTECTION

A. Protect louvers and finishes from damage during delivery and installation.

B. Protect adjacent surfaces, finishes and materials from damage during installation of louvers.

PART 2 - PRODUCTS

2.1 LOUVERS

A. Manufacturer:
   1. As Specified: The Airolite Company (Marietta OH; 740-373-7676).
   2. Acceptable Substitutions: The C/S Group / Construction Specialties Inc. (Cranford NJ; 908-272-5200); Ruskin Manufacturing Div of Philips Industries, Inc.(Grandview MO 816-761-7476)

B. Basis of Design:
   1. Extruded aluminum narrow profile fixed louver; drainable.
   2. Fixed louver design. Provide blade braces as necessary for a straight non-sagging louver blades.
   3. Minimum 0.063" thick extruded aluminum blades and frames. Provide additional thickness as necessary to meet structural requirements.
   4. Free Area: Minimum 50% for 4 x 4 ft. unit.

5. AMCA certified rating.
6. Maximum 0.01 oz/sq ft. water penetration at 700 fpm air velocity, when tested in accordance with AMCA Standard 500.
7. Approved Products: The following products are approved, subject to the specified requirements:
   a. Model by Airolite Company.
      1) 4 inch depth: K609HP
      2) 6 inch depth: K6856
   b. Model by Construction Specialties, Inc.
      1) 4 inch depth: RS 4700
      2) 6 inch depth: A6097
   c. Model by Ruskin.
      1) 4 inch depth: ELF375DX
      2) 6 inch depth: ELF6375DXH

2.2 ACCESSORIES

A. Insect Screen: 16 x 18 mesh fiberglass insect screen, set in aluminum frame. Furnish with provision for screw attachment.

B. Fasteners: Aluminum or stainless steel.

C. Concealed Supports: Prefinished aluminum or hot-dipped galvanized steel.

D. Operating Hardware: Non-ferrous; select hardware for a smooth operating and secure installation.

2.3 FABRICATION

A. Fabricate louvers to the special shapes as indicated on the drawings.

B. Finishes: .7 mil clear anodized finish to match Architect's sample, to AAMA AA-M31C22A41.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Prior to starting work, carefully inspect installed work of other trades and verify that such work is complete to the point where work of this Section may properly commence. Notify the Architect in writing of conditions detrimental to the proper and timely completion of the work.

B. Do not begin installation until all unsatisfactory conditions are resolved. Beginning work constitutes acceptance of site conditions and responsibility for defective installation caused by prior observable conditions.

C. Verify that openings affecting this work are properly prepared and that opening dimensions are as required.

3.2 INSTALLATION

A. Install louvers in openings properly aligned and level. Install in accurate alignment with other exterior cladding elements.

B. Secure louver rigid with semi-concealed fasteners. Flash exterior louvers to drain.

C. Secure insect screen behind the open portions of each louver.

D. Clean surfaces and joints.

E. Coordinate with Section 079200 for installation of sealants.

END OF SECTION

SECTION 092116 - GYPSUM BOARD SHAFT WALL ASSEMBLIES

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:
   1. Shaft wall stud and runner framing systems.
   2. Gypsum shaft liner.

B. Related Sections:
   1. 061000 – Rough Carpentry: Partition framing.
   2. 092900 - Gypsum Board: Finish materials and accessories.
   3. 098100 - Acoustic Insulation: Acoustic batts; acoustical sealants.

C. Drawings, the provisions of the Agreement, the General Conditions, and Division 1 specification sections apply to all work of this Section.

1.2 REFERENCES

A. American Society for Testing and Materials (ASTM):
   1. C442 - Standard Specification for Gypsum Backing Board, Gypsum Coreboard, and Gypsum Shaftliner Board.
   2. C473 - Standard Test Methods for Physical Testing of Gypsum Panel Products.
   3. D3273 - Standard Test Method for Resistance to Growth of Mold on the Surface of Interior Coatings in an Environmental Chamber.
   4. E136 - Standard Test Method for Behavior of Materials in a Vertical Tube Furnace at 750ºC.
   5. E84 - Standard Test Method for Surface Burning Characteristics of Building Materials.

B. International Code Council (ICC)

1.3 SYSTEM DESCRIPTION

A. Shaft wall system shall consist of framing, liner board, acoustic insulation, and gypsum board. Work installed under this Section shall consist of framing and liner panels, installed and ready to receive gypsum board, accessories, and finishes.

B. Shaft wall system shall conform to the following:
   1. Structural: Framing shall provide a maximum finished wall deflection of 1/240 the span under loads as follows:
      a. Typical: 5 psf load.
      b. Mechanical plenum and return air duct applications: 15 psf.
      c. Elevator Shafts: 15 psf.
   2. Fire Rating: As indicated on the Drawings.
   3. Acoustic: Minimum STC rating of 44 to 47 at elevator shafts.

C. Where shaft wall construction is indicated on the Drawings, conventional metal stud and drywall construction may be substituted at the Contractor's option, subject to compliance with fire rating and applicable Code authorities having jurisdiction, accommodation of dimensional requirements indicated on the Drawings, including capacity of wall to accommodate items within the wall cavity as applicable.

1.4 REGULATORY REQUIREMENTS

A. Assemblies shall be approved by the local jurisdictional authorities.

B. Fire rating requirements take precedence over the construction requirements indicated. In the event of conflict, notify the Architect, and do not begin construction in the area of conflict until the conflict has been resolved.

1.5 SUBMITTALS

A. Make submittals in accordance with Section 013300.

B. Product Data: Submit manufacturer's complete product literature for each system. Submit ICC-ES report for each type of assembly

1.6 QUALITY ASSURANCE

A. The work of this Section is subject to special fire rated construction joint assembly requirements specified in Section 078500.

PART 2 - PRODUCTS

2.1 SHAFTWALL SYSTEM

A. Manufacturer: United States Gypsum Company, G-P Gypsum Corporation, National Gypsum Company, or approved, subject to compliance with specification requirements.

B. Shaft Wall Studs: Steel double E or C-H studs, manufactured or approved by the liner panel manufacturer, width as indicated, 20 gage minimum for 4 inch studs, 26 gage minimum for 6 inch studs, unless otherwise indicated.

C. Runner Tracks:
   1. Standard Runner: USG Type J, or approved.
   2. Deflection-Compensating Fire Rated Top Runner: As specified in Section 078500 [092200].

D. Liner Panels:
   1. Type: Fire resistant gypsum panels; one inch thick; beveled edge; 24 inch wide, lengths as required; tested as part of fire-rated assembly; mold- and mildew-resistant facing; one of the following.
      a. United States Gypsum Company "Sheetrock Brand Gypsum Liner Panels - Enhanced."
      b. G-P Gypsum Corporation "Dens-Glass Ultra Shaftliner."
      c. National Gypsum Company "Gold Bond BRAND 1” Fire-Shield Shaftliner XP."
   2. Performance
      a. Compliance ASTM C442.
      b. Combustibility: Non-combustible per ASTM E136; flame spread maximum 20; smoke developed 0, per ASTM E84.
      c. Water Resistance: Maximum 5 percent by weight after 2 hour immersion per ASTM C473.
      d. Mold and Mildew Resistance: Minimum average of 8 per ASTM D3273.

E. Accessories: As recommended by the shaft wall system manufacturer.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Prior to starting work, carefully inspect installed work of other trades and verify that such work is complete to the point where work of this Section may properly commence.

B. Notify the Architect in writing of conditions detrimental to the proper and timely completion of the work.

C. Do not begin work until all unsatisfactory conditions are resolved. Beginning work constitutes acceptance of site conditions and responsibility for defective installation caused by prior observable conditions.

3.2 SHAFTWALL INSTALLATION

A. Install shaft wall system in accordance with the manufacturer's recommendations, and as required to obtain the acoustical, fire rating, and structural requirements specified; coordinate with work of Section 092200.

B. Where shaft wall framing is indicated to extend to structural framing, slab, or deck above, use deflection-compensating fire rated top runners, unless approved otherwise. Install in accordance with the fire rated assembly requirements specified in Section 078500. Arrange core board to allow for 1/2 inch deflection of overhead structure without damage to components.

C. Bracing: Install diagonal angle bracing to structure or to other partitions as necessary to reinforce partitions against lateral movement. Maintain included angle between bracing and studs at 45 degrees, minimum.

D. Gypsum board, accessories, and finishing are specified in Section 092900.

E. Acoustical insulation within framing systems and acoustical sealant are specified in Section 098100.

F. Fill joints between gypsum board surfaces and adjacent construction with fire rated joint compound in accordance with the requirements of the fire rated construction joint assembly manufacturer.

G. Provide continuous fire rated shaft wall assemblies. Where adjacent construction interrupts fire rated assemblies, provide additional construction as necessary to maintain the continuity of the fire rated assemblies.

3.3 TOLERANCES

A. Install shaft wall system with 1/8 inch in 10 feet maximum variation from plane in each direction.

END OF SECTION

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:
   1. Interior gypsum board.
   2. Gypsum soffit board.

B. Related Sections:
   1. 061000 - Rough Carpentry: Support framing for gypsum board; wood blocking and backing.
   2. 061643 - Gypsum Sheathing.
   3. 072100 - Thermal Insulation.

C. Drawings, the provisions of the Agreement, the General Conditions, and Division 1 specification sections apply to work of this Section.

D. Substitutions: Substitutions will be considered only under the terms and conditions of Section 016000.

1.2 REFERENCES

A. American Society for Testing and Materials (ASTM):
   1. C475 - Joint Treatment Materials for Gypsum Wallboard Construction.
   2. C557 - Adhesives for Fastening Gypsum Wallboard to Wood Framing.
   3. C931 - Standard Specification for Exterior Gypsum Soffit Board
   4. C1002 - Steel Drill Screws for the Application of Gypsum Board.
   5. C1177 Standard Specification for Glass Mat Gypsum Substrate for Use as Sheathing
   6. C1395 - Specification for Gypsum Ceiling Board
   7. C1396 - Specification for Gypsum Board
   8. D3273 Standard Test Method for Resistance to Growth of Mold on the Surface of Interior Coatings in an Environmental Chamber

B. Gypsum Association (GA):
   1. GA-216 - Recommended Specifications for the Application and Finishing of Gypsum Board.

C. Northwest Wall and Ceiling Bureau (NWCB): LFGB-398 - Recommended Levels for Finishing of Gypsum Board.

1.3 SUBMITTALS

A. Make submittals in accordance with Section 013300.

B. Submit complete manufacturer's product literature and installation instructions for each of the materials used.

1.4 QUALITY ASSURANCE

A. Installer Qualifications: Registered with the Northwest Wall and Ceiling Bureau.

B. Perform work in accordance with GA 216, unless specified otherwise, or required otherwise to meet fire rating requirements.

C. Regulatory Requirements:
   1. Provide assemblies meeting the hourly fire ratings indicated and specified. Assemblies shall be approved by the local jurisdictional authorities.
   2. Fire rating requirements take precedence over the construction requirements indicated. In the event of conflict, notify the Architect, and do not begin construction in the area of conflict until the conflict has been resolved.

D. Assembly Instructions: Contractor shall keep at the site and make available to installers a copy of the following:
   1. Installation requirements for each fire rated assembly.
   2. GA 216.

E. All interior primers, adhesives, coatings and sealants shall comply with the most recent version of Rule 1168 of the South Coast Air Quality Management District.

PART 2 - PRODUCTS

2.1 GYPSUM BOARD MATERIALS

A. Furnish boards of maximum permissible length for type of installation indicated, tapered edge for boards to be exposed, taped and finished; square edge for boards in concealed applications; 5/8 inch thick unless noted or specified otherwise; furnish type X for fire rated partitions.

B. Types:
   1. Standard Board: ASTM C1396; 5/8 inch thickness unless otherwise indicated.
   2. Water Resistant Board: ASTM C1396.
   3. Ceiling Board: ASTM C1395; sag resistant.

2.2 ACCESSORIES

A. Adhesive for laminated construction: ASTM C557, unless recommended otherwise by the gypsum board manufacturer.

B. Interior Gypsum Trim:
   1. Conform to GA 216, unless indicated or specified otherwise.
   2. Concealed flange crimp-on or tape-on type; metal or PVC at Contractor's option.
   3. Control Joint Trim: USG 093 or approved.
   4. Reveal Moldings: Fry Reglet Co. , Pittcon Industries, Inc., Gordon Inc, or approved; aluminum extrusions with taping flanges; shapes as indicated.

C. Joint Tapes:
   1. Standard: ASTM C475 and GA 216.
   2. Mesh Tape for Water Resistant Backing Board: 2-1/2 inch wide glass fiber tape; 10x10 mesh; self adhesive type.

D. Joint and Finishing Compound: ASTM C475; furnish setting type joint compound for use at water resistant board.

E. Screws: ASTM C1002.

F. Light Texturing Compound: USG Spray Texture Finish, or approved.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Prior to starting work, carefully inspect installed work of other trades and verify that such work is complete to the point where work of this Section may properly commence. Notify the Architect in writing of conditions detrimental to the proper and timely completion of the work.

B. Do not begin work until unsatisfactory conditions are resolved. Beginning work constitutes acceptance of site conditions and responsibility for defective installation caused by prior observable conditions.

3.2 GYPSUM BOARD INSTALLATION

A. Install gypsum board in accordance with GA 216, and fire rated assembly requirements.

B. Erect wallboard so that edges and corners are firmly supported.

C. Double Layer Applications:
   1. Use backing board or standard board for first layer.
   2. Offset joints of second layer from joints of first layer.

D. Trim:
   1. Use longest practical lengths, with no piece less than 2 feet long for continuous runs greater than 8 feet. Securely fasten and align trim ends at joints.
   2. Place concealed flange corner beads at external corners. At angles other than 90 degrees, bend the flange to conform to the angle.
   3. Place concealed flange type L trim where gypsum board abuts dissimilar materials.
   4. Use J trim at exposed gypsum board edges and at joints where sealant is indicated.

E. Allow a 1/2 inch gap where gypsum board extends to overhead structure and deflection provisions are incorporated into lightgage metal framing. Do not fasten gypsum board to top runner. Where the ceiling is exposed in the finished work, finish top edge with a casing bead, and caulk with acrylic sealant as specified in Section 079200.

F. Sealant Joints:
   1. Coordinate installation of firestopping and sealants at concealed joints between partitions and structure at fire rated and acoustically insulated partitions.
   2. Where sealant joints are indicated at ends or edges of wallboard, install for uniform 1/8 inch joint, unless otherwise indicated. Installation of sealant in exposed locations is specified in Section 079200.

G. Provide water resistant gypsum board at walls in restrooms, toilets, shower rooms, janitor closets and other areas subject to similar damp conditions.

3.3 CONTROL JOINTS

A. Discontinue gypsum board and use control joint trim at control joints.

B. Coordinate with the framing installer to ensure that framing is installed immediately on either side of each control joint.

C. Space control joints as indicated. When not indicated, locate as follows:
   1. At maximum 30 foot intervals along continuous wall planes.
   2. At maximum 50 foot intervals at continuous ceilings with perimeter relief.
   3. At maximum 30 foot intervals at continuous ceilings without perimeter relief.
   4. At locations where expansion or control joints occur in the building structure.
   5. Locate control joints to form rectangular or square sections, in "L," "U," "T," or other irregularly shaped areas.
   6. Position control joints to intersect light fixtures, air diffusers, door openings, and other areas of stress concentration.
   7. Coordinate with Section 092200 for special requirements at fire rated assemblies.

D. Verify location with the Architect prior to installation. Give the Architect a minimum of 48 hours notice.

3.4 FINISHING

A. Provide finishing in accordance with GA 214.

B. Where necessary to sand, do so without damaging the face of the gypsum board.

C. Levels of Finish:
   1. Level 5: Not Used.
   2. Level 4: Typical, unless indicated otherwise
   3. Level 3: Provide at the following locations
      a. Surfaces to receive wall covering.
      b. Surfaces to receive textured finishes.
   4. Level 2: Provide at the following locations:
      a. Storage rooms.
      b. Mechanical rooms.
      c. Janitors closets.
      d. Surfaces to receive thick finish materials applied to gypsum board surfaces.
   5. Level 1: Provide at the following locations:
      a. Surfaces of acoustical assemblies concealed form view in the finished work

6. Level 0: Provide at surfaces of non-fire rated assemblies concealed from view in the finished work, including surfaces to be covered by casework, wood paneling,

3.5 TOLERANCES

A. Install gypsum board with 1/8 inch in 10 feet maximum variation from plane in any direction.

END OF SECTION

SECTION 093000 - TILING

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:
1. Interior wall tile.
2. Interior floor tile.
3. Reinforced waterproof membranes.
4. Crack isolation membranes.
5. Tile backing board.
6. Screeds.
7. Sealer.

B. Related Sections:
1. 061000 – Rough Carpentry: Framing and substrate
2. 079200 - Joint Sealants: Expansion joint fillers.
3. 092900 - Gypsum Board: Substrate.

C. Drawings, the provisions of the Agreement, the General Conditions, and Division 1 specification sections apply to work of this Section.

D. Substitutions: Substitute products will be considered only under the terms and conditions of Section 016000.

1.2 REFERENCES

A. American National Standards Institute (ANSI):
1. A108.1 - Ceramic Tile Installed with Portland Cement Mortar.
2. A108.5 - Installation of Ceramic Tile With Dry-Set Portland Cement Mortar or Latex-Portland Cement Mortar.
3. A108.6 - Installation of Ceramic Tile With Chemical-Resistant, Water Cleanable Tile-Setting and Grouting Epoxy.
4. A108.10 - Installation of Grout in Tilework.
5. A108.13 - Installation of Load Bearing, Bonded, Waterproof Membranes for Thin-Set Ceramic Tile and Dimension Stone.
6. A118.3 - Chemical Resistant Water Cleanable Tile-Setting and Grouting Epoxy.
7. A118.4 - Latex-Portland Cement Mortar.
8. A118.10 - Standard for Load Bearing, Bonded, Waterproof Membranes for Thin-set Ceramic Tile and Dimension Stone Installation.
9. A137.1 - Ceramic Tile

B. American Society for Testing and Materials (ASTM):
1. C144 - Aggregate for Masonry Mortar.
2. C150 - Portland Cement.
3. C206 - Finishing Hydrated Lime.
4. C207 - Hydrated Lime for Masonry Purposes.

C. Tile Council of North America (TCNA):
1. Handbook of for Ceramic Tile Installation, current edition.
2. 137.1- Recommended Standard Specifications for Ceramic Tile.

1.3 DEFINITIONS

A. Expansion Joints: Unless otherwise detailed, expansion joints in tile fields are sealant-filled joints to accommodate expansion and contraction of tile and possible substrate movement at slab control and construction joints.

B. Reinforced Waterproofing Membrane: Proprietary waterproofing membrane system installed in combination with tile application, as part of the ceramic tile work.

1.4 SUBMITTALS

A. Make submittals in accordance with Section 013300.

B. Product Data: Submit for each type of tile, grout, adhesive, additive, accessory, and membrane specified.

C. Shop Drawings: Indicate general layout, surrounding construction, location of expansion joints in substrates and tile fields, edge details, and special conditions.

D. Samples:
   1. Tile: Submit samples of each type and color of tile. Include representative range of colors and finishes to be expected.
   2. Grout: Submit cured samples of each grout color.
   3. Screeds: Submit samples of each type and finish of screed; minimum 3 inch length.

E. Schedule: Submit a schedule of each tile type, grout, and joint width combination proposed.

F. Certifications: For each type of tile specified, submit master grade certificates prior to the arrival of the shipment to the job site.

1.5 QUALITY ASSURANCE

A. Conform to ANSI Standard Specifications for the Installation of Ceramic Tile.

1.6 DELIVERY, STORAGE, AND HANDLING

A. In accordance with Section 016000.

1.7 GUARANTY

A. In accordance with Section 017700, furnish from the tile installer, a two year written guaranty, executed to the Owner, against defects in workmanship and materials.

1.8 MAINTENANCE

A. Extra Stock: Furnish minimum 1 percent of the quantity of each type of tile used in the work,

B. Leave extra stock at site where directed, in clearly marked sealed cartons.

C. Tile which is used to satisfy extra stock requirements shall be free of damaged tiles, seconds, or tile which is not in conformance with these specifications.

PART 2 - PRODUCTS

2.1 TILE

A. Tile Types: Types as indicated on the drawings.

B. Special Shapes: Unless otherwise indicated or specified, furnish special shapes as standard with the tile manufacturer for uniform transitions and concealed edges in the finished installation. Special shapes include bullnoses, double bullnoses, corner bullnoses, and cove assemblies.

2.2 ACCESSORY MATERIALS

A. Setting Materials:
   1. Type 1 Thinset Mortar: Latex modified; "Kerabond" with "Universal Keralastic" by Mapei Corp., "211 Crete Filler Powder" with "4237 Latex Thin-set Mortar Additive," by Laticrete International, Inc., "317 Floor and Wall Thin Set Mortar" with "3701 Latex Mortar Admix," by Laticrete International, Inc, or approved.
   2. Type 2 Thinset Mortar: Portland cement with 100% acrylic latex additive; in accordance with ANSI A118.4.
   3. Rapid-Set Thin Bed Mortar: Latex modified; "Grani/Rapid" with "KER 318" Flexible Admixture" by Mapei Corp., Hydroment "Single Flex FS," by Bostik, or "211 Crete Filler Powder" with "4237 Latex Thin-set Mortar Additive" and "101 Rapid Set Latex"(proportions as recommended by the manufacturer for the setting time required)," by Laticrete International, Inc.

B. Cementitious Sanded Grout:
   1. Fast Setting: "Ultra/Color" by Mapei Corp., "Floor Joint and Grout Filler" with "3701 Latex Mortar Admixture" and "101 Rapid Set Latex", by Laticrete International, Inc. (proportions as recommended by the manufacturer for the setting time required); sanded, except unsanded at joints scheduled at 1/16 inch wide.
   2. Colors: As selected by the Architect from the manufacturer's standard line.

C. Epoxy Grout: Mapei "Kerapoxy," Bostik Hydroment “100% Solids Epoxy Grout,” Laticrete International Inc. "Latapoxy SP100," or approved. Colors as selected from manufacturer's standard.

D. Uncoupling Membrane: “Ditra” by Schleuter Systems (888-472-4588).

E. Crack Isolation Membrane: One of the following.
   1. "NobleSeal CIS," by The Noble Company; reinforced CPE sheet membrane; 36" width; NobleBond 21 adhesive.
   2. "Dal-Seal CIS." By Dal-Tile Corp.
   3. "ECB Membrane," by N.A.C. Products Inc.; self bonding reinforced modified asphalt sheet membrane; 36" width.
   4. "Mapelastic SM" by the Mapei Corp.

F. Tile Backing Board and Accessories:
   1. Cementitious Backing Board: 1/2 inch nominal thickness aggregated portland cement panel, reinforced with glass fiber mesh; "Durock Brand Cement Board" by USG (800-874-8968, "Wonderboard" by Custom Building Products (800-272-8786), or approved.
   2. Joint Tape: Open weave glass mesh joint tape, self-adhesive; 2-1/2 inches wide.
   3. Fasteners: As recommended by the backing board manufacturer; thread forming self-drilling wafer head screws; polymer coated or zinc plated; USG "Durock Screws," "Rock-On," or approved.

G. Metal Screed: As manufactured by Schlüter Systems, Inc. (800-225-8902), Ceramic Tool Company, (800/236-5230), or Blanke Corporation (800/787-5055); clear anodized aluminum tile edging trim; sizes as required for installation of top of screed flush with top of tile, as detailed.

H. Metal Ramp-Screed: “Reno” Series by Schlüter Systems, Inc. (800-225-8902); configuration as indicated o as selected by Architect.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Prior to starting work, carefully inspect installed work of other trades and verify that such work is complete to the point where work of this Section may properly commence. Notify the Architect in writing of conditions detrimental to the proper and timely completion of the work.

B. Do not begin installation until unsatisfactory conditions are resolved. Beginning work constitutes acceptance of site conditions and responsibility for defective installation caused by prior observable conditions.

C. Verify that locations of expansion joints, control joints, and construction joints in substrate correspond to tile expansion joint locations.

D. Where cementitious backing board is indicated as substrate for wainscot, shim as necessary to align with gypsum board above.

3.2 PREPARATION

A. Clean substrate surfaces free of grease, dirt, dust, organic impurities, and other materials which would impair bond. Where curing agents have been used mechanically abrade or shotblast substrate surface.

3.3 TILE BACKING BOARD INSTALLATION

A. Use cementitious backing board; gypsum backing board is not acceptable.

B. Install in accordance with the manufacturer's installation instructions.

C. Install units with edges firmly supported.

D. Screw attach units with 1 inch long drywall screws spaced 6 inches on center along framing.

E. Install fiberglass reinforcing tape at joints between panels. Completely embed in a thin set mortar bed. Trowel mortar smooth with adjacent surfaces.

F. Where cementitious tile backing board is indicated as substrate for wainscot, ensure that backing board has been properly shimmed to align with gypsum board above.

3.4 UNCOUPLING MEMBRANE

A. Install uncoupling membrane in accordance with the manufacturer's instructions, unless indicated or specified otherwise.

B. Provide uncoupling membrane at following locations:
   1. Over entire wood substrate at floor tile installations,

3.5 CRACK ISOLATION MEMBRANE

A. Install crack isolation membrane in accordance with the manufacturer's instructions, unless indicated or specified otherwise.

B. Provide crack isolation membrane at following locations:
   1. At control and construction joints in concrete floors.
   2. At changes in substrate materials except where uncoupling membrane is indicated.
   3. Shrinkage cracks 1/16 inch or larger in slabs as directed by the Architect.

C. Extend a minimum of 12 inches each side of crack or joint.

D. Do not apply crack isolation membrane at joints which will be reflected as expansion joints in the tile.

E. Omit crack isolation at floors indicated for uncoupling membrane.

F. Substrate Examination:
   1. Concrete substrates are subject to examination by the Architect prior to installation of tile or slab leveling materials. Furnish a minimum of 7 days notice.
   2. The examination will determine the need for additional crack isolation membrane at shrinkage cracks and other special conditions.
   3. Provide additional crack isolation membrane in locations as directed.

3.6 SLAB LEVELING

A. Prior to installation of thinset floor tile, where local irregularities in the substrate surface would prevent level installation of the tile, the substrate shall be brought to plane surface with variations not to exceed 1/8 inch in 4 feet (cumulative) and 1/4 inch in 10 feet (non-cumulative). Smooth abrupt changes in plane.

B. Use thinset mortar or other filler for slab leveling. Other fillers are subject to endorsement by the setting mortar manufacturer. Submit manufacturer's letter of approval to the Architect, and the Owner's Representative.

C. Screed or float to appropriate thickness and specified surface tolerance. Allow to set prior to proceeding with installation. Do not exceed the maximum thicknesses for thin bed mortar as recommended by the manufacturer.

3.7 INSTALLATION OF TILE

A. Interior Floor Application - Thinset over Concrete Substrate and Concrete Substrates with Crack Isolation Membrane.
   1. TCNA System: F113 or F122 at Membranes.
   2. Installation Standard: ANSI A108.5.
   3. Setting Materials: Type 1 thinset mortar; 3/32 inch minimum thickness.
   4. Membrane: Crack isolation membrane as applicable and as specified

B. Interior Floor Application – Thinset over Wood Substrate:
   1. TCNA System: F147
   2. Installation Standard: ANSI A108.5.
   3. Bond Coat; Type 2 thinset mortar in accordance with uncoupling membrane manufacturer's instructions.
   4. Membrane: Uncoupling membrane per manufacturer's instructions

C. Wall Application - Tile Backing Board:
   1. TCNA System: Similar to W244.
   2. Installation Standard: ANSI A108.5.
   3. Setting Materials: Thinset mortar.
   4. Use vapor barrier behind tile backing board; overlap at joints a minimum of 2 inches; overlap waterproof membrane at base 3/4 inch.

D. Joint Pattern:
   1. Lay out tile pattern prior to commencing tile installation.
   2. Accurately locate grout joints on lines indicated; where not indicated, adjust grout joints within specified tolerances to minimize use of cut tiles at field edges.
   3. Where cut tiles are necessary, position tile such that cut tile at each edge of each rectilinear field is not less than half of a full size unit, unless indicated otherwise.

E. Tiles shall be blended as required to avoid pattern repeats and "patches" of adjoining tiles of distinctive color or character within each field area. Coordinate distribution of tiles with the Architect.

F. Install tiles aligned with adjacent finishes, where indicated. Provide mortar fill as necessary for proper alignment.

G. Clean joints of mortar to minimum depth of 1/4 inch to allow subsequent grout installation.

H. Provide temporary setting buttons and shims as necessary to maintain wall tiles in position until setting mortar has set.

I. Tolerances:
   1. Joint Width Variation: Plus or minus 25% of the proposed joint width.
   2. Taper: Plus or minus 25 percent from one end to the other.
   3. No portion of a tile surface shall vary more than 1/16 inch above or below an adjacent tile surface.
   4. Install tile fields level to within tolerance specified for finished substrate.

J. Special Requirements for Large Format Tiles (8 x 8 inch size or larger):
   1. Wash backs of each tile to remove dust and soil that would compromise adhesion.
   2. Dampen substrate as necessary to prevent excessive suction.
   3. Key the mortar into the substrate with the flat side of the trowel.
   4. Comb mortar over the previously keyed substrate in one direction using the notch side of the trowel.
   5. Firmly press each tile into the mortar. Press down and move the tile back and forth perpendicularly across the ridges approximately 1/8 to 1/4 inch to flatten the ridges and fill in the valleys of the combed mortar.
   6. Set tiles in accurate alignment.

K. Screed Installation:
   1. Install screeds at tile field edges at the locations indicated.
   2. Accurately cut to length for flush tightly butted joints. Provide miter cut angle joints. Remove burrs at field cuts.
   3. Install in longest possible lengths, except that no screed section shall be longer than 12 feet or shorter than 4 feet in length for continuous runs greater than 16 feet.
   4. Install screeds free from waves and variations in height, flush with top of adjacent tile surfaces.
   5. Set screeds directly in setting bed as the tile installation proceeds. Comply with screed manufacturer's instructions to achieve mortar tightly compacted between screed and tile edge.
   6. Grind screed joints as necessary to correct minor misalignment and to ease sharp outside corners.

3.8 GROUTING

A. Comply with provisions of ANSI A108.10.

B. Mix grouts in accordance with manufacturer's instructions.

C. Grout joints, except expansion joints, in accordance with the manufacturer's recommendations. Float joints to a slightly concave profile.

D. Remove excess grout from tile surfaces in accordance with the grout and tile manufacturer's recommendations. Do not use excess amounts of water.

E. Protect adjacent surfaces from damage caused by cleaning agents. Do not use cleaners which would damage tile or grout surfaces.

F. Do not grout joints indicated to receive sealants, including inside right angle corner joints between floors and walls of column bases. Grout joints perpendicular to expansion joints shall be finished flush with tile edges.

G. Cured grout joints shall be made free of efflorescence, prior to sealing.

3.9 CURING

A. Cure installation in accordance with the grout manufacturer's recommendations. Protect tile and grout during curing operations.

B. Protect tile surfaces during curing. Keep traffic off tile surfaces for a minimum of 4 days, unless recommended otherwise by the grout or mortar manufacturer.

3.10 PROTECTION

A. Protect tile installations from damage, in accordance with Section 015000.

B. Replace damaged tiles.

3.11 CLEANING

A. In accordance with Section 015000 and Section 017700.

B. Coordinate final cleaning with work of Section 079200. Do not begin cleaning operations until tile expansion joints sealants are fully cured.

C. Prior to substantial completion, wash and thoroughly rinse tile. Leave tile surfaces clean.

END OF SECTION

SECTION 096500 - RESILIENT FLOORING

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:
   1. Resilient tile flooring.
   2. Resilient stair treads.
   3. Resilient base.

B. Related Sections:
   1. 030013 - Concrete: Substrate
   2. 061000 – Rough Carpentry: Substrate

C. Drawings, the provisions of the Agreement, the General Conditions, and Division 1 specification sections apply to all work of this Section.

D. Substitutions: Substitute products will be considered only under the terms and conditions of Section 016000.

1.2 REFERENCES

A. American Society for Testing and Materials (ASTM):
   1. D5116 - Guide for Small-Scale Environmental Chamber Determination of Organic Emissions from Indoor Materials/Products.
   2. F710 - Preparing Concrete Floors to Receive Resilient Flooring.
   3. F1066 – Standard Specification for Vinyl Composition Floor Tile.
   4. F1861 - Standard Specification for Resilient Wall Base.
   5. F1869 - Standard Test Method for Measuring Moisture Vapor Emission Rate of Concrete Subfloor Using Anhydrous Calcium Chloride.
   6. F2169 - Standard Specification for Resilient Stair Treads

1.3 SUBMITTALS

A. Make submittals in accordance Section 013300.

B. Product Data:
   1. Resilient flooring.
   2. Resilient base.
   3. Resilient treads and risers.
   4. Accessories.

C. Shop drawings: Indicate floor pattern, color of various materials, and location of floor accessories.

D. Samples:
   1. Each type and color of resilient flooring material including stair treads; not less than 8"x10" in size.
   2. Each type and color of resilient base scheduled; not less than 12 inches in length.
   3. Submit samples, not less than 12 inches in length, of each type of transition strip required for the work.

1.4 QUALITY ASSURANCE

A. Qualifications of Installers:
   1. Use only skilled and experienced resilient flooring installers for preparation of substrate and installation of resilient flooring.
   2. Helpers and apprentices used for such work shall be under full and constant supervision at all times by thoroughly skilled resilient flooring installers.

B. All interior primers, adhesives, coatings and sealants shall comply with the most recent version of Rule 1168 of the South Coast Air Quality Management District.

1.5 DELIVERY, STORAGE, AND HANDLING

A. In accordance with Section 016000.

1.6 ENVIRONMENTAL REQUIREMENTS

A. Maintain minimum 70 degrees F air temperature at flooring installation area for three days prior to, during, and for 24 hours after installation.

B. Store flooring materials in area of application. Allow three days for material to reach equal temperature as area.

1.7 EXTRA STOCK

A. Deliver 5 percent of each color and pattern of floor material required for project, for maintenance use.

B. Clearly identify each box or roll.

PART 2 - PRODUCTS

2.1 RESILIENT FLOORING

A. Luxury Vinyl Tile (LVT) Flooring:
   1. Conform to ASTM F1066.
   2. Heat tolerance to withstand 85 degrees F
   3. Provide the following, as scheduled:
      a. Armstrong “Biome Wood Tones,” color Oak.
      b. Armstrong “Creations Classics,” color Roan Oak.
      c. Mohawk “Morikato Wood,” color Teak.
      d. Mannington “Nature’s Paths”, color Honey Elegant Oak.
      e. As approved

2.2 RESILIENT BASE

A. Manufacturer: One of the following, subject to Architect's approval of color:
   1. Roppe Rubber Corp.
   2. Burke Flooring Products / Burke Industries.
   3. Allstate Rubber Corp.

B. Resilient Base: ASTM F1861, Type TS, 100 percent vulcanized rubber; 1/8 inch thick; roll stock; coved and straight base as specified; 4 inch height, unless otherwise indicated on the Drawings.

2.3 STAIR MATERIALS

A. Treads:
   1. ASTM F2169 Type TS, class 2.
   2. Manufacturer: Roppe Corporation (Fostoria, OH; 800-537-9527)
   3. Product: Rubber Treads, hammered profile; square nose one-piece tread and riser; color as scheduled or selected by the Architect.
   4. Integral Nosing Strip: TBD
   5. Provide special matching stringer to fit stair configuration.

2.4 ACCESSORIES

A. Subfloor Filler: Portland cement based latex filler, mixed with water to produce a self leveling underlayment, or cementitious paste, as appropriate to project requirements.

B. Adhesives:
   1. Types recommended by resilient flooring and base manufacturers for specific application.
   2. Adhesives shall meet the requirements of the Southern California South Coast Air Quality Management District (SCAQMD) Rule 1168. (maximum VOC content of 50 grams/liter for floor covering and resilient base adhesives; 60 grams/liter for rubber flooring adhesives).
   3. Heat tolerance for adhesives to withstand 85 degrees F.

C. Transition Strips: Vinyl; color as selected by the Architect from manufacturer's standard; for use only interior of apartments or interior of rooms.

D. All other materials not specifically described, but required for a complete and proper installation of resilient flooring, shall be only as recommended by the manufacturer of the material to which it is applied and shall be subject to the approval of the Architect.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine site conditions and verify that the work of this Section may properly commence. Notify the Architect in writing of unsatisfactory conditions.

B. Moisture Testing of Concrete Slabs:
   1. Test at all concrete slabs indicated to receive resilient flooring, to determine the vapor emission rate.
   2. Perform tests in accordance with ASTM F1869.
   3. Notify the Architect if tests results show a vapor emission rate which exceeds 3 lbs per 1000 sf in a 24 hour period.
   4. Test kits are available from VAPRECISION 800-449-6194.

C. Do not begin installation until all unsatisfactory conditions are resolved. Beginning work constitutes acceptance of site conditions and responsibility for defective installation caused by prior observable conditions.

3.2 PREPARATION

A. Prepare floors in accordance with ASTM F710. Install subfloor filler to fill low spots, cracks, construction joints, holes and other defects, and as required to adjust level to meet adjacent finishes. Feather to maximum slope of 1/8 inch in 1 foot; float to smooth, flat, hard surface. Prohibit traffic over filler.

3.3 FLOORING INSTALLATION

A. Install all resilient flooring where scheduled in accordance with the manufacturer's recommendations.

B. Unless indicated otherwise, install resilient flooring with joints and seams parallel to building lines.

C. Terminate resilient flooring at centerline of door at door openings where adjacent floor finish is dissimilar, and where no threshold is indicated.

D. Install edge strips at unprotected or exposed edges where flooring terminates.

E. Scribe flooring to walls, columns, cabinets, floor outlets and other appurtenances to produce tight joints.

F. Clean substrate. Spread cement evenly in quantity recommended by manufacturer to ensure adhesion over entire area of installation. Spread only enough adhesive to permit installation of flooring before initial set.

G. Set flooring in place, press with heavy roller to ensure full adhesion.

H. Continue flooring through areas to receive moveable type partitions without interrupting floor pattern.

I. Special Requirements for Resilient Tile:
   1. Open floor tile cartons, enough to cover each area, and mix tile to ensure shade variations do not occur within any one area.
   2. Unless indicated otherwise, lay tiles parallel to building lines to produce symmetrical tile pattern.
   3. Install with minimum tile width 1/2 full size at room or area perimeter.
   4. Arrange to grid pattern with all joints aligned, with pattern grain parallel for all units and parallel to the length of the room.

J. Seal joint between flooring and adjacent materials at restrooms, bathrooms, kitchens, and other moist areas with clear silicone sealant.

3.4 BASE INSTALLATION

A. Adhesive install base materials in accordance with the manufacturer's recommendations.

B. Install base in maximum practical lengths, with minimum number of joints in each run. Fit joints tight, vertical, and in accurate alignment.

C. Install straight style base at all walls where resilient base is scheduled in areas with carpeted floors; install cove style base at walls scheduled for resilient base abutting hard surface and resilient floors.

D. Install base to walls, columns, and to casework toe kicks in all areas where resilient base is scheduled, and where no other base finish is specifically noted or detailed.

E. Coordinate installation of base with work of Section 096800.

F. Fit joints tight and vertical, in accurate alignment. For straight runs greater than 48 inches, maintain minimum 18 inches between joints.

G. Score back of base material with grooving tool, at all outside corners; maintain minimum leg length 18 inches where wall length permits. Mount base so that scored groove is accurately aligned with corner, and with base tightly adhered to wall at both sides of corner, with no visible gaps at top of base. Where cove base is formed around outside corners, stretch toe of cove for smooth transition around corner, with toe in uniform contact with the finish flooring.

H. Miter or cope inside corners for accurate fit.

I. Scribe and fit to door frames, stairs, and other obstructions.

J. Install straight and level to maximum variation of plus or minus 1/8 inch over 10 feet.

3.5 INSTALLATION - STAIR TREADS

A. Install stair treads and risers in compliance with the manufacturer's instructions. Provide primers or filers as recommended by the manufacturer for the conditions.

B. Install stair treads and risers, one piece for full width of tread.

C. Adhere over entire surface and fit accurately and securely.

D. Install stringer base

3.6 PROTECTION

A. Unless recommended otherwise by the adhesive manufacturer, prohibit traffic from resilient flooring for 48 hours after installation.

3.7 CLEANING

A. Upon completion of the installation, immediately remove all surplus adhesive from adjacent surfaces.

B. As soon as possible after installation, and in accordance with the timing recommended by the manufacturers, clean the entire resilient flooring surface using the materials recommended for that purpose by the manufacturers of the materials being cleaned.

END OF SECTION

SECTION 096723 - RESINOUS FLOORING

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes: Seamless multi-part polymer flooring system.

B. Related Sections:
   1. 061000 – Rough Carpentry: Substrate.

C. Drawings, the provisions of the Agreement, the General Conditions, and Division 1 specification sections apply to all work of this Section.

D. Substitutions: Substitutions will be considered only under the terms and conditions of Section 016000.

1.2 REFERENCES

A. American Society for Testing and Materials (ASTM):
   1. C307 - Test Method for Tensile Strength of Chemical-Resistant Mortars, Grouts, and Monolithic Surfacings.
   2. C579 - Test Methods for Compressive Strength of Chemical-Resistant Resistant Mortars and Monolithic Surfacings.
   3. D635 - Test Method for Rate of Burning and/or Extent and Time of Burning of Self-Supporting Plastics in a Horizontal Position.
   4. D638 - Test Method for Tensile Properties of Plastics.
   5. D2240 - Test Method for Rubber Property -- Durometer Hardness.

1.3 SUBMITTALS

A. Make submittals in accordance with Section 013300, unless specified otherwise.

B. Product Data: Submit product data and manufacturer's installation instructions.

C. Samples: Provide one minimum 1"x3" size sample of flooring material, applied to a suitable substrate, indicative of material and finish proposed for the finished work.

D. Submit letter from the manufacturer stating that the installer is approved by the flooring system manufacturer.

E. Maintenance Data: In accordance with Section 017700, furnish manufacturer's instructions covering care and maintenance of flooring.

1.4 QUALITY ASSURANCE

A. Applicator Qualifications: Acceptable to the primary materials manufacturer, regularly engaged in the installation of polymer floor systems, with minimum three years experience; able to demonstrate successful completion of at least five projects of similar size and complexity.

B. Pre-Installation Conference: Arrange a conference at the job site to coordinate resinous flooring and critical finish systems, to be attended by the General Contractor, Architect/Owner’s Representative and personnel involved in the actual manufacture as well as the installation of the Work in this Section and of the following Sections:
   1. Section 061000– Rough Carpentry: Subflooring

1.5 DELIVERY, STORAGE, AND HANDLING

A. In accordance with Section 016000.

B. Storage: Store materials in a protected location in strict accordance with the manufacturer's recommendations. Maintain temperature of storage area between 60°F and 90°F.

1.6 ENVIRONMENTAL CONDITIONS

A. Unless otherwise required by the flooring manufacturer, maintain surface and ambient temperature between 60°F and 90°F during installation and for 24 hours after flooring has cured.

B. Maintain ventilation to remove volatile emissions produced during the installation process.

C. Provide uniform and sufficient lighting in areas of installation.

PART 2 - PRODUCTS

2.1 SEAMLESS FLOORING SYSTEM

A. Approved Systems:
   1. Basis of Design: Stonclad GS with Stonkote GS4, total minimum thickness of 1/4", comprised of a penetrating two component epoxy primer, high performance, four-component mortar consisting of epoxy resin, curing agent, selected, graded aggregates blended with inorganic pigments, a two-component, high performance, pigmented epoxy sealer as manufactured and installed by Stonhard,

B. Components:
   1. Standard Primer: A two-component epoxy primer.
   2. Mortar Base (Stonclad GS):
      a. Formulation Description: Four-component mortar consisting of epoxy resin, curing agent, selected, graded aggregates blended with inorganic pigments.
      b. Type: Pigmented mortar
      c. Application Method: Steel trowel
      d. Application thickness: 1/4" minimum
   3. Sealer (Stonkote GS4):
      a. Resin: Epoxy
      b. Formulation Description: Two-component, high performance, epoxy sealer.
      c. Type: Pigmented
      d. Finish: Gloss
      e. Number of Coats: 1
   4. Joint/Crack Treatment:
      1. Stonproof CT5: Two-component, flexibilized, epoxy membrane designed exclusively for use in the isolation of dynamic cracks.

C. Color and Finish: As selected by Architect.

2.2 ACCESSORIES

A. Cove Strip: 1/4" radius screed with attachment flange for top edge of cove.

B. Sealant: Manufacturer's standard elastomeric urethane sealant.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Prior to starting work, carefully inspect installed work of other trades and verify that such work is complete to the point where work of this Section may properly commence. Notify the Architect in writing of conditions detrimental to the proper and timely completion of the work.

B. Do not begin installation until all unsatisfactory conditions are resolved. Beginning work constitutes acceptance of site conditions and responsibility for defective installation caused by prior observable conditions.

3.2 PREPARATION

A. Wood Substrate Preparation: Wood substrates shall be swept and vacuumed and examined for the identification for bond inhibiting materials.

3.3 INSTALLATION

A. Apply flooring in strict accordance with manufacturer's recommendations. Finish surface shall be smooth and even with no deviations from plane greater than 1/8 inch in 10 feet, and free of depressions subject to puddling. Transitions shall be smooth and gradual.

B. Thickness: 5/16" inch nominal, with minimum thickness 1/4".

C. Install cove strip 6 inches above finish floor; bed in sealant and screw through to studs. Detail cove base at all wall intersections in accordance with the manufacturer's recommendations; form uniform 1 inch to 2 inch radius cove.

D. After application of base, undercoat, and aggregate, and after undercoat has cured, thoroughly broom clean the floor to remove excess aggregate. Squeegee and backroll sealer in accordance with manufacturer's instructions for "Medium Texture" finish.

E. Seal around equipment bases and floor penetrations.

3.4 CLEAN-UP

A. After installation, clean up excess materials and rubbish.

B. Prior to Substantial Completion, clean the floor surface with cleaning agents recommended by the flooring system manufacturer.

3.5 PROTECTION

A. Adjacent Surfaces: Protect adjacent surfaces and materials from damage. Repair all damage to surrounding surfaces and materials to the satisfaction of the Architect.

B. Protect the installation from damage until final acceptance of the work.

END OF SECTION

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes: Carpet tiles, glued down to concrete or plywood substrate as indicated.

B. Related Section:
   1. 030013 - Concrete: Substrate; slab level tolerances.
   2. 061000 – Rough Carpentry: Plywood substrate

C. Drawings, the provisions of the Agreement, the General Conditions, and Division 1 specification sections apply to all work of this Section.

D. Substitutions: Substitute products will be considered only under the terms and conditions of Section 016000.

1.2 REFERENCES

A. American Society for Testing & Materials (ASTM):
   1. D4263 - Standard Test Method for Indicating Moisture in Concrete by the Plastic Sheet Method.
   2. E648-78 - Test Method for Critical Radiant Flux of Floor Covering Systems Using a Radiant Heat Energy Source.

B. American Association of Textile Chemists & Colorists (AATCC): 134-1975 - Electrostatic Propensity of Carpet.

1.3 SUBMITTALS

A. Make submittals in accordance with provisions of 013300 and 017700, as applicable.

B. Product Data: Submit carpet manufacturer's material specification and installation instructions.

C. Samples: For each color and type of carpet tile proposed for the work, submit two full size carpet tiles.

D. Maintenance Manuals: Furnish Owner with 2 printed copies of the manufacturer's recommendation for the care, cleaning, and maintenance of the carpet, including detailed instructions pertaining to the cleaning and removal of stains.

1.4 QUALITY ASSURANCE

A. Installer Qualifications: Specialist in carpet installation employing only skilled craftsmen.

B. Measurement Verification: Measurements shown on the Drawings are approximate. The Contractor's shall verify all dimensions and job site conditions; order sufficient carpet tiles to fully carpet areas as indicated and to fill overage requirements as specified.

C. All carpet of the same type shall be from the same dye lot.

1.5 DELIVERY, STORAGE, AND HANDLING

A. In accordance with Section 016000.

B. Delivery: Deliver carpet tiles to site in manufacturer's original packages clearly labeled with the manufacturer's name, brand, and related information. Upon receipt of materials, inspect for in transit damage and replace if necessary.

C. Storage: Store in dry, clean, well ventilated space; protect from damage, soiling, fading and moisture.

1.6 JOB CONDITIONS

A. Precondition: Leave carpet tiles in area to be tiled for 48 hours prior to installation.

B. Environmental Conditions: Maintain temperature in space in accordance with carpet or adhesive manufacturer's recommendations, but in no case less than 60 degrees F for 24 hours prior to, during, and after installation. Permit no traffic over newly laid adhesive applied carpet for a minimum of 24 hours after installation.

1.7 WARRANTY

A. Installed carpeting shall be warranted by the manufacturer for a period of ten years from the date of purchase, against wear in excess of ten percent of face weight, backing delamination, edge ravel, and change in dimension, and cup, dome, or dish.

1.8 MAINTENANCE

A. Extra Stock: Furnish extra uncut carpet tile in the amount of 5 percent of the installed quantity of each type and color of carpet tile. Deliver to the Owner in clearly market cartons; store where directed.

PART 2 - PRODUCTS

2.1 CARPET TILE

A. Carpet tile is indicated on the Drawings.

2.2 RELATED MATERIALS

A. Installation Tabs:
   1. At Interface Carpets, use manufacturer’s “Tactiles” modular carpet tabs.
   2. At other tiles: Manufacturer’s recommended adhesive tab system for modular carpet.

B. Adhesive: W.W. Henry Company "Peach Glue", 3M Company "Blue Glue", or approved waterproof, non-flammable carpet adhesive as recommended by the carpet tile manufacturer for compatibility with carpet backing. Carpet adhesive shall be release type, allowing carpet tiles to be removed and replaced at a later date without damaging or removing the adjacent tile pieces.

C. Floor Transition Strips: Unless otherwise indicated, floor transition strips at all transitions where carpet abuts concrete shall be stainless steel. Furnish Phillips head stainless steel countersunk screws and lead expansion anchors as necessary for anchorage.

D. Latex Underlayment: White premix latex filler, mixed with water to produce cementitious paste. Dependable Chemical Co., Inc. "Dependable White Skimcoat Underlayment" with "Latex Liquid Additive" or W.W. Henry Company "#335 Underlayment Powder" with #336 Latex Liquid Additive."

E. Miscellaneous: Furnish incidental and accessory materials, tools, and equipment required for installation of carpet.

F. Protection Paper: Fortifiber Corporation "Seekure 892," or approved heavy, reinforced, non-staining kraft laminated paper.

PART 3 - EXECUTION

3.1 INSPECTION

A. General: Do not start work under this Section until work of other trades, including painting, is substantially completed. Inspect surfaces to receive carpet; do not proceed with the work until unsatisfactory conditions have been corrected. Commencement of work constitutes acceptance of surfaces.

B. Preparation: Surfaces shall be dry, firm, sound and free from oil, dirt, paint, joint compound, bond-breaking or curing compounds, or other foreign matter. Surfaces shall be free from unusual roughness and sharp edges such that the installed carpet will present an even, smooth appearance. Damp mop floors with warm water and vacuum after mopping.

C. Cracks: Fill cracks, indents and other imperfections which could interfere with satisfactory installation with latex underlayment, mixed and applied in accordance with the manufacturer's printed instructions. Trowel to smooth surface. Allow underlayment to fully dry before applying carpet adhesive.

D. Moisture Test: Prior to commencement of carpet tile installation, and unless otherwise recommended by the carpet adhesive manufacturer, conduct standard 16-hour moisture test on concrete floors in accordance with ASTM D4263, at each area to receive carpet tile.

3.2 INSTALLATION – ADHESIVE SET

A. Floor adhesive shall be applied in accordance with adhesive manufacturer's recommendations using a roller to ensure 100 percent contact.

B. Installation: Place all carpet tiles in accordance with manufacturer's recommended procedures. Carpet tiles shall be adhesively applied to concrete slab. All carpet tile shall be oriented in the same direction and shall lay completely flat.

C. Lay out area such that cut perimeter tiles will be not less than 8 inches wide. Commence laying tile in center of room or space and work toward perimeters; cut border tile after field tiles have been installed. Cut carpet evenly and accurately to fit neatly at walls, columns, and projections. Lay tile square with area of installation. Joints shall be tight and unnoticeable upon completion.

D. All cutting of carpet for telephone and electrical outlets shall be the responsibility of the carpet installer.

E. Carpet tile installation shall be rolled and rerolled on the day following installation to assure complete transfer of adhesive.

F. Install floor transition strips at terminations where required. Secure strips to substrate with specified anchors, spaced 6" o.c., maximum.

3.3 CLEANING AND PROTECTION

A. Cleaning: Remove all spillage and adhesive from the face of the installed carpet immediately. Use recommended cleaning materials. On completion of installation, the entire carpet area shall be cleaned with an upright beater-type vacuum cleaner.

B. All defective and damaged carpet tiles, improperly cut tiles, and carpet tiles on which there are stains which cannot be completely removed to the satisfaction of the Architect or Owner, shall be replaced with new. The entire installation shall be left clean and free from imperfections.

C. Protection: Following cleaning and vacuuming, protect the carpeting from soiling and damage until final acceptance. [In areas where painting or other wet work is to be performed subsequent to carpeting installation, protection shall be accomplished using specified protection paper. Lap edges of paper 6 inches and secure with non-staining tape. The covering shall be kept in repair and damaged portions replaced during the construction period.]

END OF SECTION

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes: Wall coverings.

B. Related Sections:
   1. 092900 - Gypsum Board: Substrate.
   2. 099000 - Painting and Coating: Primer for substrates to receive wall covering.

C. Drawings, the provisions of the Agreement, the General Conditions, and Division 1 specification sections apply to all work of this Section.

D. Substitutions: Substitutions will be considered only under the terms and conditions of Section 016000.

1.2 REFERENCES

A. American Society for Testing and Materials (ASTM): E84 - Test Method for Surface Burning Characteristics of Building Materials.

1.3 PERFORMANCE REQUIREMENTS

A. Fire-Test-Response Characteristics: As determined by testing identical wall coverings applied with identical adhesives to substrates according to test method indicated below by a qualified testing agency. Identify products with appropriate markings of applicable testing agency.
   1. Surface-Burning Characteristics: Comply with ASTM E84; testing by a qualified testing agency. Identify products with appropriate markings of applicable testing agency.
      a. Flame-Spread Index: 25 or less.

1.4 SUBMITTALS

A. Make submittals in accordance with Section 013300, unless specified otherwise.

B. Product Data:
   1. Submit product data on proposed adhesives and accessories.

C. Quality Control Submittals:
   1. Certification: Submit certification that all fabric which does not meet current flame spread requirements has been fire retardant treated to meet the requirements specified.

D. Contract Closeout Submittals: Submit product information and maintenance instructions as a part of Operation and Maintenance Data submittals specified in Section 017700.

1.5 QUALITY CONTROL

A. Wall Covering Installer: Minimum of 3 years experience in wall covering installations of similar size and scope. Able to show evidence of experience when requested by the Architect.

B. All interior primers, adhesives, coatings and sealants shall comply with the most recent version of Rule 1168 of the South Coast Air Quality Management District.

1.6 DELIVERY, STORAGE, AND HANDLING

A. In accordance with Section 016000.

B. Store wall covering materials flat, not upright, in a dry area. Maintain temperature of storage area at a minimum of 45 degrees F., unless a higher temperature is recommended by wall covering manufacturer.

1.7 ENVIRONMENTAL CONDITIONS

A. Temperature:
   1. Do no wall covering work until surfaces and materials have been maintained at 60 degrees F. minimum, or higher if recommended by wall covering manufacturer, for 3 days before work begins.

2. Maintain minimum or above temperatures during the entire installing time and until adhesives have fully dried or cured.

B. Lighting: During installation, maintain minimum lighting level of 15 foot-candles on the surfaces to receive wall covering. Use temporary lighting, if necessary, to attain specified level.

C. Ventilation: Provide adequate continuous ventilation during the work and until adhesives have fully dried or cured.

PART 2 - PRODUCTS

2.1 WALL COVERING - GENERAL

A. Types as scheduled on the Drawings.

B. All wall coverings shall have a maximum flame spread of 75 or less when tested in accordance with the currently enforced edition of ASTM E84. Fire retardant treat all nonconforming wall covering. Treatment shall not alter the appearance of the fabric.

2.2 ACCESSORIES

A. Adhesive: Mildew-resistant, nonstaining, strippable adhesive, for use with specific wall covering and substrate application indicated and as recommended in writing by wall-covering manufacturer. No VOC

B. Primer/Sealer: Mildew resistant, complying with requirements in Section 09 91 23 "Interior Painting" and recommended in writing by wall-covering manufacturers for intended substrate.

C. Seam Tape: As recommended in writing by wall-covering manufacturer.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrate and notify the Architect of unacceptable conditions which would prevent a satisfactory installation. Unacceptable conditions include, without limitation, cracks, voids, ridges, oils, grease, moisture, porosity, indelible and water soluble crayon, ball or felt tip pen marks, and foreign materials.

B. Do not begin installation until all unsatisfactory conditions are resolved. Beginning work constitutes acceptance of site conditions and responsibility for defective installation caused by prior observable conditions.

C. Ensure that surfaces to receive wall covering have received a coat of wall size as specified in Section 099000.

3.2 PREPARATION

A. Schedule work such that the subsequent work of other sections will not damage the work of this section.

B. Verify the type, pattern, color, and quantity of each type wall covering for each location scheduled to receive wall covering.

C. Remove electrical outlet and switch plates, mechanical diffusers, escutcheons, registers, surface hardware, fittings, and fastenings prior to starting work; store during and replace after work.

D. Protection: Provide sufficient drop cloths, shields, and protective equipment to prevent wall covering materials from fouling adjacent surfaces, and in particular at storage and preparation areas.

E. At existing painted surfaces, evenly roughen with a medium grit garnet paper, wash with TSP, wipe clear water, allow to dry, and size with wall covering adhesive.

F. Apply lining paper over substrates where required by the wall covering manufacturer and as required to obtain the installation standards specified.

3.3 WALL COVERING INSTALLATION

A. Mix and apply adhesives in strict accordance with the adhesive manufacturer's directions for the type of material being applied.

B. Install wall covering secure, smooth, clean, and without wrinkles, gaps or overlaps.

C. Extend wall covering continuously behind such items as mirrors, and other items which are close to but not touching walls.

D. Install wall covering where scheduled in strict accordance with the wall covering manufacturer's recommendations.

E. Cut wall-covering strips in roll number sequence. Change the roll numbers at partition breaks and corners.

F. Install strips in same order as cut from roll.

G. Provide double-cut seams on nonmatch patterns; butt seams on match patterns.

H. Install wall covering oriented vertically, unless otherwise indicated. Horizontal seams are not permitted.

I. Corner Seams: Make no seams within 6 inches of an inside or outside corner, except where a color or pattern change is indicated. Lap wall coverings at inside corner seams to prevent substrate show through.

J. Fabrics:
   1. Use fabric rolls in consecutive numerical sequence of manufacture.
   2. Place fabric sections consecutively in exact order in which they are cut from the roll including filling all spaces above or below windows, doors, or similar penetrations.
   3. Trim patterned fabrics which are not factory pretrimmed on a work table with a straight edge and an industrial razor blade for exact pattern match.

3.4 CLEANUP

A. Remove all adhesives, and other contaminants in a manner which will not damage the surface from which it is removed.

B. Remove debris and leave areas neat and clean.

C. Replace all removed wall plates and other accessories.

D. Repair to like-new condition, or replace as directed by the Architect, all surfaces damaged by work of this Section.

END OF SECTION

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes: Plastic laminate sheet adhered directly to the wall.

B. Related Section:
   1. 092900 - Gypsum Board: Substrate.

C. Drawings, the provisions of the Agreement, the General Conditions, and Division 1 specification sections apply to all work of this Section.

D. Substitutions: Substitutions will be considered only under the terms and conditions of Section 016000.

1.2 SUBMITTALS

A. Make submittals in accordance with Section 013300.

B. Product Literature: Adhesive.

C. Samples:
   1. Three 8"x10" samples of each type of plastic laminate to be used.
   2. Cap moldings.

1.3 QUALITY ASSURANCE

A. All interior primers, adhesives, coatings and sealants shall comply with the most recent version of Rule 1168 of the South Coast Air Quality Management District.

1.4 DELIVERY, STORAGE AND HANDLING

A. Delivery: Deliver laminate sheets flat in protective cartons.

B. Storage: Store laminate sheets flat in a dry location. Acclimate to design temperature a minimum of 48 hours prior to installation.

1.5 ENVIRONMENTAL CONDITIONS

A. Maintain temperature and humidity in accordance with the adhesive manufacturer's recommendations.

B. Maintain adequate ventilation and conditions to prevent combustion of adhesive fumes.

PART 2 - PRODUCTS

2.1 HIGH PRESSURE LAMINATED PLASTIC

A. .050 thick; general purpose grade; color and finish as noted on the Drawings.

B. Cap Moldings: Aluminum; standard color as selected by the Architect.

C. Adhesive: Contact bond adhesive.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Prior to starting work, carefully inspect installed work of other trades and verify that such work is complete to the point where work of this Section may properly commence. Notify the Architect in writing of conditions detrimental to the proper and timely completion of the work.

B. Do not begin installation until all unsatisfactory conditions are resolved. Beginning work constitutes acceptance of site conditions and responsibility for defective installation caused by prior observable conditions.

3.2 CUTTING AND FITTING

A. Apply temporary strippable coating to plastic laminate to protect finished surfaces during cutting and fitting operations.

B. Cut plastic laminate to the shapes indicated.

C. File all edges smooth from face to back without chipping or causing craze lines.

D. Cut holes accurately to conform to the penetration, and oversized by 1/16" all around.

E. Allow 1/16 inch expansion space between panels and at all surrounding construction. Exposed edges shall be smooth and self-trimming.

F. Dry fit sheets into place before applying adhesive.

3.3 INSTALLATION OF LAMINATE

A. Clean substrate and laminate surfaces.

B. Apply adhesive in accordance with the manufacturer's printed application instructions.

C. Contact bond each sheet to the substrate by progressing from one side to the other to expel all air.

D. Apply pressure uniformly to the face of the sheet by using a wide hard rubber roller.

E. Install cap molding at all exposed edges.

3.4 CLEANING

A. Remove temporary strippable coatings after other work is completed in areas of plastic laminate surfacing.

B. Remove all adhesive from face of laminate using solvent recommended by manufacturer of adhesive.

C. Prevent solvent from penetrating glue line at edges and joints of laminate.

D. Clean laminate surfaces in accordance with recommendations of laminate manufacturer.

END OF SECTION

SECTION 098100 - ACOUSTIC INSULATION

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:
   1. Acoustical insulation in walls and ceilings.
   2. Acoustical sealant.

B. Related Sections:
   1. 061000 - Rough Carpentry: Support framing.
   2. 072100 - Thermal Insulation: Thermal batt and blanket insulation.
   3. 078400 - Firestopping: Fire rated penetration seals.
   4. 092116 - Gypsum Board Shaft Wall Assemblies: Acoustical performance requirements for shaft wall assemblies.

C. Drawings, the provisions of the Agreement, the General Conditions, and Division 1 specification sections apply to all work of this Section.

D. Substitutions: Substitute products will be considered only under the terms and conditions of Section 016000.

1.2 REFERENCES

A. American Society for Testing and Materials (ASTM):
   1. C665 - Mineral Fiber Blanket Thermal Insulation for Light Frame Construction and Manufactured Housing.
   2. E84 - Test Method for Surface Burning Characteristics of Building Materials.

1.3 SUBMITTALS

A. Make submittals in accordance with Section 013300.

1.4 QUALITY ASSURANCE

A. All interior primers, adhesives, coatings and sealants shall comply with the most recent version of Rule 1168 of the South Coast Air Quality Management District.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Batt Acoustical Insulation: ASTM C665, Type I; unfaced glass fiber batts, blankets, or rolls; minimum fire hazard classification rating of 25/50 per ASTM E84; 2-3/4 inches thick for installation in 2-1/2 inch stud cavities; 3-5/8 to 4 inches thick for installation in 3-5/8 inch stud cavities;6-1/2 inches thick for installation in 6 inch stud cavities; widths to friction-fit between studs, where indicated for installation in stud walls[; formaldehyde free].

B. Acoustical Sealant: Non-hardening, low-shrinkage; for use in conjunction with gypsum board; similar to USG "Sheetrock Brand Acoustical Sealant," Tremco "Acoustical Sealant 30CTG," Quiet Solution (Sunnyvale CA; ; 408-541-8000) "QuietSeal QS-350," or approved; maximum VOC content 250g/L.

C. Accessories: Furnish other accessories such as fasteners and retainers, not specifically described, but required for a complete installation.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Prior to starting work, carefully inspect installed work of other trades and verify that such work is complete to the point where work of this Section may properly commence.

B. Notify the Architect in writing of conditions detrimental to the proper and timely completion of the work.

C. Do not begin work until all unsatisfactory conditions are resolved. Beginning work constitutes acceptance of site conditions and responsibility for defective installation caused by prior observable conditions.

3.2 PREPARATION

A. Verify that adjacent materials are secure, properly spaced, dry, and ready to receive installation.

B. Verify that mechanical and electrical services within spaces to insulated have been installed and tested.

C. Furnish acoustical insulation to hollow metal installer for installation in hollow metal frames in acoustical partitions.

3.3 INSTALLATION

A. Install insulation in stud cavities in accordance with manufacturer's instructions, and as indicated. Coordinate with other trades as necessary to complete acoustical barriers at wall penetrations.

B. Install insulation without gaps or voids.

C. Trim insulation neatly to fit spaces. Use insulation materials free of damage.

D. Acoustical Insulation at Ceilings:
   1. Lay acoustical insulation over each acoustically insulated partition which terminates at the ceiling. Insulation shall extend a minimum of 48" each side of the centerline of the acoustical partition
   2. Acoustical insulation batts shall be tightly butted.
   3. Cut and fit neatly around mechanical and sprinkler drops.
   4. Fill spaces between wall batts (at top plate line) and ceiling batts to ensure complete sound closure.
   5. Omit insulation over tops of recessed fluorescent light fixtures; and within 2 inches of recessed incandescent fixtures.

E. Sealant:
   1. Install acoustical sealant continuously around perimeter of all acoustically insulated partitions; one continuous bead at each side of framing member interface with substrate.
   2. Where double layer of gypsum board is indicated, provide sealant at butt joints between boards , including corner joints, and additional bead at perimeter of base layer prior to installation of finish layer.
   3. Except for penetrations in fire rated construction to receive firestopping or fire rated construction joint assemblies, seal all penetrations through acoustical assemblies, including cutouts for lighting fixtures, cabinets, pipes and plumbing, HVAC ducts, and electrical boxes.

END OF SECTION

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes: Site applied paint coatings, except as otherwise noted.

B. Related Sections:
1. 051200 - Structural Steel: Preprimed metal surfaces.
2. 055000 - Metal Fabrications: Pre-primed metal surfaces.
3. 064000 - Architectural Woodwork: Shop finished materials.
4. 081113 - Hollow Metal Doors and Frames: Preprimed metal surfaces.
5. 081400 - Wood Doors: Prefinished doors.
6. 097200 - Wall Coverings: Finish material over primed surfaces.

C. Drawings, the provisions of the Agreement, the General Conditions, and Division 1 specification sections apply to all work of this Section.

D. Substitutions: Substitute products will be considered only under the terms and conditions of Section 016000.

1.2 DEFINITIONS:

A. Sheen: Degree of luster of the dried paint film. Where terms such as "gloss," "semi-gloss," "low-gloss," "matte," "satin," "eggshell," or "flat," are used, it shall be subject to the Architect's interpretation, regardless of manufacturer's nomenclature for any particular sheen level. The Architect reserves the right to select from any of manufacturer's published sheen levels for each paint system, if sheen of initial paint finish sample is not approved.

1.3 SUBMITTALS

A. Make submittals in accordance with Section 013300.

B. Materials List: Organize to indicate painting systems to be used with each substrate. Include proposed dft for each coat and manufacturer's product data as required to verify compliance with the specified requirements. Do not include MSDS sheets.

C. Samples:
1. Paint Samples:
   a. Submit three samples of each paint finish on an 8"x10" card. Reference manufacturer, type of paint, color, sheen, substrate, and application.
   b. Furnish additional samples until all paint finishes are approved.
2. Transparent Finish Samples:
   a. Submit samples of each wood species and transparent finish combination.
   b. If, in the judgment of the Contractor, the wood species or finish method selected indicate that color variations may be inevitable, submit samples in sets of 3 or more illustrating the possible range of these variations.
   c. When approved, the finished sample or sets shall become the standard for approval.

D. Contract Closeout Submittals: Record Paint Samples: In accordance with Section 017700, submit three 8"x10" samples of each paint and color used, indicating paint manufacturer and formula number; bind in identical sets. Deliver to on site location as directed.

1.4 QUALITY ASSURANCE

A. Applicator: Company specializing in commercial painting and finishing with a minimum of three years documented experience.

B. Environmental Requirements for Solvent Based Paints: Comply with the Environmental Protection Agency (EPA) requirements for volatile solvents content limitations, as applicable to each classification of coating.

C. All interior primers, adhesives, coatings and sealants shall comply with the most recent version of Rule 1168 of the South Coast Air Quality Management District.

D. Visual Standards: Each distinct area of the finished work shall be free of variations in color and sheen, orange peel, runs, sags, blistering, checking, cracking, scratches, dust, dirt, bugs, and other contaminants.

E. Surface Preparation: Conform to MPI Architectural Painting Specifications Manual, SSPC, manufacturer's instructions, and work as needed to prepare substrates to be free of conditions that may impair adhesion and uniformity.
   1. Remove bond breakers, dust, foreign matter, and surface irregularities.
   2. Prepare to prevent bleed-through of substrate material.

1.5 DELIVERY, STORAGE, AND HANDLING

A. In accordance with Section 016000.

B. Delivery: Deliver paint materials to the jobsite in sealed, original, labeled containers, each bearing manufacturer's name, type of paint, brand name, color designation, and instructions for mixing and/or reducing.

C. Storage: Store paint materials at a minimum ambient temperature of 45 degrees F. in a well ventilated area.

D. Toxic, acidic, and combustible materials: Take all necessary precautionary safety measures as recommended by the material manufacturers and governing regulations.

E. Place cotton waste, cloths, and material which may constitute a fire hazard in closed metal containers and daily remove from the site.

1.6 SITE CONDITIONS

A. Weather Conditions:
   1. Do no exterior work on unprotected surfaces when raining, or other moisture is present or expected, or before applied paints can dry or attain proper cure.
   2. Allow wetted surfaces to dry and attain temperatures and condition specified hereinafter before proceeding with previously started work.

B. Temperature:
   1. Do no painting work when surface and air temperatures are below 40 degrees F or below those temperatures recommended by the manufacturer for the material type used.
   2. Minimum temperatures for latex finishes: 45 degrees F for interior work and 50 degrees F. for exterior work, unless approved otherwise.

C. Lighting: Maintain a lighting level of minimum 50 foot-candles on the surfaces to be painted or finished.

D. Ventilation: Provide adequate continuous ventilation.

1.7 MAINTENANCE

A. Furnish overage of paint materials equal to 5 percent minimum of quantity of each paint and transparent finish system component, color and sheen required for the work, but furnish not more than five full one gallon cans, nor less than two full one quart cans, of each type. Overruns in excess of five gallons may be furnished to the Owner at the Contractor's option. Overage shall be taken from the batch mix furnished for the work. Overage shall be furnished in completely filled, properly labeled, sealed cans.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Unless specified otherwise, furnish manufacturer's highest grade coating systems by one of the following manufacturers:
   1. Benjamin Moore Paint Company.
   2. The Sherwin-Williams Company.
   3. Pittsburgh Paints.

4. Pratt & Lambert.
5. ICI Paints North America.

2.2 PAINT SYSTEMS

A. Materials not specifically noted and otherwise required for the work, such as linseed oil, shellac, thinners and the like shall be of a quality not less than that required by manufacturers of the finish materials used in the work.

B. Products for each general purpose shall be compatible. Each system shall be products of one manufacturer where ever possible.

C. Exterior Ferrous Metal - Zinc Rich/Epoxy/Polyurethane System: One of the following
   1. Manufacturer: Tnemec Company Inc. (Kansas City, MO; 816-483-3400).
      a. Zinc Primer: Tnemec Series "394 PerimePrime;" single component moisture cured primer; minimum 62 percent solids by volume.
      b. Epoxy Primer: "Hi-Build Epoxoline II" Series N69.
      c. Polyurethane Finish Coats: Series 1075 "Endura-Shield II"; Acrylic Polyurethane Enamel; semi-gloss or satin sheen.
   2. Manufacturer: Carboline Company (St. Louis, MO; 314-644-1000; 800-848-4645).
      a. inc-Rich Primer: "Carbozinc 859"; organic zinc-rich epoxy primer; minimum 80 percent by weight metallic zinc in the cured film.
      b. Epoxy Primer: "Carboline 888 "
      c. Polyurethane Finish Coats: Carboline 133 HB; semi-gloss or satin sheen.
   3. Manufacturer: Ameron Protective Coatings (Brea, CA; 714-529-1951).
      a. Zinc-Rich Primer: "68HS"; organic zinc-rich epoxy primer; minimum 80 percent by weight metallic zinc in the cured film.
      b. Epoxy Primer: "Amercoat 385."
      c. Polyurethane Finish Coats: Amercoat 450SA"; semi-gloss or satin sheen.
   4. Manufacturer: ICI Devoe.
      a. Zinc-Rich Primer: "Catha-Coat 302H"; "reinforced" inorganic zinc-rich epoxy primer; minimum 56 percent by weight metallic zinc in the cured film.
      b. Epoxy Primer: "Devran 224HS," "Bar-Rust 231," or "Bar-Rust 233H."
      c. Polyurethane Finish Coats: "Devthane 378"; semi-gloss or satin sheen.

D. Interior Latex Paint System – Gypsum Board Substrate: One of the following.
   1. Manufacturer: Benjamin Moore Paint Company
      a. Primer: Eco-Spec Interior Latex Primer Sealer (231)
      b. Finish: Eco-Spec Latex Eggshell Enamel (223)
   2. Manufacturer: Sherwin-Williams
      a. Primer: Harmony Primer 0 VOC B11W900
      b. Finish: Harmony 0 VOC B9 Series; Eggshell sheen

E. Interior Trim Systems – Metal Substrate: One of the following.
   1. Manufacturer: Benjamin Moore Paint Company
      a. Metal Primer: (DTM waterborne). IMC Acrylic Semi-Gloss DTM Coating (M29)
      b. Finish: (Semi-Gloss) Impervex 309.
   2. Manufacturer: Sherwin-Williams
      a. Metal Primer: DTM Acrylic Primer B66-W1; 2.5 – 5.0 mils dft 138 g/l VOC
      b. Finish: Pro Classic Waterborne Semi-gloss dft 157 g/l VOC
   3. Manufacturer: Ameron International.
      a. Metal Primer: "Amercoat 148," Waterborne Acrylic Primer.
      b. Finish: "Amercoat 220," Waterborne Acrylic Topcoat; semigloss.

F. Interior Trim Systems – Opaque Finish Wood Substrate: One of the following.
   1. Manufacturer: Benjamin Moore Paint Company
      a. Primer: Fresh Start All Purpose 100% Acrylic Primer (023)
      b. Finish: (Semi-Gloss) Impervex 309.
   2. Manufacturer: ICI Dulux
      a. Primer: LM9116 "Lifemaster 2000" primer."

b. Finish: LM9200 "Lifemaster 2000" S.G.

3. Manufacturer: Sherwin-Williams
   a. Primer: Harmony Primer 0 VOC B11W900
   b. Finish: Pro Classic Waterborne Semi-gloss dft 157 g/l VOC

G. Interior Waterborne Epoxy Systems: One of the following.
1. Manufacturer: Tnemec Company, Inc.
   a. Gypsum Board Primer: "Series "151 Elasto-Grip"
   b. Metal Primer: "Series 115 Unibond WB"
   c. Finish Coat: "Series 113 Tnemec-Tufcoat".
2. Manufacturer: ICI Dulux
   a. Gypsum Board Primer: "Ultra-Hide Aquacrylic Gripper Stain Killer Primer-Sealer 3210-1200."
   b. Metal Primer: "Tru-Glaze-WB 4030 Waterborne Epoxy Primer"
   c. Finish Coat: "Tru-glaze 4406 Waterborne Acrylic Epoxy Semi-Gloss."
3. Manufacturer: Sherwin-Williams
   a. Gypsum Board Primer: "Preprite Classic Primer."
   b. Metal Primer: "Procryl Primer"
   c. Finish Coat: "Epo-plex Multi-mil WB Epoxy".

PART 3 - EXECUTION

3.1 EXAMINATION

A. Prior to starting work, inspect installed work of other trades and verify that such work is complete to the point where work of this Section may properly commence. Perform adhesion tests on factory primed items. Notify the Architect in writing of conditions detrimental to the proper and timely completion of the work.

B. Do not begin installation until all unsatisfactory conditions are resolved. Beginning work constitutes acceptance of site conditions and responsibility for defective installation caused by prior observable conditions.

3.2 MOISTURE CHECK

A. Check for excess moisture using an electronic moisture meter. Do not paint materials with moisture levels which would impair the bonding of finish coatings.

3.3 PROTECTION

A. Adequately protect surfaces not to be painted, from spills, drips, over painting, and other damage caused by this work. Include surfaces within the paint storage and preparation areas.

B. Hardware and Miscellaneous Items:
1. Remove electrical outlet and switch plates, mechanical diffusers, escutcheons, surface hardware, and fittings prior to starting work.
2. Store, clean and reinstall these items upon completion of work in each area. Use materials and techniques as necessary to prevent damage to finishes on such items.

3.4 SURFACE PREPARATION

A. Prepare surfaces by removing dirt, dust, grease, oil, moisture, and other contaminants which would impair finish adhesion.

B. Ferrous Metal Shop Primed under other Sections: Solvent clean to remove oil and grease. Remove loose rust, and blistered and peeling paint to bare metal by scraping, sanding, and wire brushing in accordance with SSPC-SP2 and SP3. Immediately retouch damaged or abraded surfaces with compatible primer. Lightly sand all shop prime painted surfaces to receive paint finish.

C. Galvanized Ferrous Metal:
1. Undamaged Surfaces: Solvent clean in accordance with SSPC-SP1; abrade surfaces with metal preparation pad.

2. Damaged Surfaces: Remove loose rust to bare metal by scraping, sanding, and wire brushing in accordance with SSPC-SP2 and SP3. Touch up damaged surfaces with zinc rich primer.

D. Unprimed Ferrous Metal:
1. Solvent clean in accordance with SSPC SP-1.
2. Commercial blast per SSPC SP6.

E. Wood - Opaque paint finish:
1. Spot coat knots, pitch streaks, and sappy sections with sealer.
2. Fill all nail holes and cracks. Sand filler smooth and level with wood surface.

F. Wood - Transparent and Semi-Transparent Finishes: Fill all exposed finish nail holes and cracks with matching color filler after prime coat is applied. Sand filler smooth and level with adjacent surfaces.

G. Concrete - Interior:
1. Remove all contaminants by washing and wire brushing. Sandblast if necessary.
2. Remove all traces of efflorescence, oil, dirt, curing compounds, bond breakers, form release agents, and other materials which would inhibit paint bond.

3.5 GENERAL APPLICATION REQUIREMENTS

A. Unless specified or indicated otherwise, follow paint manufacturer's label directions for general application procedures and coverage rates.

B. Do not apply finishes on surfaces that are not sufficiently dry. Make sure each coat of finish is dry and hard before a following coat is applied unless the manufacturer's directions state otherwise.

C. Tint filler to match stain when clear finishes are specified; work filler well into grain and, before it has set, working perpendicularly to the grain, wipe the excess from the surface.

D. Opaque Finishes:
1. Apply number of coats scheduled for each application, except that additional finish coats shall be applied as necessary for complete hiding of substrate colors.
2. Apply primer coats untinted. Where more than one coat of paint is required, tint each succeeding coat up to the final coat similar in tint, but slightly lighter in value (shade).
3. Sand lightly between coats if necessary to achieve required finish; sand between all coats applied to wood substrates.

E. Rollers for application and backrolling of latex paints shall have a nap of 3/8 inch or less.

F. Where roller texture is scheduled for application to gypsum board surfaces, finish coats may be roller-applied, or spray applied and backrolled at Contractor's option.

G. Factory Primed Surfaces: Apply scheduled finish system, less primer coat, except as necessary for patching damage to factory prime coating.

H. Except where scheduled or indicated otherwise, the intent is to paint all new rooms and areas. Existing areas which have not been remodeled or do not have patched surfaces are not to be repainted. Where existing surfaces have been remodeled or patched the entire room is to be repainted, including the associated access panels, electrical panels, hollow metal doors and frames (both sides), and similar elements within the room.

I. Epoxy/Urethane Systems: Brush roller or spray apply, as recommended by the manufacturer for the condition.

3.6 CLEANUP

A. As the work proceeds and on completion of the work, promptly remove all sealers, primers, paints and finishes where spilled, splashed or splattered in a manner not to damage the surface from which it is removed.

B. Remove masking.

C. Clean, or replace with new, all lamps and electrical fixtures damaged by overspray; replace with new identical components all lighting fixture louvers and reflectors damaged by overspray.

3.7 COLOR SCHEDULE

A. Provide paint colors to match those indicated on the drawings. Where a paint color is listed from a specific manufacturer, paint products from other approved manufacturers may be used, provided the color exactly matches the specified color, and the paint system meets the specified requirements. Where no paint color is indicated, provide color and sheen as selected by the Architect.

B. Allow for approximately 70% deep tint colors at exterior; approximately 20% at interior.

3.8 EXTERIOR PAINTING AND COATING SCHEDULE

A. Galvanized Metal - Epoxy/Urethane System:
   1. System: Epoxy/Polyurethane System:
      a. Epoxy Primer: Tnemec "Hi-Build Epoxoline II" Series N69, Carboline 888, Ameron "Amercoat 385," or approved; similar to MPI #101.
      b. Polyurethane Finish Coats: Tnemec Series 73 "Endura-Shield" Acrylic Polyurethane Enamel, Carboline "133 HB," Ameron "Amercoat 450SA," or approved; semi-gloss or satin sheen.
   2. Sheen: Semi-gloss, unless indicated otherwise.
   3. Application: Exterior galvanized metal surfaces.
   4. Retouch welds and damaged galvanized coatings with zinc primer; apply one coat epoxy primer, and two urethane finish coats in accordance with the manufacturer's recommendations. Verify compatibility with shop applied primer. Apply epoxy primer over all shop applied primers, unless the specified primer was shop applied. Brush, roller or spray apply as recommended by manufacturer for conditions.

3.9 INTERIOR PAINTING AND COATING SCHEDULE

A. Gypsum Board - Latex System:
   1. System: Three coats - first coat latex primer sealer (untinted), second and third coat latex paint.
   2. Sheen: Roller texture, satin sheen, except provide flat sheen at light coves, ceilings, skylight areas, clerestory areas, interior fascias, and other light sensitive surfaces. Verify locations of each sheen with Architect before proceeding with work.
   3. Application:
      a. Use on all exposed gypsum board surfaces, including the exposed portions of wall surfaces between adjacent fabric covered panels and mirrors.
      b. Provide prime coat only behind permanently mounted mechanically anchored mirrors, fabric panels, and similar elements.
      c. Do not apply primer or paint coatings to surfaces to receive adhesively mounted mirrors or tile.

B. Gypsum Wall Board - Epoxy System:
   1. System: Three coats - first coat manufacturer's recommended primer sealer, and second and third coats epoxy coating.
   2. Sheen: Gloss, unless indicated otherwise.
   3. Application: Interior gypsum board surfaces at Trash Room.

C. Wood - Opaque Finish Latex System:
   1. System: Three coats; first coat latex wood primer, and second and third coat latex enamel.
   2. Sheen: Semi-gloss, unless indicated otherwise.
   3. Application: Use on wood surfaces only where field-applied opaque paint coatings are indicated.
   4. indicated.

D. Ferrous Metal and Galvanized - Acrylic System:
   1. System: Three coats; first coat acrylic DTM primer; second and third coats latex finish. The primer may be omitted at factory primed surfaces, except as necessary to recoat damaged or abraded preprimed surfaces.
   2. Sheen: Semi-gloss, unless indicated otherwise.
   3. Application: Interior ferrous metal surfaces including hollow steel metal doors and frames, pipe steel hand and guard rails, overhead doors and frames, access doors and panels, and fire extinguisher cabinets.

E. Concrete – Acrylic/Latex System:
   1. System: 2 coats - first coat acrylic primer, second coat acrylic latex.
   2. Sheen: Semi-gloss sheen, unless indicated otherwise.
   3. Application: Interior exposed concrete walls indicated to be painted, except where epoxy coating is indicated and elsewhere as specified otherwise.

3.10 EXPOSED MECHANICAL AND ELECTRICAL WORK IN FINISHED SPACES

A. Ferrous Metal Ducts, Exposed Piping, and Conduit (Except Stainless Steel): As specified this Section for ferrous metal - paint finish.

B. Inside of Ducts, Where Visible from Room:
   1. Same treatment as specified for galvanized and ferrous metal surfaces.
   2. Two Coat Acrylic Flat Finish: As specified this Section for each material. Dull black color.

C. Exposed Registers, Grilles, Exposed Conduit, Electric Cabinets, and Unfinished Portions of Cast-iron Fixtures Exposed to View:
   1. Acrylic Bonding Primer (water based). Gray color. Red primer not accepted.
   2. Two Coat Acrylic Semi-Gloss Finish: Interior Latex, Semi-Gloss.
   3. Typical, except as indicated otherwise; color to match adjacent wall.

END OF SECTION

SECTION 101400 - SIGNAGE

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:
   1. Code required signage.

B. Related Sections:
   1. 260013 - Electrical General Provisions.
   2. 260500 - Common Work Results for Electrical.

C. Drawings, the provisions of the Agreement, the General Conditions, and Division 1 specification sections apply to all work of this Section.

D. Substitutions: Substitute products will be considered only under the terms and conditions of Section 016000.

E. Main building signage is provided by Allowance. Refer to Section 012113.

1.2 SYSTEM DESCRIPTION

A. Room Occupancy Signs: In locations as scheduled on the Drawings, in a conspicuous location near the main exit, provide signs with minimum 3/4 inch high letters posting each room's occupant capacity, in accordance with Paragraph 1004.3 of the 2003 IBC.

B. Accessibility Signage:
   1. Provide acrylic plastic reverse silk screened signs with international symbol of accessibility, raised letters, and Braille, at the following locations:
      a. Accessible areas of refuge.
      b. Accessible toilet and bathing facilities.
   2. Provide painted metal international symbol of accessibility at the following locations:
      a. Accessible parking locations.
      b. Accessible passenger loading zones.
   3. Provide directional signage at the following in accessible areas to indicate the direction to the nearest similar accessible area:
      a. Inaccessible building entrances.
      b. In accessible public toilet and bathing facilities.
      c. Inaccessible elevators and exit stairs.
   4. Each door to an exit stairway shall have a tactile sign stating EXIT, which includes raised letters and Braille, and which complies with ANSI A117.1.

1.3 SUBMITTALS

A. Make submittals in accordance with Section 013300.

B. Proposed fabricators' written confirmation of capability to utilize Adobe Illustrator EPS files for production of properly scaled templates from Owner furnished data on CD-ROM, and capability for production of full scale image of logo on a single piece of paper.

C. Product Literature: Submit for transformers, including identification of each size and type of transformer proposed for the work.

D. Shop Drawings:
   1. Indicate kinds and quantities of material, methods of joining and anchoring, gaskets and sealants, field dimensions as appropriate, and relationship to adjoining materials.
   2. Indicate requirements for sleeves, cutting, and blocking required to facilitate installation of the work.
   3. Show full size sections of all extrusions, corners, retainers, complex details, and connections, clearly indicating fabrication and erection techniques.
   4. Indicate colors and finishes of all exposed surfaces.

E. Samples: Submit samples of each general sign type proposed for the Work.

F. Schedule: Submit schedule of signage. List text, location, size, and type for each sign to be provided.

1.4 QUALITY ASSURANCE

A. Qualifications:
   1. Fabricator Qualifications: Signage manufacturer with five years documented experience in work of similar type and scope.
   2. Installer Qualifications: Use only installers skilled and experienced in the installation of graphics of the type scheduled.

B. Regulatory Requirements: Signage shall conform to the requirements of the jurisdictional code authorities.

C. Preinstallation Conference:
   1. Administer preinstallation conference as specified in Section 013119.
   2. Attendees: Contractor, Architect, Owner's Representative, sign installer.
   3. Review installation procedures and proposed locations. Perform mock-up installations in locations as approved.

1.5 COORDINATION

A. Cutting and Patching:
   1. Coordinate cutting, patching, core drilling, installation of sleeves, and sealing required for installation of dimensional letter signage.
   2. Furnish other trades with accurate instructions, layout drawings and/or templates to accommodate work to be installed.
   3. Do no cutting of structural members without the Architect's approval.
   4. Openings in concrete shall be saw cut or core drilled.
   5. Take such precautions as necessary to ensure the protection of other construction at the site.

1.6 SUBCONTRACTOR'S GUARANTY

A. Submit in accordance with Section 017700.

B. Furnish one year unconditional Subcontractor guaranty against defects in material, workmanship and installation of dimensional letter signage, from date of Occupancy. Include all components provided under this Section.

C. Covered defects shall include failure of finish integrity and appearance, failure to remain watertight, and failure to present uniform illumination.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Plastic Sheet: 1/8 inch thick acrylic sheet; low gloss finish.

B. Double Stick Tape: 3M Scotch brand #665 double-stick, double-coated tape, 1/4" wide.

C. Channel Aluminum:
   1. Sheet Material for Signs Less Than 5 Feet in Height: 0.090 inch aluminum sheet for face and 0.080 inch for return.
   2. Sheet Material for Signs Greater Than 5 Feet in Height: 0.125 inch aluminum sheet for face and 0.090 inch for return.

D. Reverse Face: Clear acrylic polycarbonate.
   1. Provide sheet material not less than ¼ inch thick for signs 5 feet in height or less.
   2. Provide sheet material not less than 3/8 inch for exterior letters greater than 5 feet in height.

2.2 FABRICATION

A. Signs shall be free of rough edges, irregular surfaces, non uniform finishes, and similar imperfections.

B. Plastic Signage:

1. Unless specified otherwise, signage shall be silk screened to the backside of clear plastic sheet, unless approved otherwise. Provide solid color background over silk screened text. Apply images with uniform colors, sharp definition of line, and accurate configuration. Unless specified otherwise, text shall be 1 inch high Helvetica medium.

C. Live Load Capacity Signs:
   1. Fabricate from minimum 16 gage stainless steel sheet metal with stamp formed and paint filled text.
   2. Provide 3/4 inch high text in Helvetica medium text style.

D. Exterior Traffic and Parking Signs:
   1. Fabricate from minimum .063 aluminum, with baked enamel finish and silk screened graphic.
      a. Traffic Control - beaded embossed.
      b. Parking Control - flat screened.
   2. Support: U-Channel hot-rolled steel; deep green baked enamel finish; punched for bolt mounting of sign.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Prior to starting work, carefully inspect installed work of other trades and verify that such work is complete to the point where work of this Section may properly commence. Notify the Architect in writing of conditions detrimental to the proper and timely completion of the work.

B. Do not begin installation until all unsatisfactory conditions are resolved. Beginning work constitutes acceptance of site conditions and responsibility for defective installation caused by prior observable conditions.

3.2 INSTALLATION

A. All graphics shall be mounted level and plumb and in accurate alignment, unless indicated otherwise.

B. Mounting – Plastic Signs:
   1. Clean surfaces as necessary to accept mounting tape.
   2. Use double stick tape for mounting unless approved otherwise.

C. Exit Stair Signs: Locate the sign approximately 5 feet above the floor landing in a position which is readily visible when the door is in the open or closed position.

END OF SECTION

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:
   1. Corner guards.

B. Related Sections:
   1. 061000 – Rough Carpentry: Framing and backing.
   2. 092900 - Gypsum Board: Substrate.
   3. 097233 - Plastic Laminate Wall Coverings

C. Drawings, the provisions of the Agreement, the General Conditions, and Division 1 specification sections apply to all work of this Section.

D. Substitutions: Substitute products will be considered only under the terms and conditions of Section 016000.

1.2 REFERENCES

A. American Society for Testing and Materials (ASTM):
   1. A653 - Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process.

1.3 SUBMITTALS

A. Make submittals in accordance with Section 013300, unless specified otherwise.

B. Product data.

C. Samples:
   1. Wall bumper; minimum 12 inch length.
   2. Corner guard; full length.
   3. Submit samples in exact colors proposed for the work.

D. Contract Closeout Submittals: Submit in accordance with Section 017700.
   1. Maintenance and cleaning instructions.

1.4 ENVIRONMENTAL CONDITIONS

A. Provide ventilation to remove volatile emissions produced during the installation process.

PART 2 - PRODUCTS

2.1 COMPONENTS

A. Stainless Steel Corner Guards (SSCG): Model WCG by Wilkinson-Hi-Rise, LLC (866-424-8837) or CG-50 by Pawling Corporation (800-431-3456); 1/8 inch radius corner bend; 16 ga type 304 stainless steel; 3-1/2” wings with returned edges; 48" length unless otherwise indicated. Furnish cement and related accessories as required for adhesive installation.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Prior to starting work, carefully inspect installed work of other trades and verify that such work is complete to the point where work of this section may properly commence. Notify the Architect, in writing of conditions detrimental to the proper and timely completion of the work.

B. Do not begin installation until all unsatisfactory conditions are resolved. Beginning work constitutes acceptance of conditions as satisfactory.

3.2 INSTALLATION

A. Install components plumb and level and in strict accordance with the manufacturer's recommendations, unless indicated otherwise.

B. Provide manufacturer’s standard end caps at all exposed ends of plastic extrusions.

C. Corner Guards: Install corner guards from finished floor to underside of wall guard. If there is no wall guard, extend corner guard flush with top of wainscot.

END OF SECTION

SECTION 102813 – TOILET ACCESSORIES

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:
   1. Metal and plastic toilet accessories.
   2. Grab bars for accessible toilet enclosures.
   3. Shower seat, rod and curtain.
   4. Rough-in frames furnished to other sections.
   5. Attachment hardware.

B. Related Sections:
   1. 061000 - Rough Carpentry: Blocking.
   2. 092200 – Lightgage Metal Support Framing: Metal backing and support framing.

C. Drawings, the provisions of the Agreement, the General Conditions, and Division 1 specification sections apply to all work of this Section.

D. Substitutions: Substitutions will be considered only under the terms and conditions of Section 016000.

1.2 REFERENCES

A. American National Standards Institute (ANSI): A117.1 - Accessible and Usable Building Facilities (2003)

1.3 SUBMITTALS

A. Make submittals in accordance with Section 013300.

B. Product Data:
   1. Submit for each toilet accessory.
   2. Include complete blocking and mounting instructions for fold down baby counters.

1.4 DELIVERY, STORAGE, AND HANDLING

A. Do not deliver accessories to site until rooms in which they are to be installed are ready to receive them.

B. Pack accessories individually in a manner to protect accessory and its finish.

1.5 COORDINATION

A. Verify locations and dimensions shown with field conditions prior to installation.

B. Avoid damaging the work or finish of other trades; repair damage, or replace damaged items, as directed, at no additional cost to the Owner.

1.6 WARRANTY

A. Submit in accordance with Section 017700.

B. Folding Baby Counters: Include manufacturer's standard $1,000,000 liability policy, written to cover all units installed under this contract.

1.7 MAINTENANCE

A. Furnish 4 cases of 500 sanitary bed liners for fold down baby counters.

PART 2 - PRODUCTS

2.1 GENERAL

A. Manufacturer: Bobrick Washroom Equipment Company (North Hollywood CA; 818-503-1630), unless indicated or approved otherwise.

2.2 TOILET ACCESSORIES

A. Washroom, Locker Room, Break Room, and Utility Room Accessories:
   1. Grab Bars (GB): Bobrick B-5837 Series and B-5806-18 Series at vertical bar, size and configuration as indicated; include concealed anchor devices.
   2. Paper Towel Dispensers: “In-Sight Elect-Matic HRT Dispenser” by Kimberley Clark, model #09703 for #50500 rolls.
   3. Semi-Recessed Waste Receptacle: B-3644.
   4. Lav-Mounted Soap Dispenser: B-822.
   5. Wall-Mounted Soap Dispenser: B-2112
   6. Wall-Mounted Dispensers: B-2112
   7. Seat Cover Dispenser: B-221.
   8. Toilet Paper Dispenser: B-27460.
   9. Stainless Steel Shelf: B-298 (8” x 16”) at each mirror and water closet.
   10. Water Closet Coat Hooks: B-985.
   11. Towel Hooks: B-211
   12. Framed Mirror: B-165-1836.
   13. Mop/Broom Holder: B-223x36.
   14. Shelf with Mop and Broom Holders and Hooks: B-239 x 34
   15. Shower Rod and Curtain: B-6107, with 204 curtain and 204-1 hooks
   16. Sanitary Napkin Vendor: B-370634C
   17. Sanitary Napkin Disposal Unit: B-254.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Prior to starting work, carefully inspect installed work of other trades and verify that such work is complete to the point where work of this Section may properly commence. Notify the Architect in writing of conditions detrimental to the proper and timely completion of the work.

B. Do not begin installation until all unsatisfactory conditions are resolved. Beginning work constitutes acceptance of site conditions and responsibility for defective installation caused by prior observable conditions.

3.2 PREPARATION

A. Coordinate with Section 102115 for preparation of reinforcements and openings to receive thru-partition mounted accessories.

B. Deliver inserts and rough-in frames to jobsite at appropriate time for building-in. Coordinate installation.

C. Furnish templates and rough-in measurements as required.

D. Protect adjacent or adjoining finished surfaces from damage during installation of work of this Section.

E. Verify exact location of accessories.

F. Coordinate installation of blocking and backing as necessary to support wall mounted items.

G. All exposed fasteners shall be tamper-resistant type.

3.3 INSTALLATION

A. Install fixtures, accessories and items in accordance with manufacturer's instructions, and as indicated on the Drawings.

B. Install true, plumb, and level, securely and rigidly anchored to substrate.

C. Mount accessories in locations and elevations as indicated on the Drawings. Where elevation is not indicated, mount at the minimum elevation recommended by the manufacturer.

D. Use tamper-resistant fasteners.

END OF SECTION

SECTION 104416 – FIRE EXTINGUISHERS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:
   1. Fire extinguisher cabinets.
   2. Fire extinguishers.

B. Related Sections:
   1. 061000 – Rough Carpentry: Blocking and framing for cabinets.
   2. 092900 - Gypsum Board: Coordination.
   3. 099000 - Painting and Coating: Field painting at exterior surface of fire extinguisher cabinets.

C. Drawings, the provisions of the Agreement, the General Conditions, and Division 1 specification sections apply to all work of this Section.

D. Substitutions: Substitute products will be considered only under the terms and conditions of Section 016000.

1.2 SUBMITTALS

A. Make submittals in accordance with Section 013300.

B. Product Data: Submit product literature for fire extinguisher brackets, fire extinguisher cabinets, and each type of extinguisher proposed for the work.

1.3 SUBCONTRACTOR GUARANTEE

A. Furnish Subcontractor Guarantees in accordance with Section 017700.

1.4 DELIVERY, STORAGE, AND HANDLING

A. In accordance with Section 016000.

PART 2 - PRODUCTS

2.1 FIRE EXTINGUISHER CABINETS

A. Surface Mounted and Semi-Recessed Cabinets:
   1. For Non-Rated Installation: Potter-Roemer, Inc. Model “Alta 7032-B;” similar products by Larsen’s Manufacturing Company will be considered by Substitution Request.
   2. Type: Clear lacquered aluminum finish, full break glass with lock, and equipped with manufacturer's standard continuous hinge.

2.2 FIRE EXTINGUISHERS

A. Dry Chemical - ABC Multi-Purpose Type:
   1. Type FE: Amerex “#10 Tall”, UL rated 4A:80B:C, approximately 5 inch diameter x 20 inch high, polyester coated steel shell.
   2. Similar products by Larsen’s Manufacturing or Potter-Roemer, as approved.
   3. Agent: Ammonium phosphate base.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine the areas and conditions under which work of this Section will be performed. Verify appropriate rough opening dimensions and blocking locations.

3.2 INSTALLATION

A. Provide semi-recessed cabinets at all locations except provide surface mounted cabinets at Trash and Storage Rooms

B. Coordinate with other trades to ensure proper and adequate provision for interface with the work of this Section.

C. Install cabinets properly shimmed, and secured to the framing, in proper alignment with plane of wall finish materials, as applicable.

D. Install fire extinguisher in each fire extinguisher cabinet by brackets mounted at back of cabinet.

E. Where fire extinguishers are indicated for wall mounting, secure bracket to wall through finish to framing or blocking.

F. Fire extinguishers shall be installed, charged, tagged, and dated, not more than 30 days prior to building turnover.

END OF SECTION

SECTION 105113 - METAL LOCKERS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:
   1. Metal lockers.

B. Related Sections:
   1. 061000 – Rough Carpentry: Framing and blocking.
   2. 092900 - Gypsum Board: Substrate.

C. Drawings, the provisions of the Agreement, the General Conditions, and Division 1 specification sections apply to all work of this Section.

D. Substitutions: Substitutions will be considered only under the terms and conditions of Section 016000.

1.2 SUBMITTALS

A. Make submittals in accordance with Section 013300.

B. Product Data:
   1. Manufacturer's standard published literature with complete description of components, and features of products proposed for the work.
   2. Color card with samples or reproductions of manufacturer's standard finish colors.

C. Shop Drawings: Indicate locker room layout; locker types and configurations, field dimensions (as appropriate), and attachment details. Identify filler panel locations and accessories.

PART 2 - PRODUCTS

2.1 LOCKERS

A. Manufacturer: One of the following.
   1. Penco Products Inc.
   2. Lyon Metal Products Inc.
   3. Republic Storage Systems Co. Inc.
   4. Medart Inc

B. Type and Size: Standard box locker design; size 12”Wx72”Hx15”D per box; louvered door panel.

C. Finish: Manufacturer's standard baked enamel; color as selected by Architect.

D. Provide all lockers with 6" legs and metal filler panels, 20 gauge.

E. Exposed locker ends shall have minimum 16-gage cover panels; furnish top and vertical filler panels to close gaps between locker row ends and walls.

F. Provide the following accessories at each locker:
   1. Built-in keyed combination locks; adjustable combination; all keyed alike.
      a. Furnish six keys; deliver to Owner in accordance with Section 017700.
      b. Furnish three replacement lock assemblies.
   2. Number plate, with sequential number.
   3. Upper shelf.
      a. Provide minimum (1) locker per room with adjustable-height shelf or otherwise ADA compliant shelf.

G. Provide continuous sloping hood at top row of lockers.

H. Provide top filler at inside corners.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Prior to starting work, carefully inspect installed work of other trades and verify that such work is complete to the point where work of this section may properly commence. Notify the Architect, in writing of conditions detrimental to the proper and timely completion of the work.

B. Do not begin installation until all unsatisfactory conditions are resolved. Beginning work constitutes acceptance of conditions as satisfactory.

3.2 INSTALLATION

A. Install lockers plumb and in strict accordance with the manufacturer's recommendations, unless indicated otherwise.

B. Wall-mounted lockers shall be securely anchored to wall.

END OF SECTION

SECTION 109013 - MISCELLANEOUS SPECIALTIES

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:
   1. Security key box.

B. Drawings, the provisions of the Agreement, the General Conditions, and Division 1 specification sections apply to all work of this Section.

C. Substitutions: Substitute products will be considered only under the terms and conditions of Section 016000.

1.2 SUBMITTALS

A. Make submittals in accordance with Section 013300.

B. Product Data: Submit manufacturer's complete product literature and other items as required by individual articles herein.

PART 2 - PRODUCTS

2.1 SECURITY KEY BOX

A. Type: Series 3200 “Knox Box”; recessed type; by The Knox Company, Irvine CA (800/552-5669).

B. Provide with optional alarm tamper switch and manufacturer’s recessed mounting kit.

C. Finish: Manufacturer's standard dark bronze powder coat finish.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Install each item in accordance with manufacturer's instructions, as detailed, and in accordance with special requirements of each article.

END OF SECTION

SECTION 113100 - RESIDENTIAL APPLIANCES

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:
   1. Electric range
   2. Range hood.
   3. Dishwasher.
   4. Refrigerator/Freezer.
   5. Microwave
   6. Garbage Disposer

B. Related Sections:
   1. 064000 – Architectural Woodwork: Adjacent casework construction.
   2. Division 26 – Electrical: Circuitry and wiring.

C. Drawings, the provisions of the Agreement, the General Conditions, and Division 1 specification sections apply to all work of this Section.

D. Substitutions: Substitutions will be considered only under the terms and conditions of Section 016000.

1.2 SUBMITTALS

A. Make submittals in accordance with Section 013300.

B. Product Data: Submit complete product data for each piece of equipment.

1.3 QUALITY ASSURANCE

A. All appliances shall meet EPA Energy Star certification.

B. Provide ADA accessible appliances.

1.4 DELIVERY, STORAGE, AND HANDLING

A. In accordance with Section 016000.

PART 2 - PRODUCTS

2.1 ELECTRIC RANGE

A. 30-in smooth surface 5 element 5.3-cu ft self-cleaning air fry convection oven freestanding electric range.

B. Whirlpool Model WFE535S0LZ

C. Stainless steel finish

2.2 REFRIGERATOR/FREEZER

A. 24.6-cu ft Side-by-Side Refrigerator with ice maker and ice and water dispenser.

B. Whirlpool Model WRS315SDHZ

C. Provide ¼ inch copper water supply.

D. Stainless steel finish.

2.3 DISHWASHER

A. Top Control 24-in Built-In Dishwasher; Energy Star; 55-dBA max

B. Whirlpool Model WDP540HAMZ

2.4 MICROWAVE/HOOD

A. 1.7-cu ft 1000-Watt over-the-range microwave with hood

B. Whirlpool Model WMH31017HZ

C. Stainless steel finish

2.5 GARBAGE DISPOSER

A. Non-corded 3/4-HP continuous feed noise insulation garbage disposal.

B. InSinkErator Model SPACESAVER-XP.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Prior to starting work, carefully inspect installed work of other trades and verify that such work is complete to the point where work of this Section may properly commence. Notify the Architect in writing of conditions detrimental to the proper and timely completion of the work.

B. Do not begin installation until all unsatisfactory conditions are resolved. Beginning work constitutes acceptance of site conditions and responsibility for defective installation caused by prior observable conditions.

3.2 INSTALLATION

A. Install appliances in accordance with the manufacturer's recommendations in the locations indicated.

B. Secure appliances firmly in place.

C. Inspect for defects.

D. Adjust to provide efficient operation.

E. Test operations.

F. Wash and clean appliances following completed installation.

END OF SECTION

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:
   1. Manual roller shades.
   2. Motorized roller shades.

B. Drawings, the provisions of the Agreement, the General Conditions, and Division 1 specification sections apply to all work of this Section.

C. Substitutions: Substitute products will be considered only under the terms and conditions of Section 016000.

1.2 SUBMITTALS

A. Make submittals under provisions of Section 013300.

B. Product literature: In addition, indicate all components requiring finish selections and provide standard finish options for selection.

C. Shop Drawings:
   1. Indicate roller shade sizes and mounting details. Indicate relationship to adjacent construction. Provide wiring diagrams for motorized shades, including switch configurations.
   2. Provide plan and mounting details based on verified field conditions of each manual and motorized installation. Show location of control loop and width of shade. Provide elevation for non-typical installations.

D. Samples: Submit fabric and finish samples for selection.

E. Contract Closeout Submittals: In accordance with Section 017700; cleaning and maintenance instructions.

1.3 QUALITY ASSURANCE

A. Installer Qualifications: A minimum of 3 years experience in the installation of roller window shade systems of the type specified.

B. Fabrics shall be supplied in continuous rolls with no horizontal seams.

C. Fascia panels shall be able to be installed across two or more shade bands in one piece.

D. Provide mock-up demonstrating relationship between roller shades and systems furniture panel to determine acceptable light gap.

E. Coordinate motorized shades controls design with design/build lighting control vendor.

1.4 WARRANTIES

A. Roller Shade Hardware and Chain Warranty: Manufacturer's standard non-depreciating twenty-five year limited warranty.

B. Shadecloth: Manufacturer's standard ten year warranty.

C. Roller Shade Motors and Motor Control Systems: Manufacturer's standard non-depreciating five year warranty.

D. Roller Shade Installation: One year from date of Substantial Completion, not including scaffolding, lifts or other means to reach inaccessible areas.

PART 2 - PRODUCTS

2.1 ROLLER WINDOW SHADES

A. Manufacturer: One of the following:
   1. Hunter Douglas; (Poway, CA; 800-727-8953).
   2. Draper Inc. (Spiceland, IN; 765-987-7999)
   3. MechoShade Systems, Inc. (Long Island City NY; 718-729-2020).
   4. Skyco Shading Systems, Inc (Santa Ana, CA; 800-777-5926)

B. Manual Roller Shades:
   1. Basis of Design: Hunter Douglas Contract “RB 500 Manual Roller Shades.”
   2. Provide manually operated commercial grade roller shade system with engineered heavy duty chain drive pulley operating system consisting of metal clutch housing and locking plug.
   3. Roller Tube:
      a. Manufacturer's standard corrosion-resistant steel or extruded-aluminum tubes of diameters and wall thicknesses selected for suitability for installation conditions, span, length and weight of shades.
      b. Tube diameter shall be manufacturer’s narrowest available for conditions.
   4. Clutch Mechanism: Wrap-spring design in fiberglass reinforced polyester housing assembly. Clutch shall operate bi-directionally using an endless beaded chain.
   5. Control Loop: Endless nickel-plated steel or stainless steel ball chain.
   6. Brackets:
      a. Type as required for installation conditions; color to match fascia panel.
      b. Brackets and housing size and configuration shall be smallest available for conditions.
   7. Fascia Panel: Extruded aluminum panel with black anodized aluminum finish or enamel finish with color as selected by the Architect from the manufacturer's standard line; snap-on mounting to roller-shade mounting brackets.
   8. End Caps: Provide where mounting conditions expose outside of roller shade brackets.
   9. Fabric: PVC-free; fabrics as scheduled on the Drawings.
   10. Hembar: Cloth covered to match standard shade fabric.
   11. Locations: All lower-level exterior windows (both floors) and interior relites where indicated.

C. Motorized Roller Shades:
   1. Basis of Design: Hunter Douglas “Automated RB 500 Roller Shade – Intelligent Wired”.
   2. Type: Motorized vertical roll-up, fabric, window shade with motors, controls, mounting brackets, and other components necessary for complete installation.
   3. Rollers: Corrosion-resistant steel or extruded-aluminum tubes of diameters and wall thicknesses required to accommodate operating mechanisms and weights, spans, and lengths of shades indicated without deflection. Provide with permanently lubricated drive-end assemblies and idle-end assemblies designed to facilitate removal of shadebands for service.
   4. Shade Motors:
      a. A tubular, asynchronous motor, 120V ac (60 Hz) single-phase motor, with an integral capacitor, and a thermally protected, permanently lubricated and maintenance free gearbox with a torque range lifting capacity from a minimum of 35.2 in-lbf to a maximum of 885 in-lbf. Motor to fit into a tube with an inside diameter of 1.875 inches. Minimum audible noise equal between 38 and 60 dBA according to the standards of ISO 3741 NF 31022 in dBA ref. 1pW at nominal torque without end product. Controller to be embedded microprocessor type or bus connection using RJ9/RJ45 (Radio and Digital motors).
      b. Maximum current draw for each shade motor of 2.3 amps.
      c. Use motors rated at the same nominal speed for all shades in the same room.
   5. Motor Control System:
      a. Radio Remote Control: Electric controls with NEMA ICS 6, Type 1 enclosure for recessed or flush mounting.
      b. Provide appropriate (spike and brown out) over-current protection (+/- 10 percent of line voltage) for each of the four individual motor circuits and shall be rated by UL or ETL as a recognized component of this system and tested as an integrated system.

c. Each shade motor shall be accessible (for control purposes) from up to four local switches and one master switch.
d. Control system shall have two standard operating modes: Normal mode allowing the shades to be stopped anywhere in the window's opening height and uniform mode, allowing the shades to only be stopped at the predefined intermediate stop positions. Both modes shall allow for all up / all down positioning.
e. Reconfiguration of switch groups shall not require rewiring of the hardwired line voltage motor power supply wiring, or the low voltage control wiring. Reconfiguration of switch groups shall be accomplished within the motor control device.

6. Brackets: Type as required for installation conditions; color to match fascia panel.
7. Fascia Panel: Extruded aluminum panel with black anodized aluminum finish or enamel finish with color as selected by the Architect from the manufacturer's standard line; snap-on mounting to roller-shade mounting brackets.
8. End Caps: Provide where mounting conditions expose outside of roller shade brackets.
9. Fabric: Types and colors as scheduled on the Drawings.
10. Hembar: Cloth covered to match standard blackout fabric.
11. Locations: All upper-level exterior windows.

2.2 FABRICATION

A. Fabricate units to fit the openings indicated, from head to sill, and from jamb to jamb.

B. Fabricate elements to integrate with adjacent construction.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Prior to starting work, carefully inspect installed work of other trades and verify that such work is complete to the point where work of this section may properly commence. Notify the Architect, in writing of conditions detrimental to the proper and timely completion of the work.

B. Do not begin installation until all unsatisfactory conditions are resolved. Beginning work constitutes acceptance of conditions as satisfactory.

3.2 INSTALLATION

A. Install in accordance with manufacturer's instructions.

B. Install shades level, square, true, and with uniform and equal perimeter spacing, free of folds. Install for smooth operation.

C. Provide all support framing and brackets as necessary to support roller shades.

D. Fascia panels to have maximum 1/8" gap between panels. Touch up contrasting cut ends with matching face finish.

E. Install blackout angles at all blackout shade locations.

END OF SECTION

SECTION 123200 - MANUFACTURED WOOD CASEWORK

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:
   1. Wood-faced cabinets of stock design.
   2. Plastic-laminate-faced wood cabinets of stock design.
   3. Plastic-laminate countertops.

B. Related Sections:
   1. 064000 – Architectural Woodwork: Countertops; other requirements for casework not identified in this Section.

C. Drawings, the provisions of the Agreement, the General Conditions, and Division 1 specification sections apply to all work of this Section.

D. Substitutions: Substitute products will be considered only under the terms and conditions of Section 016000.

1.2 REFERENCES

A. Architectural Woodwork Institute (AWI): Architectural Woodwork Quality Standards, Guide Specifications, and Quality Certification Program; current edition.

B. International Building Code (IBC)

1.3 SUBMITTALS

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

B. Shop Drawings: Include plans, elevations, sections, details, and attachments to other work.

C. Samples: For cabinet finishes and for each type of top material indicated.

1.4 QUALITY ASSURANCE

A. Manufacturer Qualifications: A qualified manufacturer that is certified for chain of custody by an FSC-accredited certification body.

B. Quality Standard: Unless otherwise indicated, comply with requirements for modular cabinets in AWI's "Architectural Woodwork Quality Standards."
   1. Provide AWI Quality Certification Program certificate indicating that manufactured wood casework complies with requirements.
   2. Cabinets shall be manufactured to “Custom” standards.

C. Mock-Ups:
   1. Provide mock-up in accordance with Section 014500.
   2. Fabricate one lower casework unit to receive transparent finish and one unit to receive opaque finish; complete with countertop, hardware and all electrical and mechanical components; and finished as specified. Select unit as approved by the Architect.
   3. Components approved by Architect may be incorporated into the Work.

1.5 WARRANTY

A. Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace components of manufactured wood casework that fail in materials or workmanship within specified warranty period.
   1. Failures include, but are not limited to, the following:
      a. Delamination of components or other failures of glue bond.
      b. Warping of components.
      c. Failure of operating hardware.

d. Deterioration of finishes.
2. Warranty Period: Five years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 CASEWORK

A. Basis of Design:
1. Manufacturer: Lanz Cabinets (Eugene, OR).
2. Model:
a. Pacific Collection;" all-plywood box,
b. "Chetco II" design; Natural Beech (clear finish); standard overlay construction.
c. White overlay interiors.

B. Subject to compliance with requirements, the following manufacturers may be submitted for approval by the Architect:
1. Kerf Design (Seattle, WA; 206-954-8677)
2. European Cabinets (Palo Alto, CA; 650- 843-0901).
3. Westmark Products (Tacoma, WA; 253-531-3470).
4. Trellis LLC (Issaquah, WA; 206-931-2743).

2.2 MATERIALS AND COMPONENTS

A. Low-Emitting Materials: Fabricate manufactured wood casework, including countertops, with adhesives and composite wood products containing no urea formaldehyde.

B. Low-Emitting Materials: Adhesives and composite wood products shall comply with the testing and product requirements of the California Department of Health Services' "Standard Practice for the Testing of Volatile Organic Emissions from Various Sources Using Small-Scale Environmental Chambers."

C. Door And Drawer Fronts: Natural Beech recessed panel Shaker door and drawer fronts. Color to match face.

D. Case And Shelves: Face frame manufactured with ¾" Beech. Case and shelves manufactured with 5/8" veneer plywood with natural interior finish. Exposed edges are capped with PVC edging applied through a hot melt bonding process. No urea formaldehyde.

E. Drawers: ½" birch plywood sides, back, bottom and sub-front. Use rubber or felt bumpers on drawers to minimize noise transfer.

F. Door And Drawer Fronts: 90 degree side wrap ¾" thick industrial strength, furniture grade high density wood core with high pressure plastic melamine laminate on both sides, 5mm edge tape to top and bottom.

G. Kitchen Plastic Laminate: "Wilson Art" HPL 4796-60, "Brushed Chestnut". Colors will be selected from standard range of any of the above manufacturers at the Architect's option. Color selected by Architect, butt all joints, no metal trim.

H. Kitchen Countertop, Back And End Splash: Plastic laminate, laminated to 45-pound industrial grade particle board ¾" thick. 1-1/2" countertop front edge with 180 degree wrap, exposed edges and exposed sides. Plastic laminate back and end splash with 90 degree wrap.

I. Hardware:
1. Hinges: ½" overlay semi-concealed self-closing hinges.
2. Pulls: Richelieu 205, satin nickel finish.
3. Drawer guides: Epoxy coated side-mount drawer guides.

J. Finish: Low VOC environmentally benevolent finish to meet or exceed Green Guard Emission Standards. Multi-step finishing process, hand-sealed, stained and top-coated with pre-catalyzed finish.

2.3 FABRICATION

A. All parts are machined for accuracy and interlocking strength. All joints are glued and stapled. All exterior parts of the cabinet shall have nails and staples set and holes filled.

B. Verify all dimension and cabinet unit sizes prior to fabrication. Use no filler panels more than 3" in width.

C. Cut to fit unless specified to be shop-fabricated or shop-cut to exact size. Where woodwork abuts other finished work, scribe and cut for accurate fit. Before making cutouts, drill pilot holes at comers.

D. Cut openings for equipment to be installed. Comply with equipment manufacturers requirements, but provide internal corners of 1/8" minimum radius. Smooth saw cut and ease edges. Provide plastic grommets at holes.

E. Seal cut edges of counter at openings for sinks and other "wet" equipment, using waterproofing compound recommended by plastic manufacturer and compatible with laminating adhesive.

F. Distribute defects allowed in the quality grade specified to the best overall advantage, when installing job assembled woodwork items.

2.4 COUNTERTOPS

A. Custom countertops are specified in Section 064000.

PART 3 - EXECUTION

3.1 CASEWORK INSTALLATION

A. Install level, plumb, and true; shim as required, using concealed shims. Where manufactured wood casework abuts other finished work, apply filler strips and scribe for accurate fit, with fasteners concealed where practical.

B. Base Cabinets: Set cabinets straight, level, and plumb. Adjust subtops within 1/16 inch of a single plane. Fasten cabinets to masonry or framing, wood blocking, or reinforcements in walls and partitions with fasteners spaced 24 inches o.c. Bolt adjacent cabinets together with joints flush, tight, and uniform. Align similar adjoining doors and drawers to a tolerance of 1/16 inch.

C. Wall Cabinets: Hang cabinets straight, level, and plumb. Adjust fronts and bottoms within 1/16 inch of a single plane. Fasten to hanging strips, masonry, or framing, blocking, or reinforcements in walls or partitions. Align similar adjoining doors to a tolerance of 1/16 inch.

D. Adjust casework and hardware so doors and drawers operate smoothly without warp or bind. Lubricate operating hardware as recommended by manufacturer.

3.2 INSTALLATION OF TOPS

A. Field Jointing: Where possible make in the same manner as shop jointing, using dowels, splines, adhesives, and fasteners recommended by manufacturer. Prepare edges to be joined in shop so Project-site processing of top and edge surfaces is not required. Locate field joints where shown on Shop Drawings.
   1. Secure field joints in plastic-laminate countertops with concealed clamping devices located within 6 inches of front and back edges and at intervals not exceeding 24 inches. Tighten according to manufacturer's written instructions to exert a constant, heavy-clamping pressure at joints.

B. Secure tops to cabinets with Z- or L-type fasteners or equivalent, using two or more fasteners at each front, end, and back.

C. Provide backsplashes at backs and sides of counters that abut gypsum board surfaces. Do not provide backsplashes at sides of counters that abut casework or other woodwork panels.

D. Secure backsplashes and end splashes to walls with adhesive.

E. Seal junctures of tops, splashes, and walls with mildew-resistant silicone sealant or another permanently elastic sealing compound recommended by countertop material manufacturer.

3.3 CLEANING AND PROTECTING

A. Clean finished surfaces, touch up as required, and remove or refinish damaged or soiled areas to match original factory finish, as approved by Architect.

B. Protection: Provide 6-mil plastic or other suitable water-resistant covering over countertop surfaces. Tape to underside of countertop at a minimum of 48 inches o.c. Remove protection at Substantial Completion.

END OF SECTION 123200

SECTION 142400 - HYDRAULIC ELEVATORS

PART 1 - GENERAL

1.1 SUMMARY

A. Section includes: Machine room-less hydraulic passenger elevators as shown and specified. Elevator work includes:
   1. Standard pre-engineered hydraulic passenger elevators.
   2. Elevator car enclosures, hoistway entrances and signal equipment.
   3. Operation and control systems.
   4. Jack(s).
   5. Accessibility provisions for physically disabled persons.
   6. Equipment, machines, controls, systems and devices as required for safely operating the specified elevators at their rated speed and capacity.
   7. Materials and accessories as required to complete the elevator installation.

B. Related Sections:
   1. Division 1 General Requirements.
   2. Division 3 Concrete: Installing inserts, sleeves and anchors in concrete.
   3. Division 5 Metals:
      a. Providing hoist beams, pit ladders, steel framing, auxiliary support steel and divider beams for supporting guide-rail brackets.
      b. Providing steel angle sill supports and grouting hoistway entrance sills and frames.
   4. Division 9 Finishes: Providing elevator car finish flooring and field painting unfinished and shop primed ferrous materials.
   5. Division 22 Plumbing
      a. Sump pit and oil interceptor.
   6. Division 23 Heating, Ventilation and Air Conditioning
      a. Heating and ventilating hoistways and/or control room.
   7. Division 26 Sections:
      a. Providing electrical service to elevators, including fused disconnect switches where permitted. (note: fused disconnect switch to be provided as part of elevator manufacture product, see section 2.11 Miscellaneous elevator components for further details.)
      b. Emergency power supply, transfer switch and auxiliary contacts.
      c. Heat and smoke sensing devices.
      d. Convenience outlets and illumination in control room (if applicable), hoistway and pit.

C. Work Not Included: General contractor shall provide the following in accordance with the requirements of the Model Building Code and ANSI A17.1 Code. For specific rules, refer to ANSI A17.1, Part 3 for hydraulic elevators. State or local requirements must be used if more stringent. The cost of this work is not included in the TK Elevator's proposal, since it is a part of the building construction.
   1. Elevator hoist beam to be provided at top of elevator shaft. Beam must be able to accommodate proper loads and clearances for elevator installation and operation.
   2. 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.
   3. Hatch walls require a minimum two hours of fire rating. Hoistway should be clear and plumb with variations not to exceed 1/2" at any point.
   4. Elevator hoistways shall have barricades, as required.
   5. Install bevel guards at 75° on all recesses, projections or setbacks over 2" (4" for A17.1 2000 areas) except for loading or unloading.
   6. Provide rail bracket supports at pit, each floor and roof. For guide rail bracket supports, provide divider beams between hoistway at each floor and roof.
   7. Pit floor shall be level and free of debris. Reinforce dry pit to sustain normal vertical forces from rails and buffers.
   8. Where pit access is by means of the lowest hoistway entrance, a vertical ladder of non-combustible material extending 42" minimum, (48" minimum for A17.1-2000 areas) shall be provided at the same height, above sill of access door or handgrips.
   9. All wire and conduit should run remote from the hoistways.

10. When heat, smoke or combustion sensing devices are required, connect to elevator control cabinet terminals. Contacts on the sensors should be sided for 12 volt D.C.
11. Install and furnish finished flooring in elevator cab.
12. Finished floors and entrance walls are not to be constructed until after sills and door frames are in place. Consult elevator contractor for rough opening size. The general contractor shall supply the drywall framing so that the wall fire resistance rating is maintained, when drywall construction is used.
13. Where sheet rock or drywall construction is used for front walls, it shall be of sufficient strength to maintain the doors in true lateral alignment. Drywall contractor to coordinate with elevator contractor.
14. Before erection of rough walls and doors; erect hoistway sills, headers, and frames. After rough walls are finished; erect fascias and toe guards. Set sill level and slightly above finished floor at landings.
15. To maintain legal fire rating (masonry construction), door frames are to be anchored to walls and properly grouted in place.
16. The elevator wall shall interface with the hoistway entrance assembly and be in strict compliance with the elevator contractor's requirements.
17. General Contractor shall fill and grout around entrances, as required.
18. All walls and sill supports must be plumb where openings occur.
19. Locate a light fixture (200 lx / 19 fc) and convenience outlet in pit with switch located adjacent to the access door.
20. Provide telephone line, light fixture (200 lx / 19 fc), and convenience outlet in the hoistway at the landing where the elevator controller is located. Typically this will be at the landing above the 1st floor. Final location must be coordinated with elevator contractor.
21. As indicated by elevator contractor, provide a light outlet for each elevator, in center of hoistway.
22. For signal systems and power operated door: provide ground and branch wiring circuits.
23. For car light and fan: provide a feeder and branch wiring circuits to elevator control cabinet.
24. Controller landing wall thickness must be a minimum of 8 1/2 inches thick. This is due to the controller being mounted on the second floor landing in the door frame on the return side of the door. For center opening doors, the controller is located on the right hand frame (from inside the elevator cab looking out). These requirements must be coordinated between the general contractor and the elevator contractor.
25. Cutting, patching and recesses to accommodate hall button boxes, signal fixtures, etc..

1.2 SUBMITTALS

A. Product data: When requested, the elevator contractor shall provide standard cab, entrance and signal fixture data to describe product for approval.

B. Shop drawings:
   1. Show equipment arrangement in the corridor, pit, and hoistway and/or optional control room. Provide plans, elevations, sections and details of assembly, erection, anchorage, and equipment location.
   2. Indicate elevator system capacities, sizes, performances, safety features, finishes and other pertinent information.
   3. Show floors served, travel distances, maximum loads imposed on the building structure at points of support and all similar considerations of the elevator work.
   4. Indicate electrical power requirements and branch circuit protection device recommendations.

C. Powder Coat paint selection: Submit manufacturer’s standard selection charts for exposed finishes and materials.

D. Plastic laminate selection: Submit manufacturer’s standard selection charts for exposed finishes and materials.

E. Metal Finishes: Upon request, standard metal samples provided.

F. Operation and maintenance data. Include the following:
   1. Owner’s manuals and wiring diagrams.
   2. Parts list, with recommended parts inventory.

1.3 QUALITY ASSURANCE

A. Manufacturer Qualifications: An approved manufacturer with minimum 15 years of experience in manufacturing, installing, and servicing elevators of the type required for the project.
   1. The manufacturer of machines, controllers, signal fixtures, door operators cabs, entrances, and all other major parts of elevator operating equipment.
      a. The major parts of the elevator equipment shall be manufactured by the installing company, and not be an assembled system.
   2. The manufacturer shall have a documented, on-going quality assurance program.
   3. ISO-9001:2000 Manufacturer Certified
   4. ISO-14001:2004 Environmental Management System Certified

B. Installer Qualifications: The manufacturer or an authorized agent of the manufacturer with not less than 15 years of satisfactory experience installing elevators equal in character and performance to the project elevators.

C. Regulatory Requirements:
   1. ASME A17.1 Safety Code for Elevators and Escalators, latest edition or as required by the local building code.
   2. Building Code: National.
   3. NFPA 70 National Electrical Code.
   4. NFPA 80 Fire Doors and Windows.
   5. Americans with Disabilities Act - Accessibility Guidelines (ADAAG)
   6. Section 407 in ICC A117.1, when required by local authorities
   7. CAN/CSA C22.1 Canadian Electrical Code
   8. CAN/CSA B44 Safety Code for Elevators and Escalators.
   9. California Department of Public Health Standard Method V1.1–2010, CA Section 01350

D. Fire-rated entrance assemblies: Opening protective assemblies including frames, hardware, and operation shall comply with ASTM E2074, CAN4-S104 (ULC-S104), UL10(b), and NFPA Standard 80. Provide entrance assembly units bearing Class B or 1 1/2 hour label by a Nationally Recognized Testing Laboratory (2 hour label in Canada).

E. Inspection and testing:
   1. Elevator Installer shall obtain and pay for all required inspections, tests, permits and fees for elevator installation.
   2. Arrange for inspections and make required tests.
   3. Deliver to the Owner upon completion and acceptance of elevator work.

1.4 DELIVERY, STORAGE AND HANDLING

A. Manufacturing shall deliver elevator materials, components and equipment and the contractor is responsible to provide secure and safe storage on job site.

1.5 PROJECT CONDITIONS

A. Temporary Use: Elevators shall not be used for temporary service or for any other purpose during the construction period before Substantial Completion and acceptance by the purchaser unless agreed upon by Elevator Contractor and General Contractor with signed temporary agreement.

1.6 WARRANTY

A. Warranty: Submit elevator manufacturer's standard written warranty agreeing to repair, restore or replace defects in elevator work materials and workmanship not due to ordinary wear and tear or improper use or care for 12 months after final acceptance.

1.7 MAINTENANCE

A. Furnish maintenance and call back service for a period of 12 months for each elevator after completion of installation or acceptance thereof by beneficial use, whichever is earlier, during normal working hours excluding callbacks.
   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. Submit parts catalog and show evidence of local parts inventory with complete list of recommended spare parts. Parts shall be produced by manufacturer of original equipment.
3. Manufacturer shall have a service office and full time service personnel within a 100 mile radius of the project site.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Manufacturer: Design based around TK Elevator's endura Machine Room-Less hydraulic elevator.

2.2 MATERIALS, GENERAL

A. All Elevator Cab materials including frame, buttons, lighting, wall and ceiling assembly, laminates and carpet 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 powder coat for structural and 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. 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: Steel, omega shaped, fastened to the building structure with steel brackets.

D. Guides: Slide guides shall be mounted on top and bottom of the car.

E. 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 project conditions.

F. Jack: A jack unit shall be of sufficient size to lift the gross load the height specified. Factory test jack to ensure adequate strength and freedom from leakage. Brittle material, such as gray cast iron, is prohibited in the jack construction. Provide the following jack type: Twin post holeless. Two jacks piped together, mounted one on each side of the car with a polished steel hydraulic plunger housed in a sealed steel casing having sufficient clearance space to allow for alignment during installation. Each plunger shall have a high pressure sealing system which will not allow for seal movement or displacement during the course of operation. Each Jack Assembly shall have a check valve built into the assembly to allow for automatically re-syncing the two plunger sections by moving the jack to its fully contracted position. The jack shall be designed to be mounted on the pit floor or in a recess in the pit floor. Each jack section shall have a bleeder valve to discharge any air trapped in the section..

G. 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.

H. Wiring, Piping, and Oil: Provide all necessary hoistway wiring in accordance with the National Electrical Code. All necessary code compliant pipe and fittings shall be provided to connect the power unit to the jack unit. Provide proper grade inherently biodegradable oil as specified by the manufacturer of the power unit (see Power Unit section 2.04.G for further details)

I. Pit moisture/water sensor located approximately 1 foot above the pit floor to be provided. Once activated, elevator will perform “flooded pit operation”, which will run the car up to the designated floor, cycle the doors and shut down and trip the circuit breaker shunt to remove 3 phase power from all equipment, including pit equipment.

J. Motorized oil line shut-off valve shall be provided that can be remotely operated from the controller landing service panel. Also a means for manual operation at the valve in the pit is required.

2.4 POWER UNIT

A. Power Unit (Oil Pumping and Control Mechanism): A self-contained unit located in the elevator pit consisting of the following items:
   1. NEMA 4/Sealed Oil reservoir with tank cover including vapor removing tank breather
   2. An oil hydraulic pump.
   3. An electric motor.
   4. Electronic oil control valve with the following components built into single housing; high pressure relief valve, check valve, automatic unloading up start valve, lowering and leveling valve, and electro-magnetic controlling solenoids.

B. Pump: Positive displacement type pump specifically manufactured for oil-hydraulic elevator service. Pump shall be designed for steady discharge with minimum pulsation to give smooth and quiet operation. Output of pump shall not vary more than 10 percent between no load and full load on the elevator car.

C. Motor: Standard manufacture motor specifically designed for oil-hydraulic elevator service. Duty rating – motors shall be capable of 80 starts per hour with a 30% motor run time during each start.

D. Oil Control Unit: The following components shall be built into a single housing. Welded manifolds with separate valves to accomplish each function are not acceptable. Adjustments shall be accessible and be made without removing the assembly from the oil line.
   1. Relief valve shall be adjustable and be capable of bypassing the total oil flow without increasing back pressure more than 10 percent above that required to barely open the valve.
   2. Up start and stop valve shall be adjustable and designed to bypass oil flow during start and stop of motor pump assembly. Valve shall close slowly, gradually diverting oil to or from the jack unit, ensuring smooth up starts and up stops.
   3. Check valve shall be designed to close quietly without permitting any perceptible reverse flow.
   4. Lowering valve and leveling valve shall be adjustable for down start speed, lowering speed, leveling speed and stopping speed to ensure smooth "down" starts and stops. The leveling valve shall be designed to level the car to the floor in the direction the car is traveling after slowdown is initiated.
   5. Provided with constant speed regulation in both up and down direction. Feature to compensate for load changes, oil temperature, and viscosity changes.
   6. Solid State Starting: Provide an electronic starter featuring adjustable starting currents.
   7. A secondary hydraulic power source (powered by 110VAC single phase) must be provided. This is required to be able to raise (reposition) the elevator in the event of a system component failure (i.e. pump motor, starter, etc.)
   8. Oil Type: Provide a zinc free, inherently biodegradable lubricant formulated with premium base stocks to provide outstanding protection for demanding hydraulic systems, especially those operating in environmentally sensitive areas.

2.5 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: ASTM A1008 steel panels, factory applied powder coat finish with factory-applied powder coat finish entrance frame.
3. Typical door & frame finish: ASTM A366 steel panels, factory applied powder coat enamel finish with factory-applied powder coat finish entrance frame.

B. Integrated Control System: the elevator controller to be mounted to hoistway entrance above 1st landing. The entrance at this level, shall be designed to accommodate the control system and provide a means of access to critical electrical components and troubleshooting features. See section 2.09 Control System for additional requirements.

C. At the controller landing, the hoistway entrance frame shall have space to accommodate and provide a lockable means of access (group 2 security) to a 3 phase circuit breaker. See section 2.11 Miscellaneous Elevator Components for further details

D. Interlocks: Equip each hoistway entrance with an approved type interlock tested as required by code. Provide door restriction devices as required by code.

E. 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.

F. Hoistway Sills: Extruded metal, with groove(s) in top surface. Provide mill finish on aluminum.

2.6 PASSENGER ELEVATOR CAR ENCLOSURE

A. Car Enclosure:
1. Walls: Cab type TKAP, reinforced cold-rolled steel with two coats factory applied baked enamel finish, with applied vertical wood core panels covered on both sides with high pressure plastic laminate.
2. Reveals and frieze: a. Reveals and frieze: Stainless steel, no. 4 brushed finish
3. Canopy: Cold-rolled steel with hinged exit.
4. Ceiling: Suspended type, LED lighting with translucent diffuser mounted in a metal frame. Framework shall be finished with a factory applied powder coat finish.
5. Cab Fronts, Return, Transom, Soffit and Strike: Provide panels faced with brushed stainless steel
6. 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.
7. Handrail: Provide 1.5' diameter cylindrical metal on side and rear walls on front opening cars and side walls only on front and rear opening cars. Handrails shall have a stainless steel, no. 4 brushed finish.
8. Ventilation: Manufacturer’s standard exhaust fan, mounted on the car top.
9. Protection pads and buttons: Not required

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.

2.7 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. The door control system shall be digital closed loop and the closed loop circuit shall give constant feedback on the position and velocity of the elevator door. The motor torque shall be constantly adjusted to maintain the correct door speed based

on its position and load. All adjustments and setup shall be through the computer based service tool. Door movements shall follow a field programmable speed pattern with smooth acceleration and deceleration at the ends of travel. The mechanical door operating mechanism shall be arranged for manual operation in event of power failure. Doors shall automatically open when the car arrives at the landing and automatically close after an adjustable time interval or when the car is dispatched to another landing. AC controlled units with oil checks, or other deviations are not acceptable.

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 shall 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 shall 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. 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 infra-red 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.

2.8 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

2.9 CONTROL SYSTEMS

A. Controller: Shall be integrated in a hoistway entrance jamb. Should be microprocessor based, software oriented and protected from environmental extremes and excessive vibrations in a NEMA 1 enclosure. Control of the elevator shall be automatic in operation by means of push buttons in the car

numbered to correspond to floors served, for registering car stops, and by "up-down" push buttons at each intermediate landing and "call" push buttons at terminal landings.

B. Service Panel – to be located outside the hoistway in the controller entrance jamb and shall provide the following functionality/features:
   1. Access to main control board and CPU
   2. Main controller diagnostics
   3. Main controller fuses
   4. Universal Interface Tool (UIT)
   5. Remote valve adjustment
   6. Electronic motor starter adjustment and diagnostics
   7. Operation of pit motorized shut-off valve with LED feedback to the state of the valve in the pit
   8. Operation of auxiliary pump/motor (secondary hydraulic power source)
   9. Operation of electrical assisted manual lowering
   10. Provide male plug to supply 110VAC into the controller
   11. Run/Stop button

C. 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.

D. Emergency Power Operation: (10-DOA) Upon loss of the normal power supply, building-supplied standby power is available on the same wires as the normal power supply. Once the loss of normal power is detected and standby power is available, the elevator is lowered to a pre-designated landing and the doors are opened. After passengers have exited the elevator, the doors are closed and the car is shut down. When normal power is restored, the elevator automatically resumes operation.

E. Special Operation: Not Applicable

2.10 HALL STATIONS

A. Hall Stations, General: Buttons shall illuminate to indicate call has been registered at that floor for the indicated direction.
   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: Not Applicable

D. Hall lanterns: Not Applicable

E. Special Equipment: Not Applicable

2.11 MISCELLANEOUS ELEVATOR COMPONENTS

A. Oil Hydraulic Silencer: Install multiple oil hydraulic silencers (muffler device) at the power unit location. The silencers shall contain pulsation absorbing material inserted in a blowout proof housing.

B. Lockable three phase circuit breaker with auxiliary contact with shunt trip capability to be provided. Circuit breaker to be located behind locked panel (Group 2 security access) at controller landing entrance jamb and should be sized according to the National Electrical Code.

C. Lockable single phase 110V circuit breaker for cab light and fan to be provided. Circuit breaker to be located behind locked panel (Group 2 security access) at controller landing entrance jamb should be sized according to the National Electrical Code

PART 3 - EXECUTION

3.1 EXAMINATION

A. Before starting elevator installation, inspect hoistway, hoistway openings, pits and/or control room, as constructed, 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, where recommended by 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 and recommended by Code and governing regulations or agencies. 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

steel shall be cleaned with soap and water and dried with a non-abrasive surface; it shall not be cleaned with bleach-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: endura MRL Twinpost above-ground 1-stage
   2. Elevator Type: Hydraulic Machine Room-Less, Passenger
   3. Rated Capacity: 2500 lbs.
   4. Rated Speed: 80 ft./min.
   5. Operation System: TAC32H
   6. Travel:
   7. Landings: 2 total
   8. Openings:
      a. Front: 2
      b. Rear: 0
   9. Clear Car Inside: 6'-8'' wide x 4'-3'' 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: One-speed Center opening
   14. Power Characteristics: 208 volts, 3 Phase, 60 Hz.
   15. Seismic Requirements: No
   16. Hoistway Dimensions: 8'-4'' wide x 5'-9'' deep
   17. Pit Depth: 4'-0''
   18. Button & Fixture Style: Traditional Signal Fixtures
   19. Special Operations: None

END OF SECTION

SECTION 220517 - SLEEVES AND SLEEVE SEALS FOR PLUMBING PIPING

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. Sleeves.
2. Stack-sleeve fittings.
3. Sleeve-seal systems.
4. Sleeve-seal fittings.
5. Silicone sealants.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product.

1.4 INFORMATIONAL SUBMITTALS

PART 2 - PRODUCTS

2.1 SLEEVES

A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

1. Advance Products & Systems, Inc.
2. CALPICO, Inc.
3. GPT; an EnPro Industries company.

B. Cast-Iron Pipe Sleeves: Cast or fabricated of cast or ductile iron and equivalent to ductile-iron pressure pipe, with plain ends and integral waterstop collar.

C. Steel Pipe Sleeves: ASTM A 53/A 53M, Type E, Grade B, Schedule 40, anticorrosion coated or galvanized, with plain ends and integral welded waterstop collar.

D. Galvanized-Steel Sheet Sleeves: 0.0239-inch minimum thickness; round tube closed with welded longitudinal joint.

E. PVC Pipe Sleeves: ASTM D 1785, Schedule 40.

F. Molded-PVC Sleeves: With nailing flange for attaching to wooden forms.

G. Molded-PE or -PP Sleeves: Removable, tapered-cup shaped, and smooth outer surface with nailing flange for attaching to wooden forms.

2.2 STACK-SLEEVE FITTINGS

A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

1. Jay R. Smith Mfg Co; a division of Morris Group International.
2. Zurn Industries, LLC.

B. Description: Manufactured, Dura-coated or Duco-coated cast-iron sleeve with integral clamping flange for use in waterproof floors and roofs. Include clamping ring, bolts, and nuts for membrane flashing.

1. Underdeck Clamp: Clamping ring with setscrews.

2.3 SLEEVE-SEAL SYSTEMS

A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

1. GPT; an EnPro Industries company.
2. Metraflex Company (The).

B. Description:

1. Modular sealing-element unit, designed for field assembly, for filling annular space between piping and sleeve.
2. Designed to form a hydrostatic seal of 20 psig minimum.
3. Sealing Elements: EPDM-rubber High-temperature-silicone interlocking links shaped to fit surface of pipe. Include type and number required for pipe material and size of pipe.
4. Pressure Plates: Carbon steel .
5. Connecting Bolts and Nuts: Carbon steel, with corrosion-resistant coating, ASTM B 633 of length required to secure pressure plates to sealing elements.

2.4 SLEEVE-SEAL FITTINGS

A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

1. GPT; an EnPro Industries company.
2. Metraflex Company (The).

B. Description: Manufactured plastic, sleeve-type, waterstop assembly made for imbedding in concrete slab or wall.

C. Plastic or rubber waterstop collar with center opening to match piping OD.

2.5 SILICONE SEALANTS

A. Silicone, S, NS, 25, NT: Single-component, nonsag, plus 25 percent and minus 25 percent movement capability, nontraffic-use, neutral-curing silicone joint sealant, ASTM C 920, Type S, Grade NS, Class 25, Use NT.

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
   a. Sherwin-Williams Company (The).
   b. The Dow Chemical Company.

B. Silicone, S, P, 25, T, NT: Single-component, pourable, plus 25 percent and minus 25 percent movement capability, traffic- and nontraffic-use, neutral-curing silicone joint sealant; ASTM C 920, Type S, Grade P, Class 25, Uses T and NT. Grade P Pourable (self-leveling) formulation is for opening in floors and other horizontal surfaces that are not fire rated.

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
   a. May National Associates, Inc.; a subsidiary of Sika Corporation.

C. Silicone Foam: Multicomponent, silicone-based liquid elastomers that, when mixed, expand and cure in place to produce a flexible, nonshrinking foam.

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
   a. Smooth-On.

PART 3 - EXECUTION

3.1 SLEEVE INSTALLATION

A. Install sleeves for piping passing through penetrations in floors, partitions, roofs, and walls.

B. For sleeves that will have sleeve-seal system installed, select sleeves of size large enough to provide 1-inch annular clear space between piping and concrete slabs and walls.

1. Sleeves are not required for core-drilled holes.

C. Install sleeves in concrete floors, concrete roof slabs, and concrete walls as new slabs and walls are constructed.

1. Permanent sleeves are not required for holes in slabs formed by molded-PE or -PP sleeves.
2. Cut sleeves to length for mounting flush with both surfaces.
   a. Exception: Extend sleeves installed in floors of mechanical equipment areas or other wet areas 2 inches above finished floor level.
3. Using silicone sealant, seal the space outside of sleeves in slabs and walls without sleeve-seal system.

D. Install sleeves for pipes passing through interior partitions.

1. Cut sleeves to length for mounting flush with both surfaces.
2. Install sleeves that are large enough to provide 1/4-inch annular clear space between sleeve and pipe or pipe insulation.
3. Seal annular space between sleeve and piping or piping insulation; use joint sealants appropriate for size, depth, and location of joint.

E. Fire-Resistance-Rated Penetrations, Horizontal Assembly Penetrations, and Smoke Barrier Penetrations: Maintain indicated fire or smoke rating of walls, partitions, ceilings, and floors at pipe penetrations. Seal pipe penetrations with fire- and smoke-stop materials. Comply with requirements for firestopping and fill materials specified in Section 078413 "Penetration Firestopping."

3.2 STACK-SLEEVE-FITTING INSTALLATION

A. Install stack-sleeve fittings in new slabs as slabs are constructed.

1. Install fittings that are large enough to provide 1/4-inch annular clear space between sleeve and pipe or pipe insulation.
2. Secure flashing between clamping flanges for pipes penetrating floors with membrane waterproofing. Comply with requirements for flashing specified in Section 076200 "Sheet Metal Flashing and Trim."
3. Install section of cast-iron soil pipe to extend sleeve to 2 inches above finished floor level.
4. Extend cast-iron sleeve fittings below floor slab as required to secure clamping ring if ring is specified.
5. Use silicone sealant to seal the space around outside of stack-sleeve fittings.

B. Fire-Resistance-Rated Penetrations, Horizontal Assembly Penetrations, and Smoke Barrier Penetrations: Maintain indicated fire or smoke rating of floors at pipe penetrations. Seal pipe penetrations with fire- and smoke-stop materials. Comply with requirements for firestopping specified in Section 078413 "Penetration Firestopping."

3.3 SLEEVE-SEAL-SYSTEM INSTALLATION

A. Install sleeve-seal systems in sleeves in exterior concrete walls and slabs-on-grade at service piping entries into building.

B. Select type, size, and number of sealing elements required for piping material and size and for sleeve ID or hole size. Position piping in center of sleeve. Center piping in penetration, assemble sleeve-seal system components, and install in annular space between piping and sleeve. Tighten bolts against pressure plates that cause sealing elements to expand and make a watertight seal.

3.4 SLEEVE-SEAL-FITTING INSTALLATION

A. Install sleeve-seal fittings in new walls and slabs as they are constructed.

B. Assemble fitting components of length to be flush with both surfaces of concrete slabs and walls. Position waterstop flange to be centered in concrete slab or wall.

C. Secure nailing flanges to concrete forms.

D. Use silicone sealant to seal the space around outside of sleeve-seal fittings.

3.5 SLEEVE AND SLEEVE-SEAL SCHEDULE

A. Use sleeves and sleeve seals for the following piping-penetration applications:

1. Exterior Concrete Walls above Grade:
   a. Piping Smaller Than NPS 6 : Steel pipe sleeves .
   b. Piping NPS 6 and Larger: Steel pipe sleeves .
2. Exterior Concrete Walls below Grade:
   a. Piping Smaller Than NPS 6 : Steel pipe sleeves with sleeve-seal system .
      1) Select sleeve size to allow for 1-inch annular clear space between piping and sleeve for installing sleeve-seal system.
   b. Piping NPS 6 and Larger: Steel pipe sleeves with sleeve-seal system .
      1) Select sleeve size to allow for 1-inch annular clear space between piping and sleeve for installing sleeve-seal system.
3. Concrete Slabs-on-Grade:
   a. Piping Smaller Than NPS 6 : Steel pipe sleeves with sleeve-seal system .
      1) Select sleeve size to allow for 1-inch annular clear space between piping and sleeve for installing sleeve-seal system.
   b. Piping NPS 6 and Larger: Steel pipe sleeves with sleeve-seal system .
      1) Select sleeve size to allow for 1-inch annular clear space between piping and sleeve for installing sleeve-seal system.
4. Concrete Slabs above Grade:
   a. Piping Smaller Than NPS 6 : Steel pipe sleeves .
   b. Piping NPS 6 and Larger: Steel pipe sleeves .

END OF SECTION 220517

SECTION 220518 - ESCUTCHEONS FOR PLUMBING PIPING

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. Escutcheons.

1.3 DEFINITIONS

A. Existing Piping to Remain: Existing piping that is not to be removed and that is not otherwise indicated to be removed and salvaged, or removed and reinstalled.

1.4 ACTION SUBMITTALS

A. Product Data: For each type of product.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

1. BrassCraft Manufacturing Co.; a Masco company.
2. Dearborn Brass.
3. ProFlo; a Ferguson Enterprises, Inc. brand.

2.2 ESCUTCHEONS

A. One-Piece, Steel Type: With polished, chrome-plated finish and setscrew fastener.

B. One-Piece, Stainless-Steel Type: With polished stainless-steel finish.

C. One-Piece, Cast-Brass Type: With polished, chrome-plated finish and setscrew fastener.

D. One-Piece, Deep-Pattern Type: Deep-drawn, box-shaped steel with polished, chrome-plated finish and spring-clip fasteners.

E. One-Piece, Stamped-Steel Type: With polished, chrome-plated finish and spring-clip fasteners.

F. Split-Plate, Stamped-Steel Type: With polished, chrome-plated finish; concealed hinge; and spring-clip fasteners.

2.3 FLOOR PLATES

A. Split Floor Plates: Cast brass with concealed hinge.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Install escutcheons for piping penetrations of walls, ceilings, and finished floors.

B. Install escutcheons with ID to closely fit around pipe, tube, and insulation of insulated piping and with OD that completely covers opening.

1. Escutcheons for New Piping and Relocated Existing Piping:
   a. Piping with Fitting or Sleeve Protruding from Wall: One-piece, deep pattern.
   b. Chrome-Plated Piping: One-piece cast brass or split-casting brass with polished, chrome-plated finish.
   c. Insulated Piping: One-piece steel with finish.
   d. Insulated Piping: One-piece cast brass with polished, chrome-plated finish.
   e. Insulated Piping: One-piece stamped steel with polished, chrome-plated finish.
   f. Bare Piping at Wall and Floor Penetrations in Finished Spaces: One-piece steel with finish.
   g. Bare Piping at Wall and Floor Penetrations in Finished Spaces: One-piece cast brass with polished, chrome-plated finish.
   h. Bare Piping at Wall and Floor Penetrations in Finished Spaces: One-piece stamped steel with polished, chrome-plated finish.
   i. Bare Piping at Ceiling Penetrations in Finished Spaces: One-piece steel with finish.
   j. Bare Piping at Ceiling Penetrations in Finished Spaces: One-piece cast brass with polished, chrome-plated finish.
   k. Bare Piping at Ceiling Penetrations in Finished Spaces: One-piece stamped steel with polished, chrome-plated finish.
   l. Bare Piping in Unfinished Service Spaces: One-piece cast brass with polished, chrome-plated finish.
   m. Bare Piping in Unfinished Service Spaces: One-piece stamped steel with polished, chrome-plated finish.
   n. Bare Piping in Equipment Rooms: One-piece cast brass with polished, chrome-plated finish.
   o. Bare Piping in Equipment Rooms: One-piece stamped steel with polished, chrome-plated finish.

C. Install floor plates for piping penetrations of equipment-room floors.

D. Install floor plates with ID to closely fit around pipe, tube, and insulation of piping and with OD that completely covers opening.

3.2 FIELD QUALITY CONTROL

A. Using new materials, replace broken and damaged escutcheons and floor plates.

END OF SECTION 220518

SECTION 220519 - METERS AND GAGES FOR PLUMBING PIPING

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. Liquid-in-glass thermometers.
2. Thermowells.
3. Dial-type pressure gages.
4. Gage attachments.
5. Test plugs.
6. Test-plug kits.
7. Sight flow indicators.

B. Related Requirements:

1. Section 221113 "Facility Water Distribution Piping" for domestic water meters and combined domestic and fire-protection water-service meters outside the building.
2. Section 221119 "Domestic Water Piping Specialties" for water meters.
3. Section 221513 "General-Service Compressed-Air Piping" for compressed air gages.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product.

1.4 INFORMATIONAL SUBMITTALS

1.5 CLOSEOUT SUBMITTALS

PART 2 - PRODUCTS

2.1 LIQUID-IN-GLASS THERMOMETERS

A. Metal-Case, Industrial-Style, Liquid-in-Glass Thermometers:

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

a. Flo Fab Inc.
b. Miljoco Corporation.
c. Trerice, H. O. Co.
d. Weiss Instruments, Inc.
e. Winters Instruments - U.S.

2. Standard: ASME B40.200.
3. Case: Cast aluminum ; 9-inch nominal size unless otherwise indicated.
4. Case Form: Adjustable angle unless otherwise indicated.
5. Tube: Glass with magnifying lens and blue or red organic liquid.
6. Tube Background: Nonreflective aluminum with permanently etched scale markings graduated in deg F .
7. Window: Glass .
8. Stem: Aluminum and of length to suit installation.
   a. Design for Thermowell Installation: Bare stem.
9. Connector: 1-1/4 inches, with ASME B1.1 screw threads.
10. Accuracy: Plus or minus 1 percent of scale range or one scale division, to a maximum of 1.5 percent of scale range.

2.2 THERMOWELLS

A. Thermowells:

1. Standard: ASME B40.200.
2. Description: Pressure-tight, socket-type fitting made for insertion into piping tee fitting.
3. Type: Stepped shank unless straight or tapered shank is indicated.
4. External Threads: NPS 1/2, NPS 3/4, or NPS 1, ASME B1.20.1 pipe threads.
5. Internal Threads: 1/2, 3/4, and 1 inch, with ASME B1.1 screw threads.
6. Bore: Diameter required to match thermometer bulb or stem.
7. Insertion Length: Length required to match thermometer bulb or stem.
8. Lagging Extension: Include on thermowells for insulated piping and tubing.
9. Bushings: For converting size of thermowell's internal screw thread to size of thermometer connection.

2.3 PRESSURE GAGES

A. Direct-Mounted, Metal-Case, Dial-Type Pressure Gages:

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
   a. Flo Fab Inc.
   b. Miljoco Corporation.
   c. Trerice, H. O. Co.
   d. WATTS.
   e. Weiss Instruments, Inc.
   f. Winters Instruments - U.S.
2. Standard: ASME B40.100.
3. Case: Solid-front, pressure relief type(s); cast aluminum or drawn steel ; 4-1/2-inch nominal diameter.
4. Pressure-Element Assembly: Bourdon tube unless otherwise indicated.
5. Pressure Connection: Brass, with NPS 1/4 , ASME B1.20.1 pipe threads and bottom-outlet type unless back-outlet type is indicated.
6. Movement: Mechanical, with link to pressure element and connection to pointer.

7. Dial: Nonreflective aluminum with permanently etched scale markings graduated in psi .
8. Pointer: Dark-colored metal.
9. Window: Glass .
10. Ring: Brass .
11. Accuracy: Grade A, plus or minus 1 percent of middle half of scale range.

2.4 GAGE ATTACHMENTS

A. Snubbers: ASME B40.100, brass; with NPS 1/4 , ASME B1.20.1 pipe threads and porous-metal-type surge-dampening device. Include extension for use on insulated piping.

B. Valves: Brass or stainless-steel needle, with NPS 1/4 , ASME B1.20.1 pipe threads.

2.5 TEST PLUGS

A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

1. Flow Design, Inc.
2. Miljoco Corporation.
3. Trerice, H. O. Co.
4. WATTS.
5. Weiss Instruments, Inc.

B. Description: Test-station fitting made for insertion into piping tee fitting.

C. Body: Brass or stainless steel with core inserts and gasketed and threaded cap. Include extended stem on units to be installed in insulated piping.

D. Thread Size: NPS 1/2, ASME B1.20.1 pipe thread.

E. Minimum Pressure and Temperature Rating: 500 psig at 200 deg F .

F. Core Inserts: Chlorosulfonated polyethylene synthetic and EPDM self-sealing rubber.

2.6 SIGHT FLOW INDICATORS

A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

1. Emerson Process Management; Rosemount Division.
2. Ernst Flow Industries.
3. KOBOLD Instruments, Inc. - USA.
4. Pentair Valves & Controls; Penberthy Brand.

B. Description: Piping inline-installation device for visual verification of flow.

C. Construction: Bronze or stainless-steel body, with sight glass and ball, flapper, or paddle wheel indicator, and threaded or flanged ends.

D. Minimum Pressure Rating: 150 psig .

E. Minimum Temperature Rating: 200 deg F .

F. End Connections for NPS 2 and Smaller: Threaded.

G. End Connections for NPS 2-1/2 and Larger: Flanged.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Install thermowells with socket extending to center of pipe and in vertical position in piping tees.

B. Install thermowells of sizes required to match thermometer connectors. Include bushings if required to match sizes.

C. Install thermowells with extension on insulated piping.

D. Fill thermowells with heat-transfer medium.

E. Install direct-mounted pressure gages in piping tees with pressure gage located on pipe at the most readable position.

F. Install remote-mounted pressure gages on panel.

G. Install valve and snubber in piping for each pressure gage for fluids.

H. Install test plugs in piping tees.

I. Install thermometers in the following locations:

1. Inlet and outlet of each water heater.
2. Inlets and outlets of each domestic water heat exchanger.
3. Inlet and outlet of each domestic hot-water storage tank.
4. .

J. Install pressure gages in the following locations:

1. Building water service entrance into building.
2. Inlet and outlet of each pressure-reducing valve.
3. Suction and discharge of each domestic water pump.
4. .

3.2 CONNECTIONS

A. Install meters and gages adjacent to machines and equipment to allow service and maintenance of meters, gages, machines, and equipment.

3.3 ADJUSTING

A. Adjust faces of meters and gages to proper angle for best visibility.

3.4 THERMOMETER SCALE-RANGE SCHEDULE

A. Scale Range for Domestic Cold-Water Piping: 0 to 100 deg F .

B. Scale Range for Domestic Hot-Water Piping: 30 to 240 deg F .

C. Scale Range for Domestic Cooled-Water Piping: 0 to 100 deg F .

3.5 PRESSURE-GAGE SCALE-RANGE SCHEDULE

A. Scale Range for Water Service Piping: 0 to 100 psi .

B. Scale Range for Domestic Water Piping: 0 to 100 psi .

END OF SECTION 220519

SECTION 220523 - BALL VALVES FOR PLUMBING PIPING

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. Bronze ball valves.

1.3 DEFINITIONS

A. CWP: Cold working pressure.

1.4 ACTION SUBMITTALS

A. Product Data: For each type of valve.

1. Certification that products comply with NSF 61and NSF 372.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Prepare valves for shipping as follows:

1. Protect internal parts against rust and corrosion.
2. Protect threads, flange faces, and soldered ends.
3. Set ball valves open to minimize exposure of functional surfaces.

B. Use the following precautions during storage:

1. Maintain valve end protection.
2. Store valves indoors and maintain at higher-than-ambient-dew-point temperature. If outdoor storage is necessary, store valves off the ground in watertight enclosures.

C. Use sling to handle large valves; rig sling to avoid damage to exposed parts. Do not use operating handles or stems as lifting or rigging points.

PART 2 - PRODUCTS

2.1 GENERAL REQUIREMENTS FOR VALVES

A. Source Limitations for Valves: Obtain each type of valve from single source from single manufacturer.

B. ASME Compliance:

1. ASME B1.20.1 for threads for threaded end valves.
2. ASME B16.1 for flanges on iron valves.
3. ASME B16.5 for flanges on steel valves.
4. ASME B16.10 and ASME B16.34 for ferrous valve dimensions and design criteria.
5. ASME B16.18 for solder-joint connections.
6. ASME B31.9 for building services piping valves.

C. NSF Compliance: NSF 61 and NSF 372 for valve materials for potable-water service.

D. Bronze valves shall be made with dezincification-resistant materials. Bronze valves made with copper alloy (brass) containing more than 15 percent zinc are not permitted.

E. Valve Pressure-Temperature Ratings: Not less than indicated and as required for system pressures and temperatures.

F. Valve Sizes: Same as upstream piping unless otherwise indicated.

G. Valve Actuator Types:

1. Handlever: For quarter-turn valves smaller than NPS 4 .

H. Valves in Insulated Piping:

1. Include 2-inch stem extensions.
2. Extended operating handles of nonthermal-conductive material and protective sleeves that allow operation of valves without breaking vapor seals or disturbing insulation.
3. Memory stops that are fully adjustable after insulation is applied.

2.2 BRONZE BALL VALVES

A. Bronze Ball Valves, Two-Piece with Full Port and Stainless-Steel Trim:

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
   a. Apollo Valves; a part of Aalberts Integrated Piping Systems.
   b. Jenkins Valves; a Crane Co. brand.
   c. Milwaukee Valve Company.
   d. NIBCO INC.
   e. Stockham; a Crane Co. brand.
2. Description:
   a. Standard: MSS SP-110 or MSS-145.
   b. CWP Rating: 600 psig.

c. Body Design: Two piece.
d. Body Material: Bronze.
e. Ends: Threaded or soldered.
f. Seats: PTFE.
g. Stem: Stainless steel.
h. Ball: Stainless steel, vented.
i. Port: Full.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine valve interior for cleanliness, freedom from foreign matter, and corrosion. Remove special packing materials, such as blocks, used to prevent disc movement during shipping and handling.

B. Operate valves in positions from fully open to fully closed. Examine guides and seats made accessible by such operations.

C. Examine threads on valve and mating pipe for form and cleanliness.

D. Examine mating flange faces for conditions that might cause leakage. Check bolting for proper size, length, and material. Verify that gasket is of proper size, that its material composition is suitable for service, and that it is free from defects and damage.

E. Do not attempt to repair defective valves; replace with new valves.

3.2 VALVE INSTALLATION

A. Install valves with unions or flanges at each piece of equipment arranged to allow service, maintenance, and equipment removal without system shutdown.

B. Locate valves for easy access and provide separate support where necessary.

C. Install valves in horizontal piping with stem at or above center of pipe.

D. Install valves in position to allow full stem movement.

E. Install valve tags. Comply with requirements in Section 220553 "Identification for Plumbing Piping and Equipment" for valve tags and schedules.

3.3 GENERAL REQUIREMENTS FOR VALVE APPLICATIONS

A. If valves with specified CWP ratings are unavailable, the same types of valves with higher CWP ratings may be substituted.

B. Select valves with the following end connections:

1. For Copper Tubing, NPS 2 and Smaller: Threaded ends except where solder-joint valve-end option or press-end option is indicated in valve schedules below.

2. For Steel Piping, NPS 5 and Larger: Flanged ends.

3.4 DOMESTIC HOT- AND COLD-WATER VALVE SCHEDULE

A. Pipe NPS 2 and Smaller:

1. Brass ball valve, one piece. Provide with threaded or solder-joint ends.
2. Bronze ball valves, two-piece with full port and stainless steel trim. Provide with threadedorsolder -joint ends.

END OF SECTION 220523

SECTION 220524 - CHECK VALVES FOR PLUMBING PIPING

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. Bronze swing check valves.
2. Bronze swing check valves, press ends.

1.3 DEFINITIONS

A. CWP: Cold working pressure.

B. EPDM: Ethylene propylene-diene terpolymer rubber.

C. NBR: Acrylonitrile-butadiene, Buna-N, or nitrile rubber.

1.4 ACTION SUBMITTALS

A. Product Data: For each type of valve.

1. Certification that products comply with NSF 61.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Prepare valves for shipping as follows:

1. Protect internal parts against rust and corrosion.
2. Protect threads, flange faces, grooves, and weld ends.
3. Set check valves in either closed or open position.

B. Use the following precautions during storage:

1. Maintain valve end protection.
2. Store valves indoors and maintain at higher-than-ambient-dew-point temperature. If outdoor storage is necessary, store valves off the ground in watertight enclosures.

C. Use sling to handle large valves; rig sling to avoid damage to exposed parts. Do not use handwheels or stems as lifting or rigging points.

PART 2 - PRODUCTS

2.1 GENERAL REQUIREMENTS FOR VALVES

A. Source Limitations for Valves: Obtain each type of valve from single source from single manufacturer.

B. ASME Compliance:

1. ASME B1.20.1 for threads for threaded end valves.
2. ASME B16.1 for flanges on iron valves.
3. ASME B16.10 and ASME B16.34 for ferrous valve dimensions and design criteria.
4. ASME B16.18 for solder joint.
5. ASME B31.9 for building services piping valves.

C. AWWA Compliance: Comply with AWWA C606 for grooved-end connections.

D. Drinking Water System Components - Health Effects and Drinking Water System Components - Lead Content Compliance: NSF 61 and NSF 372.

E. Bronze valves shall be made with dezincification-resistant materials. Bronze valves made with copper alloy (brass) containing more than 15 percent zinc are not permitted.

F. Valve Pressure-Temperature Ratings: Not less than indicated and as required for system pressures and temperatures.

G. Valve Sizes: Same as upstream piping unless otherwise indicated.

H. Valve Bypass and Drain Connections: MSS SP-45.

2.2 BRONZE SWING CHECK VALVES

A. Bronze Swing Check Valves with Bronze Disc, Class 125:

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
   a. Apollo Valves; a part of Aalberts Integrated Piping Systems.
   b. Crane Valves; a Crane Co. brand.
   c. Milwaukee Valve Company.
   d. NIBCO INC.
2. Description:
   a. Standard: MSS SP-80, Type 3.
   b. CWP Rating: 200 psig.
   c. Body Design: Horizontal flow.
   d. Body Material: ASTM B 62, bronze.
   e. Ends: Threaded or soldered. See valve schedule articles.
   f. Disc: Bronze.

B. Bronze Swing Check Valves, Press Ends:

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
   a. Apollo Valves; a part of Aalberts Integrated Piping Systems.
   b. Crane Valves; a Crane Co. brand.
   c. Milwaukee Valve Company.
   d. NIBCO INC.
2. Description:
   a. Standard: MSS SP-80 and MSS SP-139.
   b. CWP Rating: Minimum 200 psig.
   c. Body Design: Horizontal flow.
   d. Body Material: ASTM B 584, bronze.
   e. Ends: Press.
   f. Press Ends Connection Rating: Minimum 200 psig.
   g. Disc: Brass or bronze.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine valve interior for cleanliness, freedom from foreign matter, and corrosion. Remove special packing materials, such as blocks, used to prevent disc movement during shipping and handling.

B. Operate valves in positions from fully open to fully closed. Examine guides and seats made accessible by such operations.

C. Examine threads on valve and mating pipe for form and cleanliness.

D. Examine mating flange faces for conditions that might cause leakage. Check bolting for proper size, length, and material. Verify that gasket is of proper size, that its material composition is suitable for service, and that it is free from defects and damage.

E. Do not attempt to repair defective valves; replace with new valves.

3.2 VALVE INSTALLATION

A. Install valves with unions or flanges at each piece of equipment arranged to allow service, maintenance, and equipment removal without system shutdown.

B. Locate valves for easy access and provide separate support where necessary.

C. Install valves in horizontal piping with stem at or above center of pipe.

D. Install valves in position to allow full stem movement.

E. Check Valves: Install check valves for proper direction of flow.

   1. Swing Check Valves: In horizontal position with hinge pin level.
   2. Center-Guided and Plate-Type Check Valves: In horizontal or vertical position, between flanges.

3. Lift Check Valves: With stem upright and plumb.

F. Install valve tags. Comply with requirements in Section 220553 "Identification for Plumbing Piping and Equipment" for valve tags and schedules.

3.3 ADJUSTING

A. Adjust or replace valve packing after piping systems have been tested and put into service but before final adjusting and balancing. Replace valves if persistent leaking occurs.

3.4 GENERAL REQUIREMENTS FOR VALVE APPLICATIONS

A. If valve applications are not indicated, use the following:

1. Pump-Discharge Check Valves:
   a. NPS 2 and Smaller: Bronze swing check valves with bronze disc.
   b. NPS 2-1/2 and Larger for Domestic Water: Iron swing check valves with lever and weight or spring; or iron, center-guided, metal-seat check valves.
   c. NPS 2-1/2 and Larger for Sanitary Waste and Storm Drainage: Iron swing check valves with lever and weight or spring.

B. If valves with specified CWP ratings are unavailable, the same types of valves with higher CWP ratings may be substituted.

C. End Connections:

1. For Copper Tubing, NPS 2 and Smaller: Threaded or soldered or press-ends.
2. For Copper Tubing, NPS 2-1/2 to NPS 4: Flanged or threaded.
3. For Copper Tubing, NPS 5 and Larger: Flanged.
4. For Steel Piping, NPS 2 and Smaller: Threaded.
5. For Steel Piping, NPS 2-1/2 to NPS 4: Flanged or threaded.
6. For Steel Piping, NPS 5 and Larger: Flanged.
7. For Grooved-End Copper Tubing and Steel Piping: Grooved.

3.5 LOW-PRESSURE, COMPRESSED-AIR VALVE SCHEDULE (150 PSIG OR LESS)

A. Pipe NPS 2 and Smaller:

1. Horizontal and Vertical Applications: Bronze swing check valves with bronze disc, Class 125 , with soldered or threaded end connections.

3.6 HIGH-PRESSURE, COMPRESSED-AIR VALVE SCHEDULE (150 TO 200 PSIG

3.7 DOMESTIC HOT- AND COLD-WATER VALVE SCHEDULE

A. Pipe NPS 2 and Smaller:

1. Bronze swing check valves with bronze disc, Class 125 , with soldered or [**threaded**] end connections.

2. Bronze swing check valves with press-end connections.

END OF SECTION 220524

SECTION 220529 - HANGERS AND SUPPORTS FOR PLUMBING PIPING AND EQUIPMENT

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Metal pipe hangers and supports.
2. Trapeze pipe hangers.
3. Thermal hanger-shield inserts.
4. Fastener systems.
5. Pipe-positioning systems.
6. Equipment supports.

B. Related Requirements:

1. Section 055000 "Metal Fabrications" for structural-steel shapes and plates for trapeze hangers for pipe and equipment supports.
2. Section 220516 "Expansion Fittings and Loops for Plumbing Piping" for pipe guides and anchors.

1.2 ACTION SUBMITTALS

A. Product Data: For each type of product.

B. Shop Drawings: Show fabrication and installation details and include calculations.

C. Delegated-Design Submittal: For trapeze hangers indicated to comply with performance requirements and design criteria, including analysis data signed and sealed by the qualified professional engineer responsible for their preparation.

1.3 INFORMATIONAL SUBMITTALS

A. Welding certificates.

1.4 QUALITY ASSURANCE

A. Structural-Steel Welding Qualifications: Qualify procedures and personnel according to AWS D1.1/D1.1M.

B. Pipe Welding Qualifications: Qualify procedures and operators according to "2015 ASME Boiler and Pressure Vessel Code, Section IX."

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Delegated Design: Engage a qualified professional engineer, as defined in Section 014000 "Quality Requirements," to design trapeze pipe hangers and equipment supports.

B. Structural Performance: Hangers and supports for plumbing piping and equipment shall withstand the effects of gravity loads and stresses within limits and under conditions indicated according to ASCE/SEI 7 .

1. Design supports for multiple pipes, including pipe stands, capable of supporting combined weight of supported systems, system contents, and test water.
2. Design equipment supports capable of supporting combined operating weight of supported equipment and connected systems and components.
3. Design seismic-restraint hangers and supports for piping and equipment.

2.2 METAL PIPE HANGERS AND SUPPORTS

A. Carbon-Steel Pipe Hangers and Supports:

1. Description: MSS SP-58, Types 1 through 58, factory-fabricated components.
2. Galvanized Metallic Coatings: Pregalvanized, hot-dip galvanized, or electro-galvanized.
3. Nonmetallic Coatings: Plastic coated or epoxy powder coated.
4. Padded Hangers: Hanger with fiberglass or other pipe insulation pad or cushion to support bearing surface of piping.
5. Hanger Rods: Continuous-thread rod, nuts, and washer made of carbon steel .

B. Stainless-Steel Pipe Hangers and Supports:

1. Description: MSS SP-58, Types 1 through 58, factory-fabricated components.
2. Padded Hangers: Hanger with fiberglass or other pipe insulation pad or cushion to support bearing surface of piping.
3. Hanger Rods: Continuous-thread rod, nuts, and washer made of stainless steel .

C. Copper Pipe and Tube Hangers:

1. Description: MSS SP-58, Types 1 through 58, copper-coated-steel, factory-fabricated components.
2. Hanger Rods: Continuous-thread rod, nuts, and washer made of copper-coated steel stainless steel .

2.3 TRAPEZE PIPE HANGERS

A. Description: MSS SP-58, Type 59, shop- or field-fabricated pipe-support assembly, made from structural-carbon-steel shapes, with MSS SP-58 carbon-steel hanger rods, nuts, saddles, and U-bolts.

2.4 FASTENER SYSTEMS

A. Powder-Actuated Fasteners: Threaded-steel stud, for use in hardened portland cement concrete, with pull-out, tension, and shear capacities appropriate for supported loads and building materials where used.

1. Manufacturers: Subject to compliance with requirements, undefined:
   a. Hilti, Inc.
   b. ITW Ramset/Red Head; Illinois Tool Works, Inc.
   c. MKT Fastening, LLC.

B. Mechanical-Expansion Anchors: Insert-wedge-type anchors, for use in hardened portland cement concrete, with pull-out, tension, and shear capacities appropriate for supported loads and building materials where used.

1. Manufacturers: Subject to compliance with requirements, undefined:
   a. Cooper B-line; brand of Eaton, Electrical Sector.
   b. Hilti, Inc.
   c. ITW Ramset/Red Head; Illinois Tool Works, Inc.
   d. MKT Fastening, LLC.
2. Indoor Applications: stainless steel.
3. Outdoor Applications: Stainless steel.

2.5 PIPE-POSITIONING SYSTEMS

A. Description: IAPMO PS 42 positioning system composed of metal brackets, clips, and straps for positioning piping in pipe spaces; for plumbing fixtures in commercial applications.

2.6 EQUIPMENT SUPPORTS

A. Description: Welded, shop- or field-fabricated equipment support made from structural-carbon-steel shapes.

2.7 MATERIALS

A. Aluminum: ASTM B221.

B. Carbon Steel: ASTM A1011/A1011M.

C. Structural Steel: ASTM A36/A36M carbon-steel plates, shapes, and bars; black and galvanized.

D. Stainless Steel: ASTM A240/A240M.

E. Grout: ASTM C1107/C1107M, factory-mixed and -packaged, dry, hydraulic-cement, nonshrink and nonmetallic grout; suitable for interior and exterior applications.

1. Properties: Nonstaining, noncorrosive, and nongaseous.
2. Design Mix: 5000-psi, 28-day compressive strength.

PART 3 - EXECUTION

3.1 APPLICATION

A. Comply with requirements in Section 078413 "Penetration Firestopping" for firestopping materials and installation, for penetrations through fire-rated walls, ceilings, and assemblies.

B. 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 .

3.2 HANGER AND SUPPORT INSTALLATION

A. Metal Pipe-Hanger Installation: Comply with MSS SP-58. Install hangers, supports, clamps, and attachments as required to properly support piping from building structure.

B. Metal Trapeze Pipe-Hanger Installation: Comply with MSS SP-58. Arrange for grouping of parallel runs of horizontal piping, and support together on field-fabricated trapeze pipe hangers.

1. Pipes of Various Sizes: Support together and space trapezes for smallest pipe size, or install intermediate supports for smaller-diameter pipes as specified for individual pipe hangers.
2. Field fabricate from ASTM A36/A36M carbon-steel shapes selected for loads being supported. Weld steel according to AWS D1.1/D1.1M.

C. Thermal Hanger-Shield Installation: Install in pipe hanger or shield for insulated piping.

D. Fastener System Installation:

1. Install powder-actuated fasteners for use in lightweight concrete or concrete slabs less than 4 inches thick in concrete, after concrete is placed and completely cured. Use operators that are licensed by powder-actuated tool manufacturer. Install fasteners according to powder-actuated tool manufacturer's operating manual.
2. Install mechanical-expansion anchors in concrete, after concrete is placed and completely cured. Install fasteners according to manufacturer's written instructions.

E. Pipe-Positioning-System Installation: Install support devices to make rigid supply and waste piping connections to each plumbing fixture.

F. Install hangers and supports complete with necessary attachments, inserts, bolts, rods, nuts, washers, and other accessories.

G. Equipment Support Installation: Fabricate from welded-structural-steel shapes.

H. Install hangers and supports to allow controlled thermal and seismic movement of piping systems, to permit freedom of movement between pipe anchors, and to facilitate action of expansion joints, expansion loops, expansion bends, and similar units.

I. Install lateral bracing with pipe hangers and supports to prevent swaying.

J. Install building attachments within concrete slabs or attach to structural steel. Install additional attachments at concentrated loads, including valves, flanges, and strainers, NPS 2-1/2 and larger and at changes in direction of piping. Install concrete inserts before concrete is placed; fasten inserts to forms, and install reinforcing bars through openings at top of inserts.

K. Load Distribution: Install hangers and supports, so that piping live and dead loads and stresses from movement will not be transmitted to connected equipment.

L. Pipe Slopes: Install hangers and supports to provide indicated pipe slopes and to not exceed maximum pipe deflections allowed by ASME B31.9 for building services piping.

M. Insulated Piping:

1. Attach clamps and spacers to piping.
    a. Piping Operating Above Ambient Air Temperature: Clamp may project through insulation.
    b. Piping Operating Below Ambient Air Temperature: Use thermal hanger-shield insert with clamp sized to match OD of insert.
    c. Do not exceed pipe stress limits allowed by ASME B31.9 for building services piping.
2. Install MSS SP-58, Type 39 protection saddles if insulation without vapor barrier is indicated. Fill interior voids with insulation that matches adjoining insulation.
    a. Option: Thermal hanger-shield inserts may be used. Include steel weight-distribution plate for pipe NPS 4 and larger if pipe is installed on rollers.
3. Install MSS SP-58, Type 40 protective shields on cold piping with vapor barrier. Shields shall span an arc of 180 degrees.
    a. Option: Thermal hanger-shield inserts may be used. Include steel weight-distribution plate for pipe NPS 4 and larger if pipe is installed on rollers.
4. Shield Dimensions for Pipe: Not less than the following:
    a. NPS 1/4 to NPS 3-1/2: 12 inches long and 0.048 inch thick.
    b. NPS 4: 12 inches long and 0.06 inch thick.
    c. NPS 5 and NPS 6: 18 inches long and 0.06 inch thick.
    d. NPS 8 to NPS 14: 24 inches long and 0.075 inch thick.
    e. NPS 16 to NPS 24: 24 inches long and 0.105 inch thick.
5. Pipes NPS 8 and Larger: Include wood or reinforced calcium-silicate-insulation inserts of length at least as long as protective shield.
6. Thermal Hanger Shields: Install with insulation of same thickness as piping insulation.

3.3 EQUIPMENT SUPPORTS

A. Fabricate structural-steel stands to suspend equipment from structure overhead or to support equipment above floor.

B. Grouting: Place grout under supports for equipment, and make bearing surface smooth.

C. Provide lateral bracing, to prevent swaying, for equipment supports.

3.4 METAL FABRICATIONS

A. Cut, drill, and fit miscellaneous metal fabrications for trapeze pipe hangers and equipment supports.

B. Fit exposed connections together to form hairline joints. Field weld connections that cannot be shop welded because of shipping size limitations.

C. Field Welding: Comply with AWS D1.1/D1.1M procedures for shielded, metal arc welding; appearance and quality of welds; and methods used in correcting welding work.

3.5 ADJUSTING

A. Hanger Adjustments: Adjust hangers to distribute loads equally on attachments and to achieve indicated slope of pipe.

B. Trim excess length of continuous-thread hanger and support rods to 1-1/2 inches .

3.6 HANGER AND SUPPORT SCHEDULE

A. Specific hanger and support requirements are in Sections specifying piping systems and equipment.

B. Comply with MSS SP-58 for pipe-hanger selections and applications that are not specified in piping system Sections.

C. Use hangers and supports with galvanized metallic coatings for piping and equipment that will not have field-applied finishes.

D. Use nonmetallic coatings on attachments for electrolytic protection where attachments are in direct contact with copper tubing.

E. Use carbon-steel pipe hangers and supports and metal trapeze pipe hangers and attachments for general service applications.

F. Use stainless-steel pipe hangers and stainless-steel or corrosion-resistant attachments for hostile environment applications.

G. Use copper-plated pipe hangers and copper attachments for copper piping and tubing.

H. Use padded hangers for piping that is subject to scratching.

I. Use thermal hanger-shield inserts for insulated piping and tubing.

J. Horizontal-Piping Hangers and Supports: Unless otherwise indicated and except as specified in piping system Sections, install the following types:

1. Adjustable, Steel Clevis Hangers (MSS Type 1): For suspension of noninsulated or insulated, stationary pipes NPS 1/2 to NPS 30.
2. Yoke-Type Pipe Clamps (MSS Type 2): For suspension of up to 1050 deg F pipes NPS 4 to NPS 24, requiring up to 4 inches of insulation.
3. Carbon- or Alloy-Steel, Double-Bolt Pipe Clamps (MSS Type 3): For suspension of pipes NPS 3/4 to NPS 36, requiring clamp flexibility and up to 4 inches of insulation.
4. Steel Pipe Clamps (MSS Type 4): For suspension of cold and hot pipes NPS 1/2 to NPS 24 if little or no insulation is required.
5. Pipe Hangers (MSS Type 5): For suspension of pipes NPS 1/2 to NPS 4, to allow off-center closure for hanger installation before pipe erection.

6. Adjustable, Swivel Split- or Solid-Ring Hangers (MSS Type 6): For suspension of noninsulated, stationary pipes NPS 3/4 to NPS 8.
7. Adjustable, Steel Band Hangers (MSS Type 7): For suspension of noninsulated, stationary pipes NPS 1/2 to NPS 8.
8. Adjustable Band Hangers (MSS Type 9): For suspension of noninsulated, stationary pipes NPS 1/2 to NPS 8.
9. Adjustable, Swivel-Ring Band Hangers (MSS Type 10): For suspension of noninsulated, stationary pipes NPS 1/2 to NPS 8.
10. Split Pipe Ring with or without Turnbuckle Hangers (MSS Type 11): For suspension of noninsulated, stationary pipes NPS 3/8 to NPS 8.
11. Extension Hinged or Two-Bolt Split Pipe Clamps (MSS Type 12): For suspension of noninsulated, stationary pipes NPS 3/8 to NPS 3.
12. U-Bolts (MSS Type 24): For support of heavy pipes NPS 1/2 to NPS 30.
13. Clips (MSS Type 26): For support of insulated pipes not subject to expansion or contraction.
14. Pipe Saddle Supports (MSS Type 36): For support of pipes NPS 4 to NPS 36, with steel-pipe base stanchion support and cast-iron floor flange or carbon-steel plate.
15. Pipe Stanchion Saddles (MSS Type 37): For support of pipes NPS 4 to NPS 36, with steel-pipe base stanchion support and cast-iron floor flange or carbon-steel plate, and with U-bolt to retain pipe.
16. Adjustable Pipe Saddle Supports (MSS Type 38): For stanchion-type support for pipes NPS 2-1/2 to NPS 36 if vertical adjustment is required, with steel-pipe base stanchion support and cast-iron floor flange.
17. Single-Pipe Rolls (MSS Type 41): For suspension of pipes NPS 1 to NPS 30, from two rods if longitudinal movement caused by expansion and contraction occurs.
18. Adjustable Roller Hangers (MSS Type 43): For suspension of pipes NPS 2-1/2 to NPS 24, from single rod if horizontal movement caused by expansion and contraction occurs.
19. Complete Pipe Rolls (MSS Type 44): For support of pipes NPS 2 to NPS 42 if longitudinal movement caused by expansion and contraction occurs but vertical adjustment is unnecessary.
20. Pipe Roll and Plate Units (MSS Type 45): For support of pipes NPS 2 to NPS 24 if small horizontal movement caused by expansion and contraction occurs and vertical adjustment is unnecessary.
21. Adjustable Pipe Roll and Base Units (MSS Type 46): For support of pipes NPS 2 to NPS 30 if vertical and lateral adjustment during installation, in addition to expansion and contraction, is required.

K. Vertical-Piping Clamps: Unless otherwise indicated and except as specified in piping system Sections, install the following types:

1. Extension Pipe or Riser Clamps (MSS Type 8): For support of pipe risers NPS 3/4 to NPS 24.
2. Carbon- or Alloy-Steel Riser Clamps (MSS Type 42): For support of pipe risers NPS 3/4 to NPS 24 if longer ends are required for riser clamps.

L. Hanger-Rod Attachments: Unless otherwise indicated and except as specified in piping system Sections, install the following types:

1. Steel Turnbuckles (MSS Type 13): For adjustment of up to 6 inches for heavy loads.
2. Steel Clevises (MSS Type 14): For 120 to 450 deg F piping installations.
3. Swivel Turnbuckles (MSS Type 15): For use with MSS Type 11 split pipe rings.
4. Malleable-Iron Sockets (MSS Type 16): For attaching hanger rods to various types of building attachments.
5. Steel Weldless Eye Nuts (MSS Type 17): For 120 to 450 deg F piping installations.

M. Building Attachments: Unless otherwise indicated and except as specified in piping system Sections, install the following types:

1. Steel or Malleable-Concrete Inserts (MSS Type 18): For upper attachment to suspend pipe hangers from concrete ceiling.
2. Top-Beam C-Clamps (MSS Type 19): For use under roof installations with bar-joist construction, to attach to top flange of structural shape.
3. Side-Beam or Channel Clamps (MSS Type 20): For attaching to bottom flange of beams, channels, or angles.
4. Center-Beam Clamps (MSS Type 21): For attaching to center of bottom flange of beams.
5. Welded Beam Attachments (MSS Type 22): For attaching to bottom of beams if loads are considerable and rod sizes are large.
6. C-Clamps (MSS Type 23): For structural shapes.
7. Top-Beam Clamps (MSS Type 25): For top of beams if hanger rod is required tangent to flange edge.
8. Side-Beam Clamps (MSS Type 27): For bottom of steel I-beams.
9. Steel-Beam Clamps with Eye Nuts (MSS Type 28): For attaching to bottom of steel I-beams for heavy loads.
10. Linked-Steel Clamps with Eye Nuts (MSS Type 29): For attaching to bottom of steel I-beams for heavy loads, with link extensions.
11. Malleable-Beam Clamps with Extension Pieces (MSS Type 30): For attaching to structural steel.
12. Welded-Steel Brackets: For support of pipes from below or for suspending from above by using clip and rod. Use one of the following for indicated loads:
    a. Light (MSS Type 31): 750 lb.
    b. Medium (MSS Type 32): 1500 lb.
    c. Heavy (MSS Type 33): 3000 lb.
13. Side-Beam Brackets (MSS Type 34): For sides of steel or wooden beams.
14. Plate Lugs (MSS Type 57): For attaching to steel beams if flexibility at beam is required.
15. Horizontal Travelers (MSS Type 58): For supporting piping systems subject to linear horizontal movement where headroom is limited.

N. Saddles and Shields: Unless otherwise indicated and except as specified in piping system Sections, install the following types:

1. Steel-Pipe-Covering Protection Saddles (MSS Type 39): To fill interior voids with insulation that matches adjoining insulation.
2. Protection Shields (MSS Type 40): Of length recommended in writing by manufacturer to prevent crushing insulation.
3. Thermal Hanger-Shield Inserts: For supporting insulated pipe.

O. Spring Hangers and Supports: Unless otherwise indicated and except as specified in piping system Sections, install the following types:

1. Restraint-Control Devices (MSS Type 47): Where indicated to control piping movement.
2. Spring Cushions (MSS Type 48): For light loads if vertical movement does not exceed 1-1/4 inches.
3. Spring-Cushion Roll Hangers (MSS Type 49): For equipping Type 41 roll hanger with springs.
4. Spring Sway Braces (MSS Type 50): To retard sway, shock, vibration, or thermal expansion in piping systems.
5. Variable-Spring Hangers (MSS Type 51): Preset to indicated load, and limit variability factor to 25 percent to allow expansion and contraction of piping system from hanger.

6. Variable-Spring Base Supports (MSS Type 52): Preset to indicated load, and limit variability factor to 25 percent to allow expansion and contraction of piping system from base support.
7. Variable-Spring Trapeze Hangers (MSS Type 53): Preset to indicated load, and limit variability factor to 25 percent to allow expansion and contraction of piping system from trapeze support.
8. Constant Supports: For critical piping stress and if necessary to avoid transfer of stress from one support to another support, critical terminal, or connected equipment. Include auxiliary stops for erection, hydrostatic test, and load-adjustment capability. These supports include the following types:
    a. Horizontal (MSS Type 54): Mounted horizontally.
    b. Vertical (MSS Type 55): Mounted vertically.
    c. Trapeze (MSS Type 56): Two vertical-type supports and one trapeze member.

P. Comply with MSS SP-58 for trapeze pipe-hanger selections and applications that are not specified in piping system Sections.

Q. Use mechanical-expansion anchors instead of building attachments where required in concrete construction.

R. Use pipe-positioning systems in pipe spaces behind plumbing fixtures to support supply and waste piping for plumbing fixtures.

END OF SECTION 220529

SECTION 220553 - IDENTIFICATION FOR PLUMBING PIPING AND EQUIPMENT

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. Equipment labels.
2. Warning signs and labels.
3. Pipe labels.
4. Valve tags.
5. Warning tags.

1.3 ACTION SUBMITTALS

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

PART 2 - PRODUCTS

2.1 EQUIPMENT LABELS

A. Metal Labels for Equipment:

1. Manufacturers: Subject to compliance with requirements, undefined:
   a. Brimar Industries, Inc.
   b. Craftmark Pipe Markers.
   c. Kolbi Pipe Marker Co.
2. Material and Thickness: stainless steel, 0.025-inch minimum thickness, and having predrilled or stamped holes for attachment hardware.
3. Letter Color: Black .
4. Background Color: White .
5. Minimum Label Size: Length and width vary for required label content, but not less than 2-1/2 by 3/4 inch.
6. Minimum Letter Size: 1/4 inch for name of units if viewing distance is less than 24 inches, 1/2 inch for viewing distances up to 72 inches, and proportionately larger lettering for greater viewing distances. Include secondary lettering two-thirds to three-quarters the size of principal lettering.
7. Fasteners: Stainless-steel rivets or self-tapping screws.
8. Adhesive: Contact-type permanent adhesive, compatible with label and with substrate.

B. Label Content: Include equipment's Drawing designation or unique equipment number, Drawing numbers where equipment is indicated (plans, details, and schedules), and the Specification Section number and title where equipment is specified.

C. Equipment Label Schedule: For each item of equipment to be labeled, on 8-1/2-by-11-inch bond paper. Tabulate equipment identification number, and identify Drawing numbers where equipment is indicated (plans, details, and schedules) and the Specification Section number and title where equipment is specified. Equipment schedule shall be included in operation and maintenance data.

2.2 WARNING SIGNS AND LABELS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Brimar Industries, Inc.
2. Craftmark Pipe Markers.

B. Material and Thickness: Multilayer, multicolor, plastic labels for mechanical engraving, 1/8 inch thick, and having predrilled holes for attachment hardware.

C. Letter Color: Black .

D. Background Color: Orange.

E. Maximum Temperature: Able to withstand temperatures up to 160 deg F.

F. Minimum Label Size: Length and width vary for required label content, but not less than 2-1/2 by 3/4 inch.

G. Minimum Letter Size: 1/4 inch for name of units if viewing distance is less than 24 inches, 1/2 inch for viewing distances up to 72 inches, and proportionately larger lettering for greater viewing distances. Include secondary lettering two-thirds to three-quarters the size of principal lettering.

H. Fasteners: Stainless-steel rivets or self-tapping screws.

I. Adhesive: Contact-type permanent adhesive, compatible with label and with substrate.

J. Label Content: Include caution and warning information plus emergency notification instructions.

2.3 PIPE LABELS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Brimar Industries, Inc.
2. Craftmark Pipe Markers.
3. Kolbi Pipe Marker Co.

B. General Requirements for Manufactured Pipe Labels: Preprinted, color-coded, with lettering indicating service, and showing flow direction.

C. Pretensioned Pipe Labels: Precoiled, semirigid plastic formed to cover full circumference of pipe and to attach to pipe without fasteners or adhesive.

D. Self-Adhesive Pipe Labels: Printed plastic with contact-type, permanent-adhesive backing.

E. Pipe Label Contents: Include identification of piping service using same designations or abbreviations as used on Drawings; also include pipe size and an arrow indicating flow direction.

1. Flow-Direction Arrows: Integral with piping-system service lettering to accommodate both directions or as separate unit on each pipe label to indicate flow direction.
2. Lettering Size: Size letters according to ASME A13.1 for piping .

2.4 VALVE TAGS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Brimar Industries, Inc.
2. Craftmark Pipe Markers.
3. Kolbi Pipe Marker Co.

B. Valve Tags: Stamped or engraved with 1/4-inch letters for piping system abbreviation and 1/2-inch numbers.

1. Tag Material: stainless steel, 0.025-inch minimum thickness, and having predrilled or stamped holes for attachment hardware.
2. Fasteners: Brass wire-link chain or beaded chain .

C. Valve Schedules: For each piping system, on 8-1/2-by-11-inch bond paper. Tabulate valve number, piping system, system abbreviation (as shown on valve tag), location of valve (room or space), normal-operating position (open, closed, or modulating), and variations for identification. Mark valves for emergency shutoff and similar special uses.

1. Valve-tag schedule shall be included in operation and maintenance data.

2.5 WARNING TAGS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Brimar Industries, Inc.
2. Craftmark Pipe Markers.
3. Kolbi Pipe Marker Co.

B. Description: Preprinted or partially preprinted accident-prevention tags of plasticized card stock with matte finish suitable for writing.

1. Size: 3 by 5-1/4 inches minimum .
2. Fasteners: Brass grommet and wire .
3. Nomenclature: Large-size primary caption such as "DANGER," "CAUTION," or "DO NOT OPERATE."

4. Color: Safety yellow background with black lettering.

PART 3 - EXECUTION

3.1 PREPARATION

A. Clean piping and equipment surfaces of substances that could impair bond of identification devices, including dirt, oil, grease, release agents, and incompatible primers, paints, and encapsulants.

3.2 GENERAL INSTALLATION REQUIREMENTS

A. Coordinate installation of identifying devices with completion of covering and painting of surfaces where devices are to be applied.

B. Coordinate installation of identifying devices with locations of access panels and doors.

C. Install identifying devices before installing acoustical ceilings and similar concealment.

3.3 EQUIPMENT LABEL INSTALLATION

A. Install or permanently fasten labels on each major item of mechanical equipment.

B. Locate equipment labels where accessible and visible.

3.4 PIPE LABEL INSTALLATION

A. Pipe Label Locations: Locate pipe labels where piping is exposed or above accessible ceilings in finished spaces; machine rooms; accessible maintenance spaces such as shafts, tunnels, and plenums; and exterior exposed locations as follows:

1. Near each valve and control device.
2. Near penetrations through walls, floors, ceilings, and inaccessible enclosures.
3. At access doors, manholes, and similar access points that permit view of concealed piping.
4. Spaced at maximum intervals of 50 feet along each run. Reduce intervals to 25 feet in areas of congested piping and equipment.

B. Directional Flow Arrows: Arrows shall be used to indicate direction of flow in pipes, including pipes where flow is allowed in both directions.

C. Pipe Label Color Schedule:

1. Low-Pressure Compressed Air Piping:
   a. Background: Safety blue .
   b. Letter Colors: White .
2. High-Pressure Compressed Air Piping:
   a. Background: Safety blue .
   b. Letter Colors: White .

3. Domestic Water Piping
   a. Background: Safety green .
   b. Letter Colors: White .
4. Sanitary Waste and Storm Drainage Piping:
   a. Background Color: Safety black .
   b. Letter Color: Yellow .

3.5 VALVE-TAG INSTALLATION

A. Install tags on valves and control devices in piping systems, except check valves, valves within factory-fabricated equipment units, shutoff valves, faucets, convenience and lawn-watering hose connections, and similar roughing-in connections of end-use fixtures and units. List tagged valves in a valve schedule.

B. Valve-Tag Application Schedule: Tag valves according to size, shape, and color scheme and with captions similar to those indicated in the following subparagraphs:

1. Valve-Tag Size and Shape:
   a. Cold Water: 2 inches , round .
   b. Hot Water: 2 inches , round .
   c. Low-Pressure Compressed Air: 2 inches , round .
   d. High-Pressure Compressed Air: 2 inches , round .
2. Valve-Tag Colors:
   a. Cold Water: Safety green .
   b. Hot Water: Safety green .
   c. Low-Pressure Compressed Air: Safety blue .
   d. High-Pressure Compressed Air: Safety blue .
3. Letter Colors:
   a. Cold Water: White .
   b. Hot Water: White .
   c. Low-Pressure Compressed Air: White .
   d. High-Pressure Compressed Air: White .

3.6 WARNING-TAG INSTALLATION

A. Write required message on, and attach warning tags to, equipment and other items where required.

END OF SECTION 220553

SECTION 220719 - PLUMBING PIPING INSULATION

PART 1 - GENERAL

1.1 SUMMARY

A. Section includes insulating the following plumbing piping services:

1. Domestic cold-water piping.
2. Domestic hot-water piping.
3. Domestic recirculating hot-water piping.
4. Storm-water piping exposed to freezing conditions.
5. Roof drains and rainwater leaders.
6. Supplies and drains for handicap-accessible lavatories and sinks.

B. Related Sections:

1. Section 220716 "Plumbing Equipment Insulation" for equipment insulation.

1.2 ACTION SUBMITTALS

A. Product Data: For each type of product. Include thermal conductivity, water-vapor permeance thickness, and jackets (both factory and field applied if any).

1.3 INFORMATIONAL SUBMITTALS

1.4 QUALITY ASSURANCE

A. Comply with the following applicable standards and other requirements specified for miscellaneous components:

1. Supply and Drain Protective Shielding Guards: ICC A117.1.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Packaging: Insulation system materials are to be delivered to the Project site in unopened containers. The packaging is to include name of the manufacturer, fabricator, type, description, and size , as well as ASTM standard designation and maximum use temperature.

1.6 COORDINATION

A. Coordinate sizes and locations of supports, hangers, and insulation shields specified in Section 220529 "Hangers and Supports for Plumbing Piping and Equipment."

B. Coordinate clearance requirements with piping Installer for piping insulation application. Before preparing piping Shop Drawings, establish and maintain clearance requirements for installation of insulation and field-applied jackets and finishes and for space required for maintenance.

C. Coordinate installation and testing of heat tracing.

1.7 SCHEDULING

A. Schedule insulation application after pressure testing systems and, where required, after installing and testing heat tracing. Insulation application may begin on segments that have satisfactory test results.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Surface-Burning Characteristics: For insulation and related materials, as determined by testing identical products in accordance with ASTM E84, by a testing agency acceptable to authorities having jurisdiction. Factory label insulation, jacket materials, adhesive, mastic, tapes, and cement material containers with appropriate markings of applicable testing agency.

1. All Insulation Installed Indoors: Flame-spread index of 25 or less, and smoke-developed index of 50 or less.
2.
3.

2.2 INSULATION MATERIALS

A. Comply with requirements in "Piping Insulation Schedule, General," "Indoor Piping Insulation Schedule," "Outdoor, Aboveground Piping Insulation Schedule," and "Outdoor, Underground Piping Insulation Schedule" articles for where insulating materials are applied.

B. Products do not contain asbestos, lead, mercury, or mercury compounds.

C. Products that come into contact with stainless steel have a leachable chloride content of less than 50 ppm when tested in accordance with ASTM C871.

D. Insulation materials for use on austenitic stainless steel are qualified as acceptable in accordance with ASTM C795.

E. Foam insulation materials do not use CFC or HCFC blowing agents in the manufacturing process.

F. Glass-Fiber, Preformed Pipe: Glass fibers bonded with a thermosetting resin; suitable for maximum use temperature up to 850 deg F in accordance with ASTM C411. Comply with ASTM C547.

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

a. Johns Manville; a Berkshire Hathaway company.
b. Knauf Insulation.
c. Owens Corning.

2. Preformed Pipe Insulation: Type I, Grade A with factory-applied ASJ .
3. Fabricated shapes in accordance with ASTM C450 and ASTM C585.
4. Factory-applied jacket requirements are specified in "Factory-Applied Jackets" Article.

G. Polyolefin: Polyethylene thermal plastic insulation. Comply with ASTM C534/C534M or ASTM C1427, Type I, Grade 1, for tubular materials , self-seal.

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
   a. Armacell LLC.
   b. Nomaco.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates and conditions for compliance with requirements for installation tolerances and other conditions affecting performance of insulation application.

1. Verify that systems to be insulated have been tested and are free of defects.
2. Verify that surfaces to be insulated are clean and dry.

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

3.2 PREPARATION

A. Clean and dry surfaces to receive insulation. Remove materials that will adversely affect insulation application.

B. Clean and prepare surfaces to be insulated. Before insulating, apply a corrosion coating to insulated surfaces as follows:

1. Stainless Steel: Coat 300 series stainless steel with an epoxy primer 5 mils thick and an epoxy finish 5 mils thick if operating in a temperature range of between 140 and 300 deg F. Consult coating manufacturer for appropriate coating materials and application methods for operating temperature range.
2. Carbon Steel: Coat carbon steel operating at a service temperature of between 32 and 300 deg F with an epoxy coating. Consult coating manufacturer for appropriate coating materials and application methods for operating temperature range.

C. Coordinate insulation installation with the tradesman installing heat tracing. Comply with requirements for heat tracing that apply to insulation.

D. Mix insulating cements with clean potable water; if insulating cements are to be in contact with stainless steel surfaces, use demineralized water.

3.3 GENERAL INSTALLATION REQUIREMENTS

A. Install insulation materials, accessories, and finishes with smooth, straight, and even surfaces; free of voids throughout the length of piping, including fittings, valves, and specialties.

B. Install insulation materials, forms, vapor barriers or retarders, jackets, and of thicknesses required for each item of pipe system, as specified in insulation system schedules.

C. Install accessories compatible with insulation materials and suitable for the service. Install accessories that do not corrode, compress, or otherwise damage insulation or jacket.

D. Install insulation with longitudinal seams at top and bottom (12 o'clock and 6 o'clock positions) of horizontal runs.

E. Install multiple layers of insulation with longitudinal and end seams staggered.

F. Do not weld brackets, clips, or other attachment devices to piping, fittings, and specialties.

G. Keep insulation materials dry during storage, application, and finishing. Replace insulation materials that get wet during storage or in the installation process before being properly covered and sealed in accordance with Contract Documents.

H. Install insulation with tight longitudinal seams and end joints. Bond seams and joints with adhesive recommended by insulation material manufacturer.

I. Install insulation with least number of joints practical.

J. Where vapor barrier is indicated, seal joints, seams, and penetrations in insulation at hangers, supports, anchors, and other projections with vapor-barrier mastic.

1. Install insulation continuously through hangers and around anchor attachments.
2. For insulation application where vapor barriers are indicated, extend insulation on anchor legs from point of attachment to supported item to point of attachment to structure. Taper and seal ends attached to structure with vapor-barrier mastic.
3. Install insert materials and insulation to tightly join the insert. Seal insulation to insulation inserts with adhesive or sealing compound recommended by insulation material manufacturer.
4. Cover inserts with jacket material matching adjacent pipe insulation. Install shields over jacket, arranged to protect jacket from tear or puncture by hanger, support, and shield.

K. Apply adhesives, mastics, and sealants at manufacturer's recommended coverage rate and wet and dry film thicknesses.

L. Install insulation with factory-applied jackets as follows:

1. Draw jacket tight and smooth, but not to the extent of creating wrinkles or areas of compression in the insulation.
2. Cover circumferential joints with 3-inch- wide strips, of same material as insulation jacket. Secure strips with adhesive and outward-clinching staples along both edges of strip, spaced 4 inches o.c.
3. Overlap jacket longitudinal seams at least 1-1/2 inches. Install insulation with longitudinal seams at bottom of pipe. Clean and dry surface to receive self-sealing lap. Staple laps with outward-clinching staples along edge at 4 inches o.c.
   a. For below-ambient services, apply vapor-barrier mastic over staples.

4. Cover joints and seams with tape, in accordance with insulation material manufacturer's written instructions, to maintain vapor seal.
5. Where vapor barriers are indicated, apply vapor-barrier mastic on seams and joints and at ends adjacent to pipe flanges and fittings.

M. Cut insulation in a manner to avoid compressing insulation.

N. Finish installation with systems at operating conditions. Repair joint separations and cracking due to thermal movement.

O. Repair damaged insulation facings by applying same facing material over damaged areas. Extend patches at least 4 inches beyond damaged areas. Adhere, staple, and seal patches in similar fashion to butt joints.

P. For above-ambient services, do not install insulation to the following:

1. Vibration-control devices.
2. Testing agency labels and stamps.
3. Nameplates and data plates.
4. Cleanouts.

3.4 GENERAL PIPE INSULATION INSTALLATION

A. Requirements in this article generally apply to all insulation materials, except where more specific requirements are specified in various pipe insulation material installation articles below.

B. Insulation Installation on Fittings, Valves, Strainers, Flanges, Mechanical Couplings, and Unions:

1. Install insulation over fittings, valves, strainers, flanges, mechanical couplings, unions, and other specialties with continuous thermal and vapor-retarder integrity unless otherwise indicated.
2. Insulate pipe elbows using preformed fitting insulation or mitered or routed fittings made from same material and density as that of adjacent pipe insulation. Each piece is butted tightly against adjoining piece and bonded with adhesive. Fill joints, seams, voids, and irregular surfaces with insulating cement finished to a smooth, hard, and uniform contour that is uniform with adjoining pipe insulation.
3. Insulate tee fittings with preformed fitting insulation or sectional pipe insulation of same material and thickness as that used for adjacent pipe. Cut sectional pipe insulation to fit. Butt each section closely to the next and hold in place with tie wire. Bond pieces with adhesive.
4. Insulate valves using preformed fitting insulation or sectional pipe insulation of same material, density, and thickness as that used for adjacent pipe. Overlap adjoining pipe insulation by not less than 2 times the thickness of pipe insulation, or one pipe diameter, whichever is thicker. For valves, insulate up to and including the bonnets, valve stuffing-box studs, bolts, and nuts. Fill joints, seams, and irregular surfaces with insulating cement.
5. Insulate strainers using preformed fitting insulation or sectional pipe insulation of same material, density, and thickness as used for adjacent pipe. Overlap adjoining pipe insulation by not less than 2 times the thickness of pipe insulation, or one pipe diameter, whichever is thicker. Fill joints, seams, and irregular surfaces with insulating cement. Insulate strainers, so strainer basket flange or plug can be easily removed and replaced without damaging the insulation and jacket. Provide a removable reusable insulation cover. For below-ambient services, provide a design that maintains vapor barrier.

6. Insulate flanges, mechanical couplings, and unions, using a section of oversized preformed pipe insulation. Overlap adjoining pipe insulation by not less than 2 times the thickness of pipe insulation, or one pipe diameter, whichever is thicker. Stencil or label the outside insulation jacket of each union with the word "union" matching size and color of pipe labels.
7. Cover segmented insulated surfaces with a layer of finishing cement and coat with a mastic. Install vapor-barrier mastic for below-ambient services and a breather mastic for above-ambient services. Reinforce the mastic with fabric-reinforcing mesh. Trowel the mastic to a smooth and well-shaped contour.
8. For services not specified to receive a field-applied jacket, except for flexible elastomeric and polyolefin, install fitted PVC cover over elbows, tees, strainers, valves, flanges, and unions. Terminate ends with PVC end caps. Tape PVC covers to adjoining insulation facing, using PVC tape.

C. Insulate instrument connections for thermometers, pressure gages, pressure temperature taps, test connections, flow meters, sensors, switches, and transmitters on insulated pipes. Shape insulation at these connections by tapering it to and around the connection with insulating cement and finish with finishing cement, mastic, and flashing sealant.

D. Install removable insulation covers at locations indicated. Installation conforms to the following:

1. Make removable flange and union insulation from sectional pipe insulation of same thickness as that on adjoining pipe. Install same insulation jacket as that of adjoining pipe insulation.
2. When flange and union covers are made from sectional pipe insulation, extend insulation from flanges or union at least 2 times the insulation thickness over adjacent pipe insulation on each side of flange or union. Secure flange cover in place with stainless steel or aluminum bands. Select band material compatible with insulation and jacket.
3. Construct removable valve insulation covers in same manner as for flanges, except divide the two-part section on the vertical center line of valve body.
4. When covers are made from block insulation, make two halves, each consisting of mitered blocks wired to stainless steel fabric. Secure this wire frame, with its attached insulation, to flanges with tie wire. Extend insulation at least 2 inches over adjacent pipe insulation on each side of valve. Fill space between flange or union cover and pipe insulation with insulating cement. Finish cover assembly with insulating cement applied in two coats. After first coat is dry, apply and trowel second coat to a smooth finish.
5. Unless a PVC jacket is indicated in field-applied jacket schedules, finish exposed surfaces with a metal jacket.

3.5 INSTALLATION OF GLASS-FIBER AND MINERAL WOOL INSULATION

A. Insulation Installation on Straight Pipes and Tubes:

1. Secure each layer of preformed pipe insulation to pipe with wire or bands, and tighten bands without deforming insulation materials.
2. Where vapor barriers are indicated, seal longitudinal seams, end joints, and protrusions with vapor-barrier mastic and joint sealant.
3. For insulation with jackets on above-ambient surfaces, secure laps with outward-clinched staples at 6 inches o.c.
4. For insulation with jackets on below-ambient surfaces, do not staple longitudinal tabs. Instead, secure tabs with additional adhesive, as recommended by insulation material manufacturer, and seal with vapor-barrier mastic and flashing sealant.

B. Insulation Installation on Pipe Flanges:

1. Install prefabricated pipe insulation to outer diameter of pipe flange.
2. Make width of insulation section same as overall width of flange and bolts, plus twice the thickness of pipe insulation.
3. Fill voids between inner circumference of flange insulation and outer circumference of adjacent straight pipe segments with glass-fiber or mineral-wool blanket insulation.
4. Install jacket material with manufacturer's recommended adhesive, overlap seams at least 1 inch, and seal joints with flashing sealant.

C. Insulation Installation on Pipe Fittings and Elbows:

1. Install prefabricated sections of same material as that of straight segments of pipe insulation when available.
2. When prefabricated insulation elbows and fittings are not available, install mitered sections of pipe insulation, to a thickness equal to adjoining pipe insulation. Secure insulation materials with wire or bands.

D. Insulation Installation on Valves and Pipe Specialties:

1. Install prefabricated sections of same material as that of straight segments of pipe insulation when available.
2. When prefabricated sections are not available, install fabricated sections of pipe insulation to valve body.
3. Arrange insulation to permit access to packing and to allow valve operation without disturbing insulation.
4. Install insulation to flanges as specified for flange insulation application.

3.6 INSTALLATION OF POLYOLEFIN INSULATION

A. Insulation Installation on Straight Pipes and Tubes:

1. Seal split-tube longitudinal seams and end joints with manufacturer's recommended adhesive , or via self-seal mechanism to eliminate openings in insulation that allow passage of air to surface being insulated.

B. Insulation Installation on Pipe Flanges:

1. Install pipe insulation to outer diameter of pipe flange.
2. Make width of insulation section same as overall width of flange and bolts, plus twice the thickness of pipe insulation.
3. Fill voids between inner circumference of flange insulation and outer circumference of adjacent straight pipe segments with cut sections of polyolefin sheet insulation of same thickness as that of pipe insulation.
4. Secure insulation to flanges and seal seams with manufacturer's recommended adhesive to eliminate openings in insulation that allow passage of air to surface being insulated.

C. Insulation Installation on Pipe Fittings and Elbows:

1. Install mitered sections of polyolefin pipe insulation.
2. Secure insulation materials and seal seams with manufacturer's recommended adhesive to eliminate openings in insulation that allow passage of air to surface being insulated.

D. Insulation Installation on Valves and Pipe Specialties:

1. Install cut sections of polyolefin pipe and sheet insulation to valve body.
2. Arrange insulation to permit access to packing and to allow valve operation without disturbing insulation.
3. Install insulation to flanges as specified for flange insulation application.
4. Secure insulation to valves and specialties, and seal seams with manufacturer's recommended adhesive to eliminate openings in insulation that allow passage of air to surface being insulated.

3.7 FINISHES

A. Insulation with ASJ, Glass-Cloth, or Other Paintable Jacket Material: Paint jacket with paint system identified below and as specified in Section 099113 "Exterior Painting" and Section 099123 "Interior Painting."

B. Color: Final color as selected by Architect. Vary first and second coats to allow visual inspection of the completed Work.

C. Do not field paint aluminum or stainless steel jackets.

3.8 PIPING INSULATION SCHEDULE, GENERAL

A. Acceptable preformed pipe and tubular insulation materials and thicknesses are identified for each piping system and pipe size range. If more than one material is listed for a piping system, selection from materials listed is Contractor's option.

B. Items Not Insulated: Unless otherwise indicated, do not install insulation on the following:

1. Drainage piping located in crawl spaces.
2. Underground piping.
3. Chrome-plated pipes and fittings unless there is a potential for personnel injury.

3.9 INDOOR PIPING INSULATION SCHEDULE

A. See WSEC Table C403.10.3 on cover sheet for insulation thickness.

B. Stormwater and Overflow:

1. All Pipe Sizes: Insulation is one of the following:
   a. Glass-Fiber, Preformed Pipe Insulation, Type I: 1 inch thick.
   b. Polyolefin: 1 inch thick.

C. Roof Drain and Overflow Drain Bodies:

1. All Pipe Sizes: Insulation is one of the following:
   a. Glass-Fiber, Preformed Pipe Insulation, Type I: 1 inch thick.
   b. Polyolefin: 1 inch thick.

D. Exposed Sanitary Drains, Domestic Water, Domestic Hot Water, and Stops for Plumbing Fixtures for People with Disabilities:

1. Provide Plumberex (or approved alternate manufacturer) trap and 2 supply insulation kit.:

a. Handy-Shield Maxx or equal .

3.10 OUTDOOR, ABOVEGROUND PIPING INSULATION SCHEDULE

END OF SECTION 220719

SECTION 221116 - DOMESTIC WATER PIPING

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 tube and fittings.
2. Piping joining materials.
3. Encasement for piping.
4. Transition fittings.
5. Dielectric fittings.

B. Related Requirements:

1. Section 221113 "Facility Water Distribution Piping" for water-service piping outside the building from source to the point where water-service piping enters the building.

1.3 ACTION SUBMITTALS

A. Product Data:

1. Pipe and tube.
2. Fittings.
3. Joining materials.
4. Transition fittings.

1.4 INFORMATIONAL SUBMITTALS

1.5 FIELD CONDITIONS

PART 2 - PRODUCTS

2.1 PIPING MATERIALS

A. Potable-water piping and components shall comply with NSF 14, NSF 61, and NSF 372.

2.2 COPPER TUBE AND FITTINGS

A. Drawn-Temper Copper Tube: ASTM B88, Type K ASTM B88, Type L .

B. Cast-Copper, Solder-Joint Fittings: ASME B16.18, pressure fittings.

C. Wrought-Copper, Solder-Joint Fittings: ASME B16.22, pressure fittings.

D. Bronze Flanges: ASME B16.24, Class 150, with solder-joint ends.

E. Cast Copper Unions: MSS SP-123, cast-copper-alloy, hexagonal-stock body, with ball-and-socket, metal-to-metal seating surfaces and solder-joint or threaded ends.

F. Wrought Copper Unions: ASME B16.22.

G. Copper Tube, Pressure-Seal-Joint Fittings:

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
   a. Apollo Flow Controls; Conbraco Industries, Inc.
   b. Elkhart Products Corporation.
   c. Mueller Industries, Inc.
   d. NIBCO INC.
   e. Viega LLC.
2. Fittings: Cast-brass, cast-bronze, or wrought-copper with EPDM O-ring seal in each end.
3. Minimum 200-psig working-pressure rating at 250 deg F.

2.3 PIPING JOINING MATERIALS

A. Metal, Pipe-Flange Bolts and Nuts: ASME B18.2.1, carbon steel unless otherwise indicated.

B. Solder Filler Metals: ASTM B32, lead-free alloys.

C. Flux: ASTM B813, water flushable.

D. Brazing Filler Metals: AWS A5.8M/A5.8, BCuP Series, copper-phosphorus alloys for general-duty brazing unless otherwise indicated.

E. Plastic, Pipe-Flange Gaskets, Bolts, and Nuts: Type and material recommended by piping system manufacturer unless otherwise indicated.

2.4 TRANSITION FITTINGS

A. General Requirements:

1. Same size as pipes to be joined.
2. Pressure rating at least equal to pipes to be joined.
3. End connections compatible with pipes to be joined.

B. Fitting-Type Transition Couplings: Manufactured piping coupling or specified piping system fitting.

2.5 DIELECTRIC FITTINGS

A. General Requirements: Assembly of copper alloy and ferrous materials with separating nonconductive insulating material. Include end connections compatible with pipes to be joined.

B. Dielectric Unions:

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
   a. WATTS.
   b. Wilkins.
   c. Zurn Industries, LLC.
2. Standard: ASSE 1079.
3. Pressure Rating: 125 psig minimum at 180 deg F .
4. End Connections: Solder-joint copper alloy and threaded ferrous.

C. Dielectric Nipples:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
   a. Grinnell G-Fire by Johnson Controls Company.
   b. Precision Plumbing Products.
   c. Sioux Chief Manufacturing Company, Inc.
   d. Victaulic Company.
2. Standard: IAPMO PS 66.
3. Electroplated steel nipple complying with ASTM F1545.
4. Pressure Rating and Temperature: 300 psig at 225 deg F .
5. End Connections: Male threaded or grooved.
6. Lining: Inert and noncorrosive, propylene.

PART 3 - EXECUTION

3.1 PIPING APPLICATIONS

A. Transition and special fittings with pressure ratings at least equal to piping rating may be used in applications below unless otherwise indicated.

B. Flanges and unions may be used for aboveground piping joints unless otherwise indicated.

C. Under-building-slab, domestic water piping, NPS 2 and smaller , shall be the following:

1. Drawn-temper copper tube, ASTM B88, Type L; wrought-copper, solder-joint fittings; and brazed joints.

D. Aboveground domestic water piping, NPS 2 and smaller , shall be one of the following:

1. Drawn-temper copper tube, ASTM B88, Type L ; wrought-copper, solder-joint fittings; and soldered joints.
2. Drawn-temper copper tube, ASTM B88, Type L ; copper pressure-seal-joint fittings; and pressure-sealed joints.

3. Drawn-temper copper tube, ASTM B88, Type L ; copper push-on-joint fittings; and push-on joints.

E. Aboveground domestic water piping, NPS 2-1/2 to NPS 4 , shall be one of the following:

1. Drawn-temper copper tube, ASTM B88, Type L ; wrought-copper, solder-joint fittings; and soldered joints.
2. Drawn-temper copper tube, ASTM B88, Type L ; copper pressure-seal-joint fittings; and pressure-sealed joints.
3. Drawn-temper copper tube, ASTM B88, Type L ; grooved-joint, copper-tube appurtenances; and grooved joints.

3.2 EARTHWORK

A. Comply with requirements in Section 312000 "Earth Moving" for excavating, trenching, and backfilling.

3.3 INSTALLATION OF PIPING

A. Drawing plans, schematics, and diagrams indicate general location and arrangement of domestic water piping. Indicated locations and arrangements are used to size pipe and calculate friction loss, expansion, and other design considerations. Install piping as indicated unless deviations to layout are approved on coordination drawings.

B. Install copper tubing under building slab according to CDA's "Copper Tube Handbook."

C. Install underground copper tube in PE encasement according to ASTM A674 or AWWA C105/A21.5.

D. Install valves according to the following:

1. Section 220523.12 "Ball Valves for Plumbing Piping."
2. Section 220523.13 "Butterfly Valves for Plumbing Piping."
3. Section 220523.14 "Check Valves for Plumbing Piping."
4. Section 220523.15 "Gate Valves for Plumbing Piping."

E. Install water-pressure-reducing valves downstream from shutoff valves. Comply with requirements for pressure-reducing valves in Section 221119 "Domestic Water Piping Specialties."

F. Install domestic water piping level without pitch and plumb.

G. Rough-in domestic water piping for water-meter installation according to utility company's requirements.

H. Install seismic restraints on piping. Comply with requirements for seismic-restraint devices in Section 220548 "Vibration and Seismic Controls for Plumbing Piping and Equipment."

I. Install piping concealed from view and protected from physical contact by building occupants unless otherwise indicated and except in equipment rooms and service areas.

J. Install piping indicated to be exposed and piping in equipment rooms and service areas at right angles or parallel to building walls. Diagonal runs are prohibited unless specifically indicated otherwise.

K. Install piping above accessible ceilings to allow sufficient space for ceiling panel removal, and coordinate with other services occupying that space.

L. Install piping to permit valve servicing.

M. Install nipples, unions, special fittings, and valves with pressure ratings the same as or higher than the system pressure rating used in applications below unless otherwise indicated.

N. Install piping free of sags and bends.

O. Install fittings for changes in direction and branch connections.

P. Install unions in copper tubing at final connection to each piece of equipment, machine, and specialty.

Q. Install pressure gauges on suction and discharge piping for each plumbing pump and packaged booster pump. Comply with requirements for pressure gauges in Section 220519 "Meters and Gages for Plumbing Piping."

R. Install thermostats in hot-water circulation piping. Comply with requirements for thermostats in Section 221123 "Domestic Water Pumps."

S. Install thermometers on inlet and outlet piping from each water heater. Comply with requirements for thermometers in Section 220519 "Meters and Gages for Plumbing Piping."

T. Install sleeves for piping penetrations of walls, ceilings, and floors. Comply with requirements for sleeves specified in Section 220517 "Sleeves and Sleeve Seals for Plumbing Piping."

U. Install sleeve seals for piping penetrations of concrete walls and slabs. Comply with requirements for sleeve seals specified in Section 220517 "Sleeves and Sleeve Seals for Plumbing Piping."

V. Install escutcheons for piping penetrations of walls, ceilings, and floors. Comply with requirements for escutcheons specified in Section 220518 "Escutcheons for Plumbing Piping."

3.4 JOINT CONSTRUCTION

A. Ream ends of pipes and tubes and remove burrs. Bevel plain ends of steel pipe.

B. Remove scale, slag, dirt, and debris from inside and outside of pipes, tubes, and fittings before assembly.

C. Threaded Joints: Thread pipe with tapered pipe threads according to ASME B1.20.1. Cut threads full and clean using sharp dies. Ream threaded pipe ends to remove burrs and restore full ID. Join pipe fittings and valves as follows:

1. Apply appropriate tape or thread compound to external pipe threads.
2. Damaged Threads: Do not use pipe or pipe fittings with threads that are corroded or damaged.

D. Brazed Joints for Copper Tubing: Comply with CDA's "Copper Tube Handbook," "Brazed Joints" chapter.

E. Soldered Joints for Copper Tubing: Apply ASTM B813, water-flushable flux to end of tube. Join copper tube and fittings according to ASTM B828 or CDA's "Copper Tube Handbook."

F. Pressure-Sealed Joints for Copper Tubing: Join copper tube and pressure-seal fittings with tools and procedure recommended by pressure-seal-fitting manufacturer. Leave insertion marks on pipe after assembly.

G. Push-on Joints for Copper Tubing: Clean end of tube. Measure insertion depth with manufacturer's depth gage. Join copper tube and push-on-joint fittings by inserting tube to measured depth.

H. Joint Construction for Grooved-End Copper Tubing: Make joints according to AWWA C606. Roll groove ends of tubes. Lubricate and install gasket over ends of tubes or tube and fitting. Install coupling housing sections over gasket with keys seated in tubing grooves. Install and tighten housing bolts.

I. Flanged Joints: Select appropriate asbestos-free, nonmetallic gasket material in size, type, and thickness suitable for domestic water service. Join flanges with gasket and bolts according to ASME B31.9.

J. Joints for Dissimilar-Material Piping: Make joints using adapters compatible with materials of both piping systems.

3.5 INSTALLATION OF TRANSITION FITTINGS

A. Install transition couplings at joints of dissimilar piping.

B. Transition Fittings in Underground Domestic Water Piping:

1. Fittings for NPS 1-1/2 and Smaller: Fitting-type coupling.
2. Fittings for NPS 2 and Larger: Sleeve-type coupling.

3.6 INSTALLATION OF DIELECTRIC FITTINGS

A. Install dielectric fittings in piping at connections of dissimilar metal piping and tubing.

3.7 INSTALLATION OF HANGERS AND SUPPORTS

A. Comply with requirements for seismic-restraint devices specified in Section 220548 "Vibration and Seismic Controls for Plumbing Piping and Equipment."

B. Comply with requirements for hangers, supports, and anchor devices in Section 220529 "Hangers and Supports for Plumbing Piping and Equipment."

C. Install hangers for copper piping, with maximum horizontal spacing and minimum rod diameters, to comply with MSS-58, locally enforced codes, and authorities having jurisdiction requirements, whichever are most stringent.

D. Support horizontal piping within 12 inches of each fitting.

E. Support vertical runs of copper piping to comply with MSS-58, locally enforced codes, and authorities having jurisdiction requirements, whichever are most stringent.

3.8 CONNECTIONS

A. Drawings indicate general arrangement of piping, fittings, and specialties.

B. When installing piping adjacent to equipment and machines, allow space for service and maintenance.

C. Connect domestic water piping to exterior water-service piping. Use transition fitting to join dissimilar piping materials.

D. Connect domestic water piping to water-service piping with shutoff valve; extend and connect to the following:

1. Domestic Water Booster Pumps: Cold-water suction and discharge piping.
2. Water Heaters: Cold-water inlet and hot-water outlet piping in sizes indicated, but not smaller than sizes of water heater connections.
3. Plumbing Fixtures: Cold- and hot-water-supply piping in sizes indicated, but not smaller than that required by plumbing code.
4. Equipment: Cold- and hot-water-supply piping as indicated, but not smaller than equipment connections. Provide shutoff valve and union for each connection. Use flanges instead of unions for NPS 2-1/2 and larger.

3.9 IDENTIFICATION

A. Identify system components. Comply with requirements for identification materials and installation in Section 220553 "Identification for Plumbing Piping and Equipment."

3.10 ADJUSTING

A. Perform the following adjustments before operation:

1. Close drain valves, hydrants, and hose bibbs.
2. Open shutoff valves to fully open position.
3. Open throttling valves to proper setting.
4. Adjust balancing valves in hot-water-circulation return piping to provide adequate flow.
    a. Manually adjust ball-type balancing valves in hot-water-circulation return piping to provide hot-water flow in each branch.
    b. Adjust calibrated balancing valves to flows indicated.
5. Remove plugs used during testing of piping and for temporary sealing of piping during installation.
6. Remove and clean strainer screens. Close drain valves and replace drain plugs.
7. Remove filter cartridges from housings and verify that cartridges are as specified for application where used and are clean and ready for use.
8. Check plumbing specialties and verify proper settings, adjustments, and operation.

3.11 FIELD QUALITY CONTROL

A. Perform the following tests and inspections:

1. Piping Inspections:
   a. Do not enclose, cover, or put piping into operation until it has been inspected and approved by authorities having jurisdiction.
   b. During installation, notify authorities having jurisdiction at least one day before inspection must be made. Perform tests specified below in presence of authorities having jurisdiction:
      1) Roughing-in Inspection: Arrange for inspection of piping before concealing or closing in after roughing in and before setting fixtures.
      2) Final Inspection: Arrange for authorities having jurisdiction to observe tests specified in "Piping Tests" Subparagraph below and to ensure compliance with requirements.
   c. Reinspection: If authorities having jurisdiction find that piping will not pass tests or inspections, make required corrections and arrange for reinspection.
   d. Reports: Prepare inspection reports and have them signed by authorities having jurisdiction.
2. Piping Tests:
   a. Fill domestic water piping. Check components to determine that they are not air bound and that piping is full of water.
   b. Test for leaks and defects in new piping and parts of existing piping that have been altered, extended, or repaired. If testing is performed in segments, submit a separate report for each test, complete with diagram of portion of piping tested.
   c. Leave new, altered, extended, or replaced domestic water piping uncovered and unconcealed until it has been tested and approved. Expose work that was covered or concealed before it was tested.
   d. Cap and subject piping to static water pressure of 50 psig above operating pressure, without exceeding pressure rating of piping system materials. Isolate test source and allow it to stand for four hours. Leaks and loss in test pressure constitute defects that must be repaired.
   e. Hydrostatic testing and documentation of test results for polypropylene piping to be in accordance with the manufacturer's instructions and submitted to the manufacturer upon successful completion per warranty requirements.
   f. Repair leaks and defects with new materials, and retest piping or portion thereof until satisfactory results are obtained.
   g. Prepare reports for tests and for corrective action required.

B. Domestic water piping will be considered defective if it does not pass tests and inspections.

C. Prepare test and inspection reports.

3.12 CLEANING

A. Clean and disinfect potable domestic water piping as follows:

1. Purge new piping and parts of existing piping that have been altered, extended, or repaired before using.
2. Use purging and disinfecting procedures prescribed by authorities having jurisdiction; if methods are not prescribed, use procedures described in either AWWA C651 or AWWA C652 or follow procedures described below:
   a. Flush piping system with clean, potable water until dirty water does not appear at outlets.

b. Fill and isolate system according to either of the following:
   1) Fill system or part thereof with water/chlorine solution with at least 50 ppm of chlorine. Isolate with valves and allow to stand for 24 hours.
   2) Fill system or part thereof with water/chlorine solution with at least 200 ppm of chlorine. Isolate and allow to stand for three hours.
c. Flush system with clean, potable water until no chlorine is in water coming from system after the standing time.
d. Repeat procedures if biological examination shows contamination.
e. Submit water samples in sterile bottles to authorities having jurisdiction.

B. Clean non-potable domestic water piping as follows:

1. Purge new piping and parts of existing piping that have been altered, extended, or repaired before using.
2. Use purging procedures prescribed by authorities having jurisdiction or; if methods are not prescribed, follow procedures described below:
   a. Flush piping system with clean, potable water until dirty water does not appear at outlets.
   b. Submit water samples in sterile bottles to authorities having jurisdiction. Repeat procedures if biological examination shows contamination.

C. Prepare and submit reports of purging and disinfecting activities. Include copies of water-sample approvals from authorities having jurisdiction.

D. Clean interior of domestic water piping system. Remove dirt and debris as work progresses.

END OF SECTION 221116

SECTION 221119 - DOMESTIC WATER PIPING SPECIALTIES

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Vacuum breakers.
2. Backflow preventers.
3. Water pressure-reducing valves.
4. Balancing valves.
5. Temperature-actuated, water mixing valves.
6. Strainers for domestic water piping.
7. Outlet boxes.
8. Hose stations.
9. Hose bibbs.
10. Wall hydrants.
11. Ground hydrants.
12. Drain valves.
13. Water-hammer arresters.
14. Trap-seal primer device.
15. Trap-seal primer systems.
16. Flexible connectors.

B. Related Requirements:

1. Section 220519 "Meters and Gauges for Plumbing Piping" for thermometers, pressure gauges, and flow meters in domestic water piping.
2. Section 221116 "Domestic Water Piping" for water meters.
3. Section 223200 "Domestic Water Filtration Equipment" for water filters in domestic water piping.
4. Section 224300 "Healthcare Plumbing Fixtures" for thermostatic mixing valves for sitz baths, thermostatic mixing-valve assemblies for hydrotherapy equipment, and outlet boxes for dialysis equipment.
5. Section 224500 "Emergency Plumbing Fixtures" for water tempering equipment.
6. Section 224716 "Pressure Water Coolers" for water filters for water coolers.
7. Section 224723 "Remote Water Coolers" for water filters for water coolers.
8. Section 230923.18 "Leak Detection Instruments" for leak detection devices related to HVAC applications.
9. Section 331415 "Site Water Distribution Piping" for fire water-service backflow prevention devices.

1.2 DEFINITIONS

A. AMI: Advanced Metering Infrastructure.

B. AMR: Automatic Meter Reading.

C. FKM: A family of fluroelastomer materials defined by ASTM D1418.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product.

1.4 INFORMATIONAL SUBMITTALS

1.5 CLOSEOUT SUBMITTALS

PART 2 - PRODUCTS

2.1 GENERAL REQUIREMENTS FOR PIPING SPECIALTIES

A. Domestic water piping specialties intended to convey or dispense water for human consumption are to comply with the SDWA, requirements of authorities having jurisdiction, and NSF 61 and NSF 372, or to be certified in compliance with NSF 61 and NSF 372 by an American National Standards Institute (ANSI)-accredited third-party certification body that the weighted average lead content at wetted surfaces is less than or equal to 0.25 percent.

2.2 PERFORMANCE REQUIREMENTS

A. Minimum Working Pressure for Domestic Water Piping Specialties: 125 psig unless otherwise indicated.

2.3 VACUUM BREAKERS

A. Hose-Connection Vacuum Breakers :

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
   a. MIFAB, Inc.
   b. WATTS.
   c. Woodford Manufacturing Company.
   d. Zurn Industries, LLC.
2. Standard: ASSE 1011.
3. Body: Bronze, nonremovable, with manual drain.
4. Outlet Connection: Garden-hose threaded complying with ASME B1.20.7.
5. Finish: Chrome or nickel plated .

2.4 BACKFLOW PREVENTERS

A. Reduced-Pressure-Principle Backflow Preventers :

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
   a. WATTS.

b. Zurn Industries, LLC.
2. Standard: ASSE 1013.
3. Operation: Continuous-pressure applications.
4. See plans for size and flow rates.
5. Body: Bronze for NPS 2 and smaller; ductile or cast iron with interior lining that complies with AWWA C550 or that is FDA approved for NPS 2-1/2 and larger.
6. End Connections: Threaded for NPS 2 and smaller; flanged for NPS 2-1/2 and larger.
7. Configuration: Designed for horizontal, straight-through flow.
8. Accessories:
   a. Valves NPS 2 and Smaller: Ball type with threaded ends on inlet and outlet.
   b. Valves NPS 2-1/2 and Larger: Outside-screw and yoke-gate type with flanged ends on inlet and outlet.
   c. Air-Gap Fitting: ASME A112.1.2, matching backflow-preventer connection.

B. Double-Check, Backflow-Prevention Assemblies :

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
   a. WATTS.
   b. Zurn Industries, LLC.
2. Standard: ASSE 1015.
3. Operation: Continuous-pressure applications unless otherwise indicated.
4. See plans for size and floor rates.
5. Body: Bronze for NPS 2 and smaller; ductile or cast iron with interior lining that complies with AWWA C550 or that is FDA approved for NPS 2-1/2 and larger.
6. End Connections: Threaded for NPS 2 and smaller; flanged for NPS 2-1/2 and larger.
7. Configuration: Designed for horizontal, straight-through or verticle flow.
8. Accessories:
   a. Valves NPS 2 and Smaller: Ball type with threaded ends on inlet and outlet.
   b. Valves NPS 2-1/2 and Larger: Outside-screw and yoke-gate type with flanged ends on inlet and outlet.

C. Hose-Connection Backflow Preventers :

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
   a. WATTS.
   b. Woodford Manufacturing Company.
   c. Zurn Industries, LLC.
2. Standard: ASSE 1052.
3. Operation: Up to 10-foot head of water back pressure.
4. Inlet Size: NPS 3/4.
5. Outlet Size: Garden-hose thread complying with ASME B1.20.7.
6. Capacity: At least 3-gpm flow.

2.5 WATER PRESSURE-REDUCING VALVES

A. Water Regulators :

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

a. WATTS.
b. Zurn Industries, LLC.
2. Standard: ASSE 1003.
3. Pressure Rating: Initial working pressure of 150 psig.
4. See plans for size and flow rate.
5. Body: Bronze for NPS 2 and smaller; cast iron with interior lining that complies with AWWA C550 or that is FDA approved for NPS 2-1/2 and NPS 3.
6. Valves for Booster Heater Water Supply: Include integral bypass.
7. End Connections: Threaded or solder for NPS 2 and smaller; flanged or solder for NPS 2-1/2 and NPS 3.

B. Water-Control Valves :

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
a. WATTS.
b. Zurn Industries, LLC.
2. Description: Pilot-operated, diaphragm-type, single-seated, main water-control valve.
3. Pressure Rating: Initial working pressure of 150 psig minimum with AWWA C550 or FDA-approved, interior epoxy coating. Include small pilot-control valve, restrictor device, specialty fittings, and sensor piping.
4. Main Valve Body: Cast- or ductile-iron body with AWWA C550 or FDA-approved, interior epoxy coating; or stainless steel body.
a. Pattern: Globe-valve design.
b. Trim: Stainless steel.
5. End Connections: Threaded for NPS 2 and smaller; flanged for NPS 2-1/2 and larger.

2.6 BALANCING VALVES

A. Copper-Alloy Calibrated Balancing Valves :

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
a. Bell & Gossett; a Xylem brand.
b. NIBCO INC.
c. WATTS.
2. Type: Ball or Y-pattern globe valve with two readout ports and memory-setting indicator.
3. Body: Brass or bronze.
4. Size: Same as connected piping, but not larger than NPS 2.
5. Accessories: Meter hoses, fittings, valves, differential pressure meter, and carrying case.

B. Memory-Stop Balancing Valves :

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
a. Apollo Valves; a part of Aalberts Integrated Piping Systems.
b. Hammond Valve.
c. Milwaukee Valve Company.
d. NIBCO INC.
2. Standard: MSS SP-110 for two-piece, copper-alloy ball valves.
3. Pressure Rating: 400-psig minimum CWP.

4. Size: NPS 2 or smaller.
5. Body: Copper alloy.
6. Port: Standard or full port.
7. Ball: Chrome-plated brass or stainless steel.
8. Seats and Seals: Replaceable.
9. End Connections: Solder joint or threaded.
10. Handle: Vinyl-covered steel with memory-setting device.

C. Automatic Flow Control Balancing Valves :

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
   a. Caleffi North America.
   b. IMI Hydronic Engineering Inc.
   c. ThermOmegaTech.
2. Flow Regulation: Plus or minus 5 percent over 95 percent of the working range.
3. Pressure Rating: 200 psig.
4. Size: NPS 2 or smaller.
5. Body: Stainless steel or brass.
6. Flow Cartridge: Stainless steel or antiscale polymer.
7. End Connections: Threaded or solder joint.

2.7 TEMPERATURE-ACTUATED, WATER MIXING VALVES

A. Water-Temperature Limiting Devices :

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
   a. Leonard Valve Company.
   b. WATTS.
   c. Zurn Industries, LLC.
2. Standard: ASSE 1070.
3. Pressure Rating: 125 psig.
4. Type: Thermostatically controlled, water mixing valve.
5. Material: Bronze body with corrosion-resistant interior components.
6. Connections: Threaded inlets and outlet.
7. Accessories: Check stops on hot- and cold-water supplies, and adjustable, temperature-control handle.
8. Tempered-Water Setting: 110 degree F .

B. Primary, Thermostatic, Water Mixing Valves :

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
   a. Lawler Manufacturing Company, Inc.
   b. Leonard Valve Company.
   c. Symmons Industries, Inc.
   d. WATTS.
   e. Zurn Industries, LLC.
2. Standard: ASSE 1017.
3. Pressure Rating: 125 psig minimum unless otherwise indicated.

4. Type: Cabinet-type, thermostatically controlled, water mixing valve.
5. Material: Bronze body with corrosion-resistant interior components.
6. Connections: Threaded inlets and outlet.
7. Accessories: Manual temperature control, check stops on hot- and cold-water supplies, and adjustable, temperature-control handle.
8. Tempered-Water Setting: see plans .
9. Cabinet: Factory fabricated, stainless steel, for surface mounting and with hinged, stainless steel door.

2.8 STRAINERS FOR DOMESTIC WATER PIPING

A. Y-Pattern Strainers :

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
   a. WATTS.
   b. Zurn Industries, LLC.
2. Pressure Rating: 125 psig minimum unless otherwise indicated.
3. Body: Bronze for NPS 2 and smaller; cast iron with interior lining that complies with AWWA C550 or that is FDA approved, epoxy coated and for NPS 2-1/2 and larger.
4. End Connections: Threaded for NPS 2 and smaller; flanged for NPS 2-1/2 and larger.
5. Screen: Stainless steel with round perforations unless otherwise indicated.
6. Drain: Factory-installed, hose-end drain valve.

2.9 OUTLET BOXES

A. Clothes Washer Outlet Boxes :

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
   a. Guy Gray, IPS Corporation.
   b. Sioux Chief Manufacturing Company, Inc.
   c. Symmons Industries, Inc.
2. Mounting: Recessed.
3. Material and Finish: Enameled-steel or epoxy-painted-steel Stainless steel box and faceplate.
4. Faucet: Combination valved fitting or separate hot- and cold-water valved fittings complying with ASME A112.18.1. Include garden-hose thread complying with ASME B1.20.7 on outlets.
5. Drain Outlet Connection: NPS 2.
6. Accessory: Water hammer arresters.
7. Supply Shutoff Fittings: NPS 1/2 gate, globe, or ball valves and NPS 1/2 copper, water tubing.
8. Drain: NPS 2 standpipe and P-trap for direct waste connection to drainage piping.

B. Icemaker Outlet Boxes :

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
   a. Guy Gray, IPS Corporation.

b. Sioux Chief Manufacturing Company, Inc.
2. Mounting: Recessed.
3. Material and Finish: Enameled-steel or epoxy-painted-steel Stainless steel box and faceplate.
4. Faucet: Valved fitting complying with ASME A112.18.1. Include NPS 1/2 or smaller copper tube outlet.
5. Accessory: Water hammer arrestor.
6. Supply Shutoff Fitting: NPS 1/2 gate, globe, or ball valve and NPS 1/2 copper, water tubing.

2.10 HOSE BIBBS

A. Hose Bibbs :

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
   a. Jay R. Smith Mfg Co; a division of Morris Group International.
   b. MIFAB, Inc.
   c. WATTS.
   d. Woodford Manufacturing Company.
   e. Zurn Industries, LLC.
2. Standard: ASME A112.18.1 for sediment faucets.
3. Body Material: Bronze.
4. Seat: Bronze, replaceable.
5. Supply Connections: NPS 1/2 or NPS 3/4 threaded or solder-joint inlet.
6. Outlet Connection: Garden-hose thread complying with ASME B1.20.7.
7. Pressure Rating: 125 psig.
8. Vacuum Breaker: Integral nonremovable, drainable, hose-connection vacuum breaker complying with ASSE 1011.
9. Finish for Equipment Rooms: Rough bronze, or chrome or nickel plated.
10. Finish for Finished Rooms: Chrome or nickel plated.
11. Include operating key with each operating-key hose bibb.

2.11 WALL HYDRANTS

A. Nonfreeze Wall Hydrants :

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
   a. Jay R. Smith Mfg Co; a division of Morris Group International.
   b. MIFAB, Inc.
   c. WATTS.
   d. Woodford Manufacturing Company.
   e. Zurn Industries, LLC.
2. Standard: ASME A112.21.3M for concealed -outlet, self-draining wall hydrants.
3. Pressure Rating: 125 psig.
4. Operation: Loose key.
5. Casing and Operating Rod: Of length required to match wall thickness. Include wall clamp.
6. Inlet: NPS 3/4 or NPS 1.

7. Outlet, Concealed: With integral vacuum breaker and garden-hose thread complying with ASME B1.20.7.
8. Box: Deep, flush mounted with cover.
9. Operating Keys(s): One with each wall hydrant.

B. Nonfreeze, Hot- and Cold-Water Wall Hydrants :

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
   a. Jay R. Smith Mfg Co; a division of Morris Group International.
   b. WATTS.
   c. Woodford Manufacturing Company.
   d. Zurn Industries, LLC.
2. Standard: ASME A112.21.3M for exposed-outlet, self-draining wall hydrants.
3. Pressure Rating: 125 psig.
4. Operation: Loose key.
5. Casing and Operating Rods: Of length required to match wall thickness. Include wall clamps.
6. Inlet: NPS 3/4 or NPS 1.
7. Outlet: Concealed.
8. Box: Deep, flush mounted with cover.
9. Vacuum Breaker:
   a. Nonremovable, manual-drain-type, hose-connection vacuum breaker complying with ASSE 1011 or backflow preventer complying with ASSE 1052.
   b. Garden-hose thread complying with ASME B1.20.7 on outlet.

C. Nonfreeze Vacuum Breaker Wall Hydrants :

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
   a. Jay R. Smith Mfg Co; a division of Morris Group International.
   b. WATTS.
   c. Woodford Manufacturing Company.
   d. Zurn Industries, LLC.
2. Standard: ASSE 1019, Type A or Type B.
3. Type: Automatic draining with integral air-inlet valve.
4. Classification: Type A, for automatic draining with hose removed or Type B, for automatic draining with hose removed or with hose attached and nozzle closed.
5. Pressure Rating: 125 psig.
6. Operation: Loose key or wheel handle.
7. Casing and Operating Rod: Of length required to match wall thickness. Include wall clamp.
8. Inlet: NPS 1/2 or NPS 3/4.
9. Outlet: Exposed with garden-hose thread complying with ASME B1.20.7.

2.12 GROUND HYDRANTS

A. Nonfreeze Ground Hydrants :

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

a. Jay R. Smith Mfg Co; a division of Morris Group International.
b. MIFAB, Inc.
c. WATTS.
d. Woodford Manufacturing Company.
e. Zurn Industries, LLC.

2. Standard: ASME A112.21.3M.
3. Type: Nonfreeze, concealed-outlet ground hydrant with box.
4. Operation: Loose key.
5. Casing and Operating Rod: Of at least length required for burial of valve below frost line.
6. Inlet: NPS 3/4 .
7. Outlet: Garden-hose thread complying with ASME B1.20.7.
8. Drain: Designed with hole to drain into ground when shut off.
9. Box: Standard pattern with cover.
10. Vacuum Breaker: ASSE 1011.

2.13 DRAIN VALVES

A. Ball-Valve-Type, Hose-End Drain Valves :

1. Standard: MSS SP-110 for standard-port, two-piece ball valves.
2. Pressure Rating: 400-psig minimum CWP.
3. Size: NPS 3/4.
4. Body: Copper alloy.
5. Ball: Chrome-plated brass.
6. Seats and Seals: Replaceable.
7. Handle: Vinyl-covered steel.
8. Inlet: Threaded or solder joint.
9. Outlet: Threaded, short nipple with garden-hose thread complying with ASME B1.20.7 and cap with brass chain.

2.14 WATER-HAMMER ARRESTERS

A. Water-Hammer Arresters :

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
   a. Jay R. Smith Mfg Co; a division of Morris Group International.
   b. Precision Plumbing Products.
   c. WATTS.
   d. Zurn Industries, LLC.
2. Standard: ASSE 1010 or PDI-WH 201.
3. Type: Piston Diaphragm.
4. Size: ASSE 1010, Sizes AA and A through F, or PDI-WH 201, Sizes A through F.

2.15 TRAP-SEAL PRIMER DEVICE

A. Supply-Type, Trap-Seal Primer Device :

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
   a. Jay R. Smith Mfg Co; a division of Morris Group International.
   b. MIFAB, Inc.
   c. Precision Plumbing Products.
   d. WATTS.
   e. Zurn Industries, LLC.
2. Standard: ASSE 1018.
3. Pressure Rating: 125 psig minimum.
4. Body: Bronze.
5. Inlet and Outlet Connections: NPS 1/2 threaded, union, or solder joint.
6. Gravity Drain Outlet Connection: NPS 1/2 threaded or solder joint.
7. Finish: Chrome plated, or rough bronze for units used with pipe or tube that is not chrome finished.

B. Drainage-Type, Trap-Seal Primer Device :

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
   a. Jay R. Smith Mfg Co; a division of Morris Group International.
   b. MIFAB, Inc.
   c. Precision Plumbing Products.
   d. Zurn Industries, LLC.
2. Standard: ASSE 1044, lavatory P-trap with NPS 3/8 minimum, trap makeup connection.
3. Size: NPS 1-1/4 minimum.
4. Material: Chrome-plated, cast brass.

2.16 FLEXIBLE CONNECTORS

A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

1. Flex-Hose Co., Inc.
2. Mason Industries, Inc.
3. Metraflex Company (The).

B. Stainless Steel-Hose Flexible Connectors: Corrugated-stainless steel tubing with stainless steel wire-braid covering and ends welded to inner tubing.

1. Working-Pressure Rating: Minimum 200 psig .
2. End Connections NPS 2 and Smaller: Threaded steel-pipe nipple.
3. End Connections NPS 2-1/2 and Larger: Flanged steel nipple.

PART 3 - EXECUTION

3.1 INSTALLATION OF PIPING SPECIALTIES

A. Backflow Preventers: Install in each water supply to mechanical equipment and systems and to other equipment and water systems that may be sources of contamination. Comply with authorities having jurisdiction.

1. Locate backflow preventers in same room as connected equipment or system.
2. Install drain for backflow preventers with atmospheric-vent drain connection with air-gap fitting, fixed air-gap fitting, or equivalent positive pipe separation of at least two pipe diameters in drain piping and pipe-to-floor drain. Locate air-gap device attached to or under backflow preventer. Simple air breaks are unacceptable for this application.
3. Do not install bypass piping around backflow preventers.

B. Water Regulators: Install with inlet and outlet shutoff valves. Install pressure gauges on inlet and outlet.

C. Water Control Valves: Install with inlet and outlet shutoff valves. Install pressure gauges on inlet and outlet.

D. Balancing Valves: Install in locations where they can easily be adjusted. Set at indicated design flow rates.

E. Temperature-Actuated, Water Mixing Valves: Install with check stops or shutoff valves on inlets and with shutoff valve on outlet.

1. Install cabinet-type units recessed in or surface mounted on wall as specified.

F. Y-Pattern Strainers: For water, install on supply side of each water pressure-reducing valve solenoid valve and pump.

G. Outlet Boxes: Install boxes recessed in wall or surface mounted on wall. Install 1-1/2-by-3-1/2-inch fire-retardant-treated-wood blocking, wall reinforcement between studs. Comply with requirements for fire-retardant-treated-wood blocking in Section 061000 "Rough Carpentry."

H. Hose Stations: Install with check stops or shutoff valves on inlets and with thermometer on outlet.

1. Install cabinet-type units recessed in or surface mounted on wall as specified. Install 1-1/2-by-3-1/2-inch fire-retardant-treated-wood blocking, wall reinforcement between studs. Comply with requirements for fire-retardant-treated-wood blocking in Section 061000 "Rough Carpentry."

I. Ground Hydrants: Install with 1 cu. yd. of crushed gravel around drain hole. Set ground hydrants with box flush with grade.

J. Nonfreeze, Sanitary Yard Hydrants: Set with riser pipe in concrete or pavement. Do not encase canister in concrete.

K. Water-Hammer Arresters: Install in water piping in accordance with PDI-WH 201.

L. Supply-Type, Trap-Seal Primer Device: Install with outlet piping pitched down toward drain trap a minimum of 1 percent, and connect to floor-drain body, trap, or inlet fitting. Adjust valve for proper flow.

M. Drainage-Type, Trap-Seal Primer Device: Install as lavatory trap with outlet piping pitched down toward drain trap a minimum of 1 percent, and connect to floor-drain body, trap, or inlet fitting.

N. Trap-Seal Primer Systems: Install with outlet piping pitched down toward drain trap a minimum of 1 percent, and connect to floor-drain body, trap, or inlet fitting. Adjust system for proper flow.

3.2 PIPING CONNECTIONS

A. Drawings indicate general arrangement of piping, fittings, and specialties.

B. When installing piping specialties adjacent to equipment and machines, allow space for service and maintenance.

3.3 ELECTRICAL CONNECTIONS

A. Connect wiring in accordance with Section 260519 "Low-Voltage Electrical Power Conductors and Cables."

B. Ground equipment in accordance with Section 260526 "Grounding and Bonding for Electrical Systems."

C. Install electrical devices furnished by manufacturer, but not factory mounted, in accordance with NFPA 70 and NECA 1.

3.4 CONTROL CONNECTIONS

A. Connect control wiring in accordance with Section 260523 "Control-Voltage Electrical Power Cables."

3.5 IDENTIFICATION

A. Plastic Labels for Equipment: Install engraved plastic-laminate equipment nameplate or sign on or near each of the following:

1. Vacuum breakers.
2. Backflow preventers.
3. Water pressure-reducing valves.
4. Balancing valves.
5. Temperature-actuated, water mixing valves.
6. Outlet boxes.
7. Hose stations.
8. Wall hydrants.
9. Ground hydrants.
10. Trap-seal primer device.
11. Trap-seal primer systems.

B. Distinguish among multiple units, inform operator of operational requirements, indicate safety and emergency precautions, and warn of hazards and improper operations, in addition to identifying unit. Nameplates and signs are specified in Section 220553 "Identification for Plumbing Piping and Equipment."

3.6 ADJUSTING

A. Set field-adjustable pressure set points of water pressure-reducing valves.

B. Set field-adjustable flow set points of balancing valves.

C. Set field-adjustable temperature set points of temperature-actuated, water mixing valves.

D. Adjust each pressure vacuum breaker reduced-pressure-principle backflow preventer double-check, backflow-prevention assembly and double-check, detector-assembly backflow preventer in accordance with manufacturer's written instructions, authorities having jurisdiction and the device's reference standard.

3.7 FIELD QUALITY CONTROL

A. Testing Agency: a qualified testing agency to perform tests and inspections.

B. Perform the following tests and inspections.

1. Test each pressure vacuum breaker reduced-pressure-principle backflow preventer double-check, backflow-prevention assembly and double-check, detector-assembly backflow preventer according to authorities having jurisdiction and the device's reference standard.
2. Leak Test: After installation, charge system and test for leaks. Repair leaks and retest until no leaks exist.
3. Operational Test: After electrical circuitry has been energized, start units to confirm unit operation.
4. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment.

C. Domestic water piping specialties will be considered defective if they do not pass tests and inspections.

D. Prepare test and inspection reports.

END OF SECTION 221119

SECTION 221316 - SANITARY WASTE AND VENT PIPING

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Hubless, cast-iron soil pipe and fittings.
2. Copper tube and fittings.
3. ABS pipe and fittings.
4. PVC pipe and fittings.
5. Specialty pipe fittings.
6. Encasement for underground metal piping.

1.2 ACTION SUBMITTALS

A. Product Data: For each type of product.

1.3 INFORMATIONAL SUBMITTALS

A. Coordination Drawings: Plans and elevations, or Building Information Model (BIM) drawn to scale, showing items described in this Section and coordinated with all building trades.

B. Seismic Qualification Certificates: For waste and vent piping, 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. Detailed description of piping anchorage devices on which the certification is based and their installation requirements.

C. Field quality-control reports.

1.4 FIELD CONDITIONS

1.5 WARRANTY

A. Listed manufacturers to provide labeling and warranty of their respective products.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Components and installation are capable of withstanding the following minimum working pressure unless otherwise indicated:

1. Soil, Waste, and Vent Piping: 10 ft. head of water .

2.2 PIPING MATERIALS

A. Piping materials to bear label, stamp, or other markings of specified testing agency.

B. Comply with requirements in "Piping Schedule" Article for applications of pipe, tube, fitting materials, and joining methods for specific services, service locations, and pipe sizes.

2.3 HUBLESS, CAST-IRON SOIL PIPE AND FITTINGS

A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

1. Charlotte Pipe and Foundry Company.
2. Tyler Pipe; a part of McWane family of companies.

B. Pipe and Fittings:

1. Marked with CISPI collective trademark.
2. ASTM A888 or CISPI 301.

C. CISPI, Hubless-Piping Couplings:

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
   a. Charlotte Pipe and Foundry Company.
   b. Fernco Inc.
   c. Tyler Pipe; a subsidiary of McWane Inc.
2. Standards: ASTM C1277 and CISPI 310.
3. Description: Stainless steel corrugated shield with stainless steel bands and tightening devices; and ASTM C564, rubber sleeve with integral, center pipe stop.

2.4 COPPER TUBE AND FITTINGS

A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

1. Cambridge-Lee Industries, LLC.
2. Mueller Industries, Inc.
3. Wieland Copper Products, LLC.

B. Copper Type DWV Tube: ASTM B306, drainage tube, drawn temper.

C. Copper Drainage Fittings: ASME B16.23, cast copper or ASME B16.29, wrought copper, solder-joint fittings.

D. Hard Copper Tube: ASTM B88, Type L and Type M, water tube, drawn temper.

E. Soft Copper Tube: ASTM B88, Type L, water tube, annealed temper.

F. Copper Pressure Fittings:

1. Copper Fittings: ASME B16.18, cast-copper-alloy or ASME B16.22, wrought-copper, solder-joint fittings. Furnish wrought-copper fittings if indicated.
2. Copper Unions: MSS SP-123, copper-alloy, hexagonal-stock body with ball-and-socket, metal-to-metal seating surfaces, and solder-joint or threaded ends.

G. Copper Flanges: ASME B16.24, Class 150, cast copper with solder-joint end.

1. Flange Gasket Materials: ASME B16.21, full-face, flat, nonmetallic, asbestos-free, 1/8-inch maximum thickness unless thickness or specific material is indicated.
2. Flange Bolts and Nuts: ASME B18.2.1, carbon steel unless otherwise indicated.

H. Solder: ASTM B32, lead free with ASTM B813, water-flushable flux.

2.5 ABS PIPE AND FITTINGS

A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

1. Charlotte Pipe and Foundry Company.

B. NSF Marking: Comply with NSF 14 for plastic piping components. Include "NSF-dwv" marking for plastic drain, waste, and vent piping and "NSF-sewer" for plastic sewer piping.

C. Solid-Wall ABS Pipe: ASTM D2661, Schedule 40.

D. Cellular-Core ABS Pipe: ASTM F628, Schedule 40.

E. ABS Socket Fittings: ASTM D2661, made in accordance with ASTM D3311, drain, waste, and vent patterns.

F. Solvent Cement: ASTM D2235.

2.6 PVC PIPE AND FITTINGS

A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

1. Charlotte Pipe and Foundry Company.

B. Comply with NSF 14 for plastic piping components. Include "NSF-dwv" marking for plastic drain, waste, and vent piping and "NSF-sewer" marking for plastic sewer piping.

C. Solid-Wall PVC Pipe: ASTM D2665 drain, waste, and vent.

D. Cellular-Core PVC Pipe: ASTM F891, Schedule 40.

E. PVC Socket Fittings: ASTM D2665, made in accordance with ASTM D3311, drain, waste, and vent patterns and to fit Schedule 40 pipe.

F. Adhesive Primer: ASTM F656.

G. Solvent Cement: ASTM D2564.

2.7 SPECIALTY PIPE FITTINGS

A. Transition Couplings:

1. General Requirements: Fitting or device for joining piping with small differences in ODs or of different materials. Include end connections of same size as and compatible with pipes to be joined.
2. Fitting-Type Transition Couplings: Manufactured piping coupling or specified piping system fitting.
3. Unshielded, Nonpressure Transition Couplings:
   a. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
      1) Fernco Inc.
      2) Mission Rubber Company, LLC; a division of MCP Industries.
   b. Standard: ASTM C1173.
   c. Description: Elastomeric, sleeve-type, reducing or transition pattern. Include shear ring and corrosion-resistant-metal tension band and tightening mechanism on each end.
   d. End Connections: Same size as and compatible with pipes to be joined.
   e. Sleeve Materials:
      1) For Cast-Iron Soil Pipes: ASTM C564, rubber.
      2) For Plastic Pipes: ASTM F477, elastomeric seal or ASTM D5926 PVC.
      3) For Dissimilar Pipes: ASTM D5926 PVC or other material compatible with pipe materials being joined.
4. Shielded, Nonpressure Transition Couplings:
   a. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
      1) Mission Rubber Company, LLC; a division of MCP Industries.
   b. Standard: ASTM C1460.
   c. Description: Elastomeric or rubber sleeve with full-length, corrosion-resistant outer shield and corrosion-resistant-metal tension band and tightening mechanism on each end.
   d. End Connections: Same size as and compatible with pipes to be joined.

B. Dielectric Fittings:

1. General Requirements: Assembly of copper alloy and ferrous materials with separating nonconductive insulating material. Include end connections compatible with pipes to be joined.

PART 3 - EXECUTION

3.1 EARTH MOVING

A. Comply with requirements for excavating, trenching, and backfilling specified in Section 312000 "Earth Moving."

3.2 PIPING INSTALLATION

A. Drawing plans, schematics, and diagrams indicate general location and arrangement of piping systems.

1. Indicated locations and arrangements were used to size pipe and calculate friction loss, expansion, pump sizing, and other design considerations.
2. Install piping as indicated unless deviations to layout are approved on coordination drawings.

B. Install piping in concealed locations unless otherwise indicated and except in equipment rooms and service areas.

C. Install piping indicated to be exposed and piping in equipment rooms and service areas at right angles or parallel to building walls. Diagonal runs are prohibited unless specifically indicated otherwise.

D. Install piping above accessible ceilings to allow sufficient space for ceiling panel removal.

E. Install piping to permit valve servicing.

F. Install piping at indicated slopes.

G. Install piping free of sags and bends.

H. Install fittings for changes in direction and branch connections.

I. Install piping to allow application of insulation.

J. Make changes in direction for soil and waste drainage and vent piping using appropriate branches, bends, and long-sweep bends.

1. Sanitary tees and short-sweep 1/4 bends may be used on vertical stacks if change in direction of flow is from horizontal to vertical.
2. Use long-turn, double Y-branch, and 1/8-bend fittings if two fixtures are installed back to back or side by side with common drain pipe.
    a. Straight tees, elbows, and crosses may be used on vent lines.
3. Do not change direction of flow more than 90 degrees.
4. Use proper size of standard increasers and reducers if pipes of different sizes are connected.
    a. Reducing size of waste piping in direction of flow is prohibited.

K. Lay buried building waste piping beginning at low point of each system.

1. Install true to grades and alignment indicated, with unbroken continuity of invert. Place hub ends of piping upstream.
2. Install required gaskets according to manufacturer's written instructions for use of lubricants, cements, and other installation requirements.
3. Maintain swab in piping and pull past each joint as completed.

L. Install soil and waste and vent piping at the following minimum slopes unless otherwise indicated:

1. Horizontal Sanitary Waste Piping: Two percent downward in direction of flow.
2. Vent Piping: One percent down toward vertical fixture vent or toward vent stack.

M. Install cast-iron soil piping in accordance with CISPI's "Cast Iron Soil Pipe and Fittings Handbook," Chapter IV, "Installation of Cast Iron Soil Pipe and Fittings."

1. Install encasement on underground piping in accordance with ASTM A674 or AWWA C105/A 21.5.

N. Install steel piping in accordance with applicable plumbing code.

O. Install stainless-steel piping in accordance with ASME A112.3.1 and applicable plumbing code.

P. Install aboveground copper tubing in accordance with CDA's "Copper Tube Handbook."

Q. Install aboveground ABS piping in accordance with ASTM D2661.

R. Install aboveground PVC piping in accordance with ASTM D2665.

S. Install underground ABS and PVC piping in accordance with ASTM D2321.

T. Install engineered soil and waste and vent piping systems as follows:

1. Combination Waste and Vent: Comply with standards of authorities having jurisdiction.
2. Hubless, Single-Stack Drainage System: Comply with ASME B16.45 and hubless, single-stack aerator fitting manufacturer's written installation instructions.
3. Reduced-Size Venting: Comply with standards of authorities having jurisdiction.

U. Install underground, ductile-iron, force-main piping according to AWWA C600.

1. Install buried piping inside building between wall and floor penetrations and connection to sanitary sewer piping outside building with restrained joints.
2. Anchor pipe to wall or floor. Install thrust-block supports at vertical and horizontal offsets.
3. Install encasement on piping in accordance with ASTM A674 or AWWA C105/A 21.5.

V. Install underground, copper, force-main tubing in accordance with CDA's "Copper Tube Handbook."

1. Install encasement on piping in accordance with ASTM A674 or AWWA C105/A 21.5.

W. Install force mains at elevations indicated.

X. Plumbing Specialties:

1. Install backwater valves in sanitary waster gravity-flow piping.

a. Comply with requirements for backwater valves specified in Section 221319 "Sanitary Waste Piping Specialties."

2. Install cleanouts at grade and extend to where building sanitary drains connect to building sanitary sewers in sanitary waste gravity-flow piping.
   a. Install cleanout fitting with closure plug inside the building in sanitary drainage force-main piping.
   b. Comply with requirements for cleanouts specified in Section 221319 "Sanitary Waste Piping Specialties."
3. Install drains in sanitary waste gravity-flow piping.
   a. Comply with requirements for drains specified in Section 221319 "Sanitary Waste Piping Specialties."

Y. Do not enclose, cover, or put piping into operation until it is inspected and approved by authorities having jurisdiction.

Z. Install sleeves for piping penetrations of walls, ceilings, and floors.

1. Comply with requirements for sleeves specified in Section 220517 "Sleeves and Sleeve Seals for Plumbing Piping."

AA. Install sleeve seals for piping penetrations of concrete walls and slabs.

1. Comply with requirements for sleeve seals specified in Section 220517 "Sleeves and Sleeve Seals for Plumbing Piping."

BB. Install escutcheons for piping penetrations of walls, ceilings, and floors.

1. Comply with requirements for escutcheons specified in Section 220518 "Escutcheons for Plumbing Piping."

3.3 JOINT CONSTRUCTION

A. Hubless, Cast-Iron Soil Piping Coupled Joints:

1. Join hubless, cast-iron soil piping in accordance with CISPI 310 and CISPI's "Cast Iron Soil Pipe and Fittings Handbook" for hubless-piping coupling joints.

B. Threaded Joints: Thread pipe with tapered pipe threads in accordance with ASME B1.20.1.

1. Cut threads full and clean using sharp dies.
2. Ream threaded pipe ends to remove burrs and restore full ID. Join pipe fittings and valves as follows:
   a. Apply appropriate tape or thread compound to external pipe threads unless dry seal threading is specified.
   b. Damaged Threads: Do not use pipe or pipe fittings with threads that are corroded or damaged.
   c. Do not use pipe sections that have cracked or open welds.

C. Join copper tube and fittings with soldered joints in accordance with ASTM B828. Use ASTM B813, water-flushable, lead-free flux and ASTM B32, lead-free-alloy solder.

D. Grooved Joints: Cut groove ends of pipe in accordance with AWWA C606. Lubricate and install gasket over ends of pipes or pipe and fitting. Install coupling housing sections over gasket, with keys seated in piping grooves. Install and tighten housing bolts.

E. Flanged Joints: Align bolt holes. Select appropriate gasket material, size, type, and thickness. Install gasket concentrically positioned. Use suitable lubricants on bolt threads. Torque bolts in cross pattern.

F. Plastic, Nonpressure-Piping, Solvent-Cement Joints: Clean and dry joining surfaces. Join pipe and fittings in accordance with the following:

1. Comply with ASTM F402 for safe-handling practice of cleaners, primers, and solvent cements.
2. ABS Piping: Join in accordance with ASTM D2235 and ASTM D2661 appendixes.
3. PVC Piping: Join in accordance with ASTM D2855 and ASTM D2665 appendixes.

3.4 SPECIALTY PIPE FITTING INSTALLATION

A. Transition Couplings:

1. Install transition couplings at joints of piping with small differences in ODs.
2. In Waste Drainage Piping: Shielded, nonpressure transition couplings.

B. Dielectric Fittings:

1. Install dielectric fittings in piping at connections of dissimilar metal piping and tubing.

3.5 INSTALLATION OF HANGERS AND SUPPORTS

A. Comply with requirements for seismic-restraint devices specified in Section 220548 "Vibration and Seismic Controls for Plumbing Piping and Equipment."

B. Comply with requirements for pipe hanger and support devices and installation specified in Section 220548.13 "Vibration Controls for Plumbing Piping and Equipment".

1. Install carbon-steel pipe hangers for horizontal piping in noncorrosive environments.
2. Install stainless steel pipe hangers for horizontal piping in corrosive environments.
3. Install carbon-steel pipe support clamps for vertical piping in noncorrosive environments.
4. Install stainless steel pipe support clamps for vertical piping in corrosive environments.
5. Vertical Piping: MSS Type 8 or Type 42 clamps.
6. Install individual, straight, horizontal piping runs:
   a. 100 Ft. and Less: MSS Type 1, adjustable, steel clevis hangers.
   b. Longer Than 100 Ft.: MSS Type 43, adjustable roller hangers.
   c. Longer Than 100 Ft. if Indicated: MSS Type 49, spring cushion rolls.
7. Multiple, Straight, Horizontal Piping Runs 100 Ft. or Longer: MSS Type 44 pipe rolls. Support pipe rolls on trapeze.
8. Base of Vertical Piping: MSS Type 52 spring hangers.

C. Install hangers for cast-iron and copper soil piping, with maximum horizontal spacing and minimum rod diameters, to comply with MSS SP-58, locally enforced codes, and authorities having jurisdiction requirements, whichever are most stringent.

D. Install hangers for ABS and PVC piping, with maximum horizontal spacing and minimum rod diameters, to comply with manufacturer's written instructions, locally enforced codes, and authorities having jurisdiction requirements, whichever are most stringent.

E. Support horizontal piping and tubing within 12 inches of each fitting and coupling.

F. Support vertical runs of cast-iron and copper soil piping to comply with MSS SP-58, locally enforced codes, and authorities having jurisdiction requirements, whichever are most stringent.

G. Support vertical runs of ABS and PVC piping to comply with manufacturer's written instructions, locally enforced codes, and authorities having jurisdiction requirements, whichever are most stringent.

3.6 CONNECTIONS

A. Drawings indicate general arrangement of piping, fittings, and specialties.

B. Connect soil and waste piping to exterior sanitary sewerage piping. Use transition fitting to join dissimilar piping materials.

C. Connect waste and vent piping to the following:

1. Plumbing Fixtures: Connect waste piping in sizes indicated, but not smaller than required by plumbing code.
2. Plumbing Fixtures and Equipment: Connect atmospheric vent piping in sizes indicated, but not smaller than required by authorities having jurisdiction.
3. Plumbing Specialties: Connect waste and vent piping in sizes indicated, but not smaller than required by plumbing code.
4. Install test tees (wall cleanouts) in conductors near floor and floor cleanouts with cover flush with floor.

D. Where installing piping adjacent to equipment, allow space for service and maintenance of equipment.

E. Make connections in accordance with the following unless otherwise indicated:

1. Install unions, in piping NPS 2 and smaller, adjacent to each valve and at final connection to each piece of equipment.
2. Install flanges, in piping NPS 2-1/2 and larger, adjacent to flanged valves and at final connection to each piece of equipment.

3.7 IDENTIFICATION

A. Identify exposed sanitary waste and vent piping.

B. Comply with requirements for identification specified in Section 220553 "Identification for Plumbing Piping and Equipment."

3.8 FIELD QUALITY CONTROL

A. During installation, notify authorities having jurisdiction at least 24 hours before inspection must be made. Perform tests specified below in presence of authorities having jurisdiction.

1. Roughing-in Inspection: Arrange for inspection of piping before concealing or closing-in after roughing-in and before setting fixtures.
2. Final Inspection: Arrange for final inspection by authorities having jurisdiction to observe tests specified below and to ensure compliance with requirements.

B. Reinspection: If authorities having jurisdiction find that piping will not pass test or inspection, make required corrections and arrange for reinspection.

C. Reports: Prepare inspection reports and have them signed by authorities having jurisdiction.

D. Test sanitary waste and vent piping in accordance with procedures of authorities having jurisdiction or, in absence of published procedures, as follows:

1. Test for leaks and defects in new piping and parts of existing piping that have been altered, extended, or repaired.
    a. If testing is performed in segments, submit separate report for each test, complete with diagram of portion of piping tested.
2. Leave uncovered and unconcealed new, altered, extended, or replaced waste and vent piping until it has been tested and approved.
    a. Expose work that was covered or concealed before it was tested.
3. Roughing-in Plumbing Test Procedure: Test waste and vent piping except outside leaders on completion of roughing-in.
    a. Close openings in piping system and fill with water to point of overflow, but not less than 10 ft. head of water.
    b. From 15 minutes before inspection starts to completion of inspection, water level must not drop.
    c. Inspect joints for leaks.
4. Finished Plumbing Test Procedure: After plumbing fixtures have been set and traps filled with water, test connections and prove they are gastight and watertight.
    a. Plug vent-stack openings on roof and building drains where they leave building. Introduce air into piping system equal to pressure of 1 inch wg.
    b. Use U-tube or manometer inserted in trap of water closet to measure this pressure.
    c. Air pressure must remain constant without introducing additional air throughout period of inspection.
    d. Inspect plumbing fixture connections for gas and water leaks.
5. Repair leaks and defects with new materials and retest piping, or portion thereof, until satisfactory results are obtained.
6. Prepare reports for tests and required corrective action.

E. Test force-main piping in accordance with procedures of authorities having jurisdiction or, in absence of published procedures, as follows:

1. Leave uncovered and unconcealed new, altered, extended, or replaced force-main piping until it has been tested and approved.
    a. Expose work that was covered or concealed before it was tested.
2. Cap and subject piping to static-water pressure of 50 psig above operating pressure, without exceeding pressure rating of piping system materials.
    a. Isolate test source and allow to stand for four hours.
    b. Leaks and loss in test pressure constitute defects that must be repaired.

3. Repair leaks and defects with new materials and retest piping, or portion thereof, until satisfactory results are obtained.
4. Prepare reports for tests and required corrective action.

3.9 CLEANING AND PROTECTION

A. Clean interior of piping. Remove dirt and debris as work progresses.

B. Protect sanitary waste and vent piping during remainder of construction period to avoid clogging with dirt and debris and to prevent damage from traffic and construction work.

C. Place plugs in ends of uncompleted piping at end of day and when work stops.

D. Exposed ABS and PVC Piping: Protect plumbing vents exposed to sunlight with two coats of water-based latex paint.

E. Repair damage to adjacent materials caused by waste and vent piping installation.

3.10 PIPING SCHEDULE

A. Flanges and unions may be used on aboveground pressure piping unless otherwise indicated.

B. Aboveground, soil and waste piping NPS 4 and smaller are to be any of the following:

1. Hubless, cast-iron soil pipe and fittings ; hubless-piping couplings; and coupled joints.
2. Copper Type DWV tube, copper drainage fittings, and soldered joints.
3. Solid-wall ABS pipe, ABS socket fittings, and solvent-cemented joints.
4. Solid-wall PVC pipe, PVC socket fittings, and solvent-cemented joints.
5. Dissimilar Pipe-Material Couplings: Shielded, nonpressure transition couplings.

C. Aboveground, vent piping NPS 4 and smaller is to be any of the following:

1. Hubless, cast-iron soil pipe and fittings; hubless-piping couplings; and coupled joints.
2. Copper Type DWV tube, copper drainage fittings, and soldered joints.
   a. Option for Vent Piping, NPS 2-1/2 and NPS 3-1/2: Hard copper tube, Type M; copper pressure fittings; and soldered joints.
3. Solid-wall Cellular-core ABS pipe, ABS socket fittings, and solvent-cemented joints.
4. Solid-wall Cellular-core PVC pipe, PVC socket fittings, and solvent-cemented joints.
5. Dissimilar Pipe-Material Couplings: Shielded, nonpressure transition couplings.

D. Underground, soil, waste, and vent piping NPS 4 and smaller are to be any of the following:

1. Hubless, cast-iron soil pipe and fittings; cast-iron hubless-piping couplings; and coupled joints.
2. Stainless steel pipe and fittings, gaskets, and gasketed joints.
3. Solid-wall ABS pipe, ABS socket fittings, and solvent-cemented joints.
4. Solid-wall PVC pipe, PVC socket fittings, and solvent-cemented joints.
5. Dissimilar Pipe-Material Couplings: Shielded, nonpressure transition couplings.

END OF SECTION 221316

SECTION 221319 - SANITARY WASTE PIPING SPECIALTIES

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. Cleanouts.
2. Miscellaneous sanitary drainage piping specialties.

B. Related Requirements:

1. Section 076200 "Sheet Metal Flashing and Trim" for metal roof flashing assemblies.
2. Section 077200 "Roof Accessories" for preformed flashings.
3. Section 078413 "Penetration Firestopping" for through-penetration firestop assemblies.
4. Section 221323 "Sanitary Waste Interceptors" for metal and concrete interceptors outside the building, grease interceptors, grease-removal devices, oil interceptors, and solids interceptors.
5. Section 221423 "Storm Drainage Piping Specialties" for trench drains for storm water, channel drainage systems for storm water, roof drains, and catch basins.
6. Section 224300 "Healthcare Plumbing Fixtures" for plaster sink interceptors.
7. Section 334200 "Stormwater Conveyance" for storm drainage piping and piping specialties outside the building.

1.3 DEFINITIONS

A. ABS: Acrylonitrile butadiene styrene.

B. PVC: Polyvinyl chloride.

1.4 ACTION SUBMITTALS

A. Shop Drawings:

1. Show fabrication and installation details for frost-resistant vent terminals.

1.5 INFORMATIONAL SUBMITTALS

1.6 CLOSEOUT SUBMITTALS

PART 2 - PRODUCTS

2.1 ASSEMBLY DESCRIPTIONS

A. Sanitary waste piping specialties shall bear label, stamp, or other markings of specified testing agency.

B. Comply with NSF 14 for plastic sanitary waste piping specialty components.

2.2 CLEANOUTS

A. Cast-Iron Exposed Cleanouts :

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
   a. Jay R. Smith Mfg Co; a division of Morris Group International.
   b. Josam Company.
   c. MIFAB, Inc.
   d. WATTS.
   e. Zurn Industries, LLC.
2. Standard: ASME A112.36.2M.
3. Size: Same as connected drainage piping
4. Body Material: Hubless, cast-iron soil pipe test tee as required to match connected piping.
5. Closure: Countersunk , plug.
6. Closure Plug Size: Same as or not more than one size smaller than cleanout size.

B. Cast-Iron Exposed Floor Cleanouts :

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
   a. Jay R. Smith Mfg Co; a division of Morris Group International.
   b. Josam Company.
   c. MIFAB, Inc.
   d. Sioux Chief Manufacturing Company, Inc.
   e. WATTS.
   f. Zurn Industries, LLC.
2. Standard: ASME A112.36.2M for adjustable housing threaded, adjustable housing cleanout.
3. Size: Same as connected branch.
4. Type: Adjustable housing Threaded, adjustable housing.
5. Body or Ferrule: Cast iron.
6. Outlet Connection: Threaded.
7. Frame and Cover Material and Finish: Nickel-bronze, copper alloy .

8. Frame and Cover Shape: Round .
9. Top-Loading Classification: Light Medium Duty.
10. Riser: ASTM A74, Service Class, cast-iron drainage pipe fitting and riser to cleanout.

C. Cast-Iron Wall Cleanouts :

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
   a. Jay R. Smith Mfg Co; a division of Morris Group International.
   b. Josam Company.
   c. MIFAB, Inc.
   d. WATTS.
   e. Zurn Industries, LLC.
2. Standard: ASME A112.36.2M. Include wall access.
3. Size: Same as connected drainage piping.
4. Body: Hubless, cast-iron soil pipe test tee as required to match connected piping.
5. Closure Plug:
   a. Brass Cast iron.
   b. Countersunk head.
   c. Drilled and threaded for cover attachment screw.
   d. Size: Same as or not more than one size smaller than cleanout size.
6. Wall Access, Cover Plate: Round, flat, chrome-plated brass or stainless steel cover plate with screw.

2.3 MISCELLANEOUS SANITARY DRAINAGE PIPING SPECIALTIES

A. Open Drains :

1. Description: Shop or field fabricate from ASTM A74, Service Class, hub-and-spigot, cast-iron soil-pipe fittings. Include P-trap, hub-and-spigot riser section; and where required, increaser fitting joined with ASTM C564 rubber gaskets.
2. Size: Same as connected waste piping with increaser fitting of size indicated.

B. Floor-Drain, Trap-Seal Primer Fittings :

1. Description: Cast iron, with threaded inlet and threaded or spigot outlet, and trap-seal primer valve connection.
2. Size: Same as floor drain outlet with NPS 1/2 side inlet.

C. Air-Gap Fittings :

1. Standard: ASME A112.1.2, for fitting designed to ensure fixed, positive air gap between installed inlet and outlet piping.
2. Body: Bronze or cast iron.
3. Inlet: Opening in top of body.
4. Outlet: Larger than inlet.
5. Size: Same as connected waste piping and with inlet large enough for associated indirect waste piping.

D. Expansion Joints :

1. Standard: ASME A112.6.4.

2. Body: Cast iron with bronze sleeve, packing, and gland.
3. End Connections: Matching connected piping.
4. Size: Same as connected soil, waste, or vent piping.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Install cleanouts in aboveground piping and building drain piping according to the following, unless otherwise indicated:

1. Size same as drainage piping up to NPS 4. Use NPS 4 for larger drainage piping unless larger cleanout is indicated.
2. Locate at each change in direction of piping greater than 45 degrees.
3. Locate at minimum intervals of 50 feet for piping NPS 4 and smaller and 100 feet for larger piping.
4. Locate at base of each vertical soil and waste stack.

B. For floor cleanouts for piping below floors, install cleanout deck plates with top flush with finished floor.

C. For cleanouts located in concealed piping, install cleanout wall access covers, of types indicated, with frame and cover flush with finished wall.

D. Assemble open drain fittings and install with top of hub 1 inch above floor.

E. Install floor-drain, trap-seal primer fittings on inlet to floor drains that require trap-seal primer connection.

1. Exception: Fitting may be omitted if trap has trap-seal primer connection.
2. Size: Same as floor drain inlet.

F. Install air-gap fittings on draining-type backflow preventers and on indirect-waste piping discharge into sanitary drainage system.

G. Install sleeve and sleeve seals with each riser and stack passing through floors with waterproof membrane.

H. Install expansion joints on vertical stacks and conductors. Position expansion joints for easy access and maintenance.

I. Install wood-blocking reinforcement for wall-mounting-type specialties.

J. Install traps on plumbing specialty drain outlets. Omit traps on indirect wastes unless trap is indicated.

3.2 PIPING CONNECTIONS

A. Comply with requirements in Section 221316 "Sanitary Waste and Vent Piping" for piping installation requirements. Drawings indicate general arrangement of piping, fittings, and specialties.

B. Install piping adjacent to equipment, to allow service and maintenance.

3.3 LABELING AND IDENTIFYING

A. Distinguish among multiple units, inform operator of operational requirements, indicate safety and emergency precautions, and warn of hazards and improper operations, in addition to identifying unit.

1. Nameplates and signs are specified in Section 220553 "Identification for Plumbing Piping and Equipment."

3.4 PROTECTION

A. Protect drains during remainder of construction period to avoid clogging with dirt or debris and to prevent damage from traffic or construction work.

B. Place plugs in ends of uncompleted piping at end of each day or when work stops.

END OF SECTION 221319

SECTION 221320 - SANITARY DRAINS

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. Floor drains.

1.3 DEFINITIONS

A. ABS: Acrylonitrile-butadiene styrene.

B. FRP: Fiberglass-reinforced plastic.

C. HDPE: High-density polyethylene.

D. PE: Polyethylene.

E. PP: Polypropylene.

F. PVC: Polyvinyl chloride.

1.4 ACTION SUBMITTALS

A. Product Data: For each type of product.

PART 2 - PRODUCTS

2.1 DRAIN ASSEMBLIES

A. Sanitary drains shall bear label, stamp, or other markings of specified testing agency.

B. Comply with NSF 14 for plastic sanitary piping specialty components.

2.2 FLOOR DRAINS

A. Cast-Iron Floor Drains :

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
   a. Jay R. Smith Mfg Co; a division of Morris Group International.
   b. Josam Company.
   c. MIFAB, Inc.
   d. WATTS.
   e. Zurn Industries, LLC.
2. Standard: ASME A112.6.3.
3. Outlet: Bottom .
4. Top or Strainer Material: Nickel bronze .
5. Top Shape: Round .
6. Top Loading Classification: Light Duty <Delete if not applicable>.
7. Trap Features: Trap-seal primer valve drain connection .

PART 3 - EXECUTION

3.1 INSTALLATION

A. Install floor drains at low points of surface areas to be drained. Set grates of drains flush with finished floor, unless otherwise indicated.

1. Position floor drains for easy access and maintenance.
2. Set floor drains below elevation of surrounding finished floor to allow floor drainage.
3. Set with grates depressed according to the following drainage area radii:
   a. Radius, 30 Inches or Less: Equivalent to 1 percent slope, but not less than 1/4-inch total depression.
   b. Radius, 30 to 60 Inches: Equivalent to 1 percent slope.
   c. Radius, 60 Inches or Larger: Equivalent to 1 percent slope, but not greater than 1-inch total depression.
4. Install floor-drain flashing collar or flange, so no leakage occurs between drain and adjoining flooring.
   a. Maintain integrity of waterproof membranes where penetrated.
5. Install individual traps for floor drains connected to sanitary building drain, unless otherwise indicated.

B. Install trench drains at low points of surface areas to be drained.

1. Set grates of drains flush with finished surface, unless otherwise indicated.

3.2 CONNECTIONS

A. Comply with requirements in Section 221316 "Sanitary Waste and Vent Piping" for piping installation requirements. Drawings indicate general arrangement of piping, fittings, and specialties.

B. Comply with requirements in Section 221319 "Sanitary Waste Piping Specialties" for backwater valves, air admittance devices and miscellaneous sanitary drainage piping specialties.

C. Comply with requirements in Section 221323 "Sanitary Waste Interceptors" for grease interceptors, grease-removal devices, oil interceptors, sand interceptors, and solid interceptors.

D. Install piping adjacent to equipment to allow service and maintenance.

E. Ground equipment according to Section 260526 "Grounding and Bonding for Electrical Systems."

F. Connect wiring according to Section 260519 "Low-Voltage Electrical Power Conductors and Cables."

3.3 LABELING AND IDENTIFYING

A. Distinguish among multiple units, inform operator of operational requirements, indicate safety and emergency precautions, and warn of hazards and improper operations, in addition to identifying unit. Nameplates and signs are specified in Section 220553 "Identification for Plumbing Piping and Equipment."

3.4 PROTECTION

A. Protect drains during remainder of construction period to avoid clogging with dirt or debris and to prevent damage from traffic or construction work.

B. Place plugs in ends of uncompleted piping at end of each day or when work stops.

END OF SECTION 221320

SECTION 223300 - ELECTRIC, DOMESTIC-WATER HEATERS

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. Commercial, electric, storage, domestic-water heaters.
2. Domestic-water heater accessories.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product.

1. Include rated capacities, operating characteristics, electrical characteristics, and furnished specialties and accessories.

1.4 INFORMATIONAL SUBMITTALS

1.5 Retain "Seismic Qualification Data" Paragraph below if required by seismic criteria applicable to Project. Coordinate with Section 220548 "Vibration and Seismic Controls for Plumbing Piping and Equipment." See ASCE/SEI 7 for certification requirements for equipment and components.

1.6 CLOSEOUT SUBMITTALS

1.7 COORDINATION

A. Coordinate sizes and locations of concrete bases with actual equipment provided.

1.8 WARRANTY

A. Special Warranty: Manufacturer agrees to repair or replace components of electric, domestic-water heaters that fail in materials or workmanship within specified warranty period.

1. Failures include, but are not limited to, the following:
   a. Structural failures including storage tank and supports.
   b. Faulty operation of controls.
   c. Deterioration of metals, metal finishes, and other materials beyond normal use.

2. Warranty Periods: From date of Substantial Completion.
   a. Commercial, Electric, Storage, Domestic-Water Heaters:
      1) Storage Tank: Three years.
      2) Controls and Other Components: Three years.
   b. Expansion Tanks: Five years.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by an NRTL, and marked for intended location and use.

B. Seismic Performance: Commercial, electric, domestic-water heaters shall withstand the effects of earthquake motions determined in accordance with 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."
2. Component Importance Factor: 1.0.

C. ASHRAE/IES Compliance: Applicable requirements in ASHRAE/IES 90.1.

D. NSF Compliance: Fabricate and label equipment components that will be in contact with potable water to comply with NSF 61 and NSF 372.

2.2 COMMERCIAL, ELECTRIC, DOMESTIC-WATER HEATERS

A. Commercial, Electric, Storage, Domestic-Water Heaters:

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
   a. A. O. Smith Corporation.
   b. Bradford White Corporation.
   c. Rheem Manufacturing Company.
2. Source Limitations: Obtain domestic-water heaters from single source from single manufacturer.
3. Standard: UL 1453.
4. Storage-Tank Construction: Non-ASME-code, steel vertical arrangement.
   a. Tappings: Factory fabricated of materials compatible with tank and piping connections. Attach tappings to tank before testing.
      1) NPS 2 and Smaller: Threaded ends in accordance with ASME B1.20.1.
      2) NPS 2-1/2 and Larger: Flanged ends in accordance with ASME B16.5 for steel and stainless steel flanges, and in accordance with ASME B16.24 for copper and copper-alloy flanges.
   b. Pressure Rating: 150 psig .
   c. Interior Finish: Comply with NSF 61 and NSF 372 barrier materials for potable-water tank linings, including extending lining material into tappings.
5. Factory-Installed, Storage-Tank Appurtenances:
   a. Anode Rod: Replaceable magnesium.
   b. Drain Valve: Corrosion-resistant metal with hose-end connection.

c. Insulation: Comply with ASHRAE/IES 90.1.
d. Jacket: Steel with enameled finish or high-impact composite material.
e. Heating Elements: Electric, screw-in or bolt-on immersion type arranged in multiples of three.
f. Temperature Control: Adjustable thermostat.
g. Safety Controls: High-temperature-limit and low-water cutoff devices or systems.
h. Relief Valves: ASME rated and stamped for combination temperature-and-pressure relief valves. Include one or more relief valves with total relieving capacity at least as great as heat input, and include pressure setting less than working-pressure rating of domestic-water heater. Select one relief valve with sensing element that extends into storage tank.

6. Special Requirements: NSF 5 construction.

2.3 DOMESTIC-WATER HEATER ACCESSORIES

A. Domestic-Water Expansion Tanks:

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
   a. A. O. Smith Corporation.
   b. AMTROL, Inc.
   c. State Industries.
2. Source Limitations: Obtain domestic-water expansion tanks from single source from single manufacturer.
3. Description: Steel pressure-rated tank constructed with welded joints and factory-installed, butyl-rubber diaphragm. Include air precharge to minimum system-operating pressure at tank.
4. Construction:
   a. Tappings: Factory-fabricated steel, welded to tank before testing and labeling. Include ASME B1.20.1 pipe thread.
   b. Interior Finish: Comply with NSF 61 and NSF 372 barrier materials for potable-water tank linings, including extending finish into and through tank fittings and outlets.
   c. Air-Charging Valve: Factory installed.
5. Capacity and Characteristics:
   a. Working-Pressure Rating: 150 psig .
   b. Capacity Acceptable: See plans.

B. Drain Pans: Corrosion-resistant metal with raised edge. Include dimensions not less than base of domestic-water heater, and include drain outlet not less than NPS 3/4 with ASME B1.20.1 pipe threads.

C. Piping-Type Heat Traps: Field-fabricated piping arrangement in accordance with ASHRAE/IES 90.1 .

D. Heat-Trap Fittings: ASHRAE/IES 90.1 .

E. Combination Temperature-and-Pressure Relief Valves: ASME rated and stamped. Include relieving capacity at least as great as heat input, and include pressure setting less than working-pressure rating of domestic-water heater. Select relief valves with sensing element that extends into storage tank.

F. Shock Absorbers: ASSE 1010 or PDI-WH 201, Size A water hammer arrester.

PART 3 - EXECUTION

3.1 DOMESTIC-WATER HEATER INSTALLATION

A. Commercial, Electric, Domestic-Water Heater Mounting: Install commercial, electric, domestic-water heaters on concrete base. Comply with requirements for concrete bases specified in Section 033000 "Cast-in-Place Concrete."

1. Exception: Omit concrete bases for commercial, electric, domestic-water heaters if installation on stand, bracket, suspended platform, or directly on floor is indicated.
2. Maintain manufacturer's recommended clearances.
3. Arrange units so controls and devices that require servicing are accessible.
4. 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.
5. For supported equipment, install epoxy-coated anchor bolts that extend through concrete base and anchor into structural concrete floor.
6. Place and secure anchorage devices. Use setting drawings, templates, diagrams, instructions, and directions furnished with items to be embedded.
7. Install anchor bolts to elevations required for proper attachment to supported equipment.
8. Anchor domestic-water heaters to substrate.

B. Install electric, domestic-water heaters level and plumb, in accordance with layout drawings, original design, and referenced standards. Maintain manufacturer's recommended clearances. Arrange units so controls and devices needing service are accessible.

1. Install shutoff valves on domestic-water-supply piping to domestic-water heaters and on domestic-hot-water outlet piping. Comply with requirements for shutoff valves specified in Section 220523.12 "Ball Valves for Plumbing Piping," Section 220523.13 "Butterfly Valves for Plumbing Piping," and Section 220523.15 "Gate Valves for Plumbing Piping."

C. Install commercial, electric, domestic-water heaters with seismic-restraint devices. Comply with requirements for seismic-restraint devices specified in Section 220548 "Vibration and Seismic Controls for Plumbing Piping and Equipment."

D. Install combination temperature-and-pressure relief valves in top portion of storage tanks. Use relief valves with sensing elements that extend into tanks. Extend domestic-water heater relief-valve outlet, with drain piping same as domestic-water piping in continuous downward pitch, and discharge by positive air gap onto closest floor drain.

E. Install combination temperature-and-pressure relief valves in water piping for electric, domestic-water heaters without storage. Extend domestic-water heater relief-valve outlet, with drain piping same as domestic-water piping in continuous downward pitch, and discharge by positive air gap onto closest floor drain.

F. Install water-heater drain piping as indirect waste to spill by positive air gap into open drains or over floor drains. Install hose-end drain valves at low points in water piping for electric, domestic-water heaters that do not have tank drains. Comply with requirements for hose-end drain valves specified in Section 221119 "Domestic Water Piping Specialties."

G. Install thermometers on outlet piping of electric, domestic-water heaters. Comply with requirements for thermometers specified in Section 220519 "Meters and Gages for Plumbing Piping."

H. Install thermometers on inlet and outlet piping of residential, solar, electric, domestic-water heaters. Comply with requirements for thermometers specified in Section 220519 "Meters and Gages for Plumbing Piping."

I. Assemble and install inlet and outlet piping manifold kits for multiple electric, domestic-water heaters. Fabricate, modify, or arrange manifolds for balanced water flow through each electric, domestic-water heater. Include shutoff valve and thermometer in each domestic-water heater inlet and outlet, and throttling valve in each electric, domestic-water heater outlet. Comply with requirements for valves specified in Section 220523.12 "Ball Valves for Plumbing Piping," Section 220523.13 "Butterfly Valves for Plumbing Piping," and Section 220523.15 "Gate Valves for Plumbing Piping," and comply with requirements for thermometers specified in Section 220519 "Meters and Gages for Plumbing Piping."

J. Install piping-type heat traps on inlet and outlet piping of electric, domestic-water heater storage tanks without integral or fitting-type heat traps.

K. Fill electric, domestic-water heaters with water.

L. Charge domestic-water expansion tanks with air to required system pressure.

M. Install dielectric fittings in all locations where piping of dissimilar metals is to be joined. The wetted surface of the dielectric fitting contacted by potable water shall contain less than 0.25 percent of lead by weight.

3.2 PIPING CONNECTIONS

A. Comply with requirements for piping specified in Section 221116 "Domestic Water Piping." Drawings indicate general arrangement of piping, fittings, and specialties.

B. Where installing piping adjacent to electric, domestic-water heaters, allow space for service and maintenance of water heaters. Arrange piping for easy removal of domestic-water heaters.

3.3 IDENTIFICATION

A. Identify system components. Comply with requirements for identification specified in Section 220553 "Identification for Plumbing Piping and Equipment."

3.4 DEMONSTRATION

A. Train Owner's maintenance personnel to adjust, operate, and maintain commercial , electric, domestic-water heaters. Training shall be a minimum of one hour(s).

END OF SECTION 223300

SECTION 224716 - PRESSURE WATER COOLERS

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. Pressure water coolers.
2. Supports.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of pressure water cooler and bottle filling station.

1. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes.
2. Include rated capacities, operating characteristics, electrical characteristics, and furnished specialties and accessories.

1.4 CLOSEOUT SUBMITTALS

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Standards:

1. Pressure water coolers and bottle filling stations intended to convey or dispense water for human consumption are to comply with the U.S. Safe Drinking Water Act (SDWA), requirements of the Authority Having Jurisdiction (AHJ), and with NSF 61 or NSF 372, or be certified in compliance with NSF 61 or NSF 372 by an ANSI-accredited third-party certification body, that the weighted average lead content at wetted surfaces is less than or equal to 0.25 percent.
2. Comply with ASHRAE 34 for water coolers. Provide HFC 134a (tetrafluoroethane) refrigerant unless otherwise indicated.
3. Comply with UL 399.
4. Comply with ASME A112.19.3/CSA B45.4.
5. 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.

6. Comply with NSF 42 and NSF 53 for water filters for water coolers and bottle filling stations.
7. Comply with ICC A117.1 for accessible water coolers and bottle filling stations.

2.2 PRESSURE WATER COOLERS

A. Pressure Water Coolers - Surface Wall-Mounted, Stainless Steel: .

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
   a. Elkay.
   b. Halsey Taylor.
   c. Oasis International.
2. Source Limitations: Obtain surface wall-mounted, stainless steel, pressure water coolers from single source from single manufacturer.
3. Type: Vandal resistant .
4. Bubbler: One, with adjustable stream regulator, located on each cabinet deck.
5. Control: Push bar .
6. Glass filler.
7. Bottle Filler: Sensor activation : Fill rate 0.5 to 1.5 gpm .
8. Drain: Grid with NPS 1-1/4 tailpiece.
9. Supply: NPS 3/8 with shutoff valve.
10. Waste Fitting: ASME A112.18.2/CSA B125.2, NPS 1-1/4 brass P-trap.
11. Filter: One or more water filters with capacity sized for unit peak flow rate.
12. Cooling System: Electric, with hermetically sealed compressor, cooling coil, air-cooled condensing unit, corrosion-resistant tubing, refrigerant, corrosion-resistant-metal storage tank, and adjustable thermostat.
13. Support: Water-cooler carrier.
14. Water-Cooler Mounting Height: Accessible in accordance with ICC A117.1 High/low - standard/accessible in accordance with ICC A117.1.
15. Capacities and Characteristics:
    a. Cooled Water: 8 gph .
    b. Ambient-Air Temperature: 90 deg F.
    c. Inlet-Water Temperature: 80 deg F.
    d. Cooled-Water Temperature: 50 deg F.

2.3 SUPPORTS

A. Water-Cooler Carrier:

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
   a. Jay R. Smith Mfg Co; a division of Morris Group International.
   b. Josam Company.
   c. MIFAB, Inc.
   d. Zurn Industries, LLC.
2. Standard: ASME A112.6.1M.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine roughing-in for water-supply and sanitary drainage and vent piping systems to verify actual locations of piping connections before fixture installation.

B. Examine walls and floors for suitable conditions where fixtures will be installed.

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

3.2 INSTALLATION

A. Install fixtures level and plumb according to roughing-in drawings. For fixtures indicated for children, install at height required by authorities having jurisdiction.

B. Set freestanding, pressure water coolers on floor.

C. Install off-the-floor carrier supports, affixed to building substrate, for wall-mounted fixtures.

D. Install mounting frames, affixed to building construction, and attach recessed, pressure water coolers, and bottle filling stations to mounting frames.

E. Install water-supply piping with shutoff valve on supply to each fixture to be connected to domestic-water distribution piping. Use ball valve. Install valves in locations where they can be easily reached for operation. Valves are specified in Section 220523.12 "Ball Valves for Plumbing Piping"

F. Install trap and waste piping on drain outlet of each fixture to be connected to sanitary drainage system.

G. Install wall flanges or escutcheons at piping wall penetrations in exposed, finished locations. Use deep-pattern escutcheons where required to conceal protruding fittings. Comply with escutcheon requirements specified in Section 220518 "Escutcheons for Plumbing Piping."

H. Seal joints between fixtures and walls using sanitary-type, one-part, mildew-resistant, silicone sealant. Match sealant color to fixture color. Comply with sealant requirements specified in Section 079200 "Joint Sealants."

3.3 PIPING CONNECTIONS

A. Connect fixtures with water supplies, stops, and risers, and with traps, soil, waste, and vent piping. Use size fittings required to match fixtures.

B. Comply with water piping requirements specified in Section 221116 "Domestic Water Piping."

C. Install ball shutoff valve on water supply to each fixture. Install valve upstream from filter for water cooler. Comply with valve requirements specified in Section 220523.12 "Ball Valves for Plumbing Piping"

D. Comply with soil and waste piping requirements specified in Section 221316 "Sanitary Waste and Vent Piping."

3.4 ELECTRICAL CONNECTIONS

A. Ground equipment according to Section 260526 "Grounding and Bonding for Electrical Systems."

B. Install electrical devices furnished by manufacturer, but not factory mounted, according to NFPA 70 and NECA 1.

C. Install nameplate for each electrical connection, indicating electrical equipment designation and circuit number feeding connection.

1. Nameplates to be laminated acrylic or melamine plastic signs, as specified in Section 260553 "Identification for Electrical Systems."
2. Nameplates to be laminated acrylic or melamine plastic signs with a black background and engraved white letters at least 1/2 inch high.

3.5 ADJUSTING

A. Adjust fixture flow regulators for proper flow and stream height.

B. Adjust pressure water-cooler temperature settings.

3.6 CLEANING

A. After installing fixture, inspect unit. Remove paint splatters and other spots, dirt, and debris. Repair damaged finish to match original finish.

B. Clean fixtures, on completion of installation, according to manufacturer's written instructions.

C. Provide protective covering for installed fixtures.

D. Do not allow use of fixtures for temporary facilities unless approved in writing by Owner.

END OF SECTION 224716

SECTION 230500 - COMMON WORK RESULTS FOR HVAC

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.

B. Related Sections include the following:

1. 230816 “General Commissioning Requirements”.

1.2 SUMMARY

A. This Section includes the following to complement other Division 23 Sections:
1. Submittals.
2. Coordination Drawings.
3. Record Documents.
4. Maintenance Manuals.
5. Piping materials and installation instructions common to most piping systems.
6. Concrete base construction requirements.
7. Escutcheons.
8. Dielectric fittings.
9. Flexible connectors.
10. Mechanical sleeve seals.
11. Nonshrink grout for equipment installations.
12. Field-fabricated metal equipment supports.
13. Installation requirements common to equipment specification sections.
14. Rough-ins.
15. Mechanical Installations.
16. Cutting and patching.
17. Touchup painting and finishing.

1.3 GENERAL REQUIREMENTS

A. Intent:
1. The intent of the Contract Documents is for the Contractor to include all work necessary for the complete mechanical systems, tested and ready for operation.
2. By submitting a proposal, the Contractor represents that it has made a thorough examination of the site, of the work, and all existing conditions and limitations, and that it has examined the Contract Documents in complete detail and has determined beyond doubt that the drawings, specifications, and existing conditions are sufficient, adequate and satisfactory for the construction of the work under the Contract.
3. Where minor adjustments of the work are necessary for purposes of fabrication or installation of items, or resolution of conflicts between items within the intent of the Contract Documents, the Contractor shall make such adjustments with no added compensation. Where such adjustments affect functional or aesthetic design of the work, they shall first be submitted to the Architect for review and approval.

B. Conditions:
   1. Conform to all Bidding Requirements, General Conditions and Amendments to the General Conditions, Supplementary Conditions and Special Conditions and General Requirements, Division 01, which govern the work specified herein.
   2. The Contractor is obligated to comply with the above in addition to the requirements of this Section.
   3. Modifications by this Section do not nullify any other portions of the above referenced conditions.

C. Make complete mechanical installation, connecting to all equipment shown on the plans, or called for in the specifications. Mechanical contractor to provide any additional extra dampers and valves not shown on plans to obtain design criteria as required by the balancing contractor.

D. Plans and Specifications: Plans and specifications shall be taken together.
   1. Contractor shall provide all equipment, materials and work shown on the plans and/or called for in these specifications.
   2. Provide work specified and not indicated on plans, or work indicated on plans and not specified, as though mentioned in both.
   3. When discrepancies or conflicts occur within the documents, the Architect shall determine which takes precedence and the Contractor shall perform the selected requirement without additional cost.

E. Mechanical Drawings:
   1. Mechanical drawings do not attempt to show all aspects of building construction, which will affect the installation of mechanical systems. The mechanical drawings are diagrammatic and do not intend to show all offsets and fittings that may be required for a complete installation. Locations of equipment, pipes, valves, traps, ductwork, etc. shown on the drawings, shall be followed as closely as conditions will permit. Review all project drawings, including, but not limited to, architectural, structural and electrical drawings; and coordinate with all trades involved so there is no conflict with work of other trades and so Owner secures best arrangement of work consistent with use of space.
   2. Verify exact distances between points shown of drawings by actual measurement at site, as no extra cost will be allowed for differences between actual measurements and scaled measurements.
   3. Changes in design, configuration, or location of equipment, piping, or ductwork, advisable in the opinion of Contractor, shall be submitted to Architect for approval before proceeding with work, with written assurance from other trades that such changes will not interfere with their installation, nor cause any extra cost on their part. Such changes shall be made at no additional cost to Owner.
   4. Check location of all work of all trades and avoid interferences. Special attention is called to the following items; conflicts shall be reported to Architect for decision and direction:
      a. Exact location of outlets shown on architectural details.
      b. Location of suspended ceilings.
      c. Location of ducts, grilles, pipes, and other mechanical equipment so electrical outlets are clear of these items and in proper relation to same.

1.4 DEFINITIONS AND ABBREVIATIONS

A. Finished Spaces: Spaces other than mechanical and electrical equipment rooms, furred spaces, pipe and duct shafts, unheated spaces immediately below roof, spaces above ceilings, unexcavated spaces, crawl spaces, and tunnels.

B. Exposed, Interior Installations: Exposed to view indoors. Examples include finished occupied spaces and mechanical equipment rooms.

C. Exposed, Exterior Installations: Exposed to view outdoors, or subject to outdoor ambient temperatures and weather conditions. Examples include rooftop locations.

D. Concealed, Interior Installations: Concealed from view and protected from physical contact by building occupants. Examples include spaces above hard or lay-in type ceilings and in duct shafts.

E. Concealed, Exterior Installations: Concealed from view and protected from weather conditions and physical contact by building occupants, but subject to outdoor ambient temperatures. Examples include installations within unheated shelters.

F. The word "provide," as used in Division 23, means "furnish and install."

G. The word "approved," as used in these specifications, means acceptance by the Architect.

H. Indicated: The term "indicated" refers to graphic representations, notes, or schedules on the drawings, or other paragraphs or schedules in the specifications, and similar requirements in the Contract Documents. Terms such as "shown," "noted," "scheduled," and "specified" are used to help the reader locate the reference. Location is not limited.

I. Directed: Terms such as "directed," "requested," "authorized," "selected," "approved," "required," and "permitted," mean directed by the Architect, requested by the Architect, and similar phrases.

J. Mechanical Systems - Including but not limited to:
1. Heating, Ventilation and Air Conditioning Systems.
2. Temperature Controls System.

K. Abbreviations:

AMCA	Air Moving and Conditioning Association
ANSI	American National Standards Institute
ARI	Air Conditioning and Refrigeration Institute
ASHRAE	American Society of Heating, Refrigerating and Air Conditioning Engineers
ASME	American Society of Mechanical Engineers
ASTM	American Society of Testing Materials
AWWA	American Water Works Association
AWS	American Welding Society
CISPI	Cast Iron Soil Pipe Institute
FM	Factory Mutual Engineering Corporation
IBC	International Building Code
IMC	International Mechanical Code
NEBB	National Environmental Balancing Bureau
NEC	National Electric Code
NEMA	National Electrical Manufacturers Association
NFPA	National Fire Protection Association
NREC	Washington State Non-Residential Energy Code
OSHA	Occupational Safety and Health Administration
SMACNA	Sheet Metal and Air Conditioning Contractors National Association, Inc.
UPC	Uniform Plumbing Code
UL	Underwriters Laboratories

1.5 CODES, PERMITS AND INSPECTIONS

A. Codes: Work shall be installed as a minimum in conformity with applicable local ordinances and statutes. Standards and sizes, which exceed preceding requirements, shall be installed as drawn or specified. Nothing in the specifications shall be construed to permit deviation to less than the requirements of governing codes. Contractor is not relieved from furnishing and installing work shown or specified which may be beyond requirements of ordinances, laws, regulations, and codes.

B. Codes and Standards: Applicable codes and standards shall include, but not necessarily be limited to:
1. Uniform Plumbing Code, by International Association of Plumbing and Mechanical Officials.
2. International Mechanical Code, by International Code Council.
3. International Building Code, by International Code Council.
4. Requirements of OSHA, EPA and WISHA.
5. National Fire Protection Association Codes.
6. ASME codes for boiler and pressure vessels.
7. SMACNA HVAC Duct Construction Standards, latest edition.
8. All local and state amendments.
9. Requirements of all agencies have jurisdictional authority over installation of mechanical systems.

C. Permits, Fees and Inspections:
1. Contractor shall arrange and pay for all permits, fees and inspections required in connection with this installation. The Contractor shall present the Owner with properly signed certificates of final inspection before the work will be accepted.
2. Contractor shall call for all inspections by local building official(s) when they become due, and shall not cover any work until approved by these governing authorities.
3. Contractor shall make all arrangements with utility companies for water, steam, gas and drainage services, etc., associated with the work and include required payments for meters, piping, services, connection charges and materials furnished and installed by utility companies. Work and materials shall be in strict accordance with rules of respective authorities.

D. Underwriters Laboratory Approval: Where Underwriters Laboratories (UL) standards exist, all items of electrical equipment or items partially composed of electrical equipment shall carry Underwriters Laboratories (UL) label either for the entire unit or for the electrical portion of the equipment. If UL standards do not exist, equipment shall be provided that has been labeled by an independent testing agency that is recognized by the authority having jurisdiction.

E. ASME Code Stamp: ASME code stamp required on all pressure vessels and relief valves. Certificate required from the Boiler Inspector showing approval of the equipment and its installation.

1.6 WORK INCLUDED

A. Work under this division shall include providing all materials, labor, equipment, tools, appliances, hoisting, scaffolding, supervision and overhead for the proper execution and completion of the mechanical work.

B. Should these specifications or references made therein fail to specify adequately an item of equipment or material required for proper completion of the work in accordance with present day practice, this deficiency shall not relieve Contractor from furnishing and installing same.

Call such omissions to attention of Architect and use such equipment or material as approved by Architect.

C. All new equipment and products as noted in Part 2 of each section shall be installed as per manufacturer's recommendations.

1.7 WORKMANSHIP

A. This Contractor shall provide completed systems with a neat and finished appearance. If, in the judgment of the Architect, any portion of the work has not been performed in a workmanlike manner or is left in a rough, unfinished state, this Contractor will be required to remove, reinstall or replace same and patch and paint surrounding surfaces in a manner acceptable to the Architect, without increase in cost to the Owner.

1.8 SUBMITTALS, GENERAL REQUIREMENTS

A. General: Follow the procedures for submittals or as described herein and specified in Division 01.

B. General Requirements for Division 23 Submittals: Provide the following submittals as indicated in each Division 23 section. Additional submittal requirements may be included in the individual sections.
1. Product Data: Submit manufacturer’s product data for the items listed in the individual Division 23 sections. Product data shall demonstrate compliance with all specified features and requirements. Submittals for equipment shall include, but not be limited to, data indicating equipment capacity meets the indicated values at specified conditions, equipment drawings indicating all dimensions, connection information, service space requirements, recommended piping and/or wiring diagrams, installation details and extended warranties either offered by equipment manufacturer or required by specifications.
2. Shop Drawings: Submit Contractor prepared drawings of Contractor fabricated mechanical systems. Drawings shall be prepared at ¼” scale using Computer Aided Design (CAD) software unless indicated otherwise. Drawings shall show exact location of equipment, piping and ductwork, each section of shop fabricated duct or pipe and location of field joints, supports and building attachments, and seismic restraint locations.
3. Reports and Certificates: Indicate and interpret test results for compliance with performance requirements. Provide performance certificates.
4. Operation and Maintenance Data: Submit proposed Division 23 Operation and Maintenance materials for approval prior to inclusion in the comprehensive final bound edition. See Article in this section on Operation and Maintenance Manuals for materials required to be included.

C. Number of Copies: Provide one additional copy of mechanical shop drawings and product data submitted over the number required in 01 Submittals, to allow for one copy of each submittal to be retained by the Mechanical Engineer. Additional copies may be required by individual sections of these Specifications.

D. Format: Provide submittals arranged with numerical index and tabs in 3-ring notebook containing the total volume of material. All product data shall be submitted complete by system, partial submittals are not acceptable and may be returned unreviewed. Systems are defined here as plumbing systems (Division 22), fire suppression system (Division 21) HVAC system, and HVAC control system. Reference submittals, including title and location of project, Architect, Contractor, submission date, and specification paragraph number to indicate clearly the loca-

tion, service, equipment identification numbers as shown on drawings, and function of each particular item. Where manufacturers' catalogs, pamphlets, or data sheets are submitted in lieu of prepared shop drawings, such submissions shall indicate specifically the item for which approval is required in red ink, and submissions showing general information only are not acceptable. Electronic copies are acceptable.

E. Submittals not in conformance to above paragraphs will be returned unreviewed.

1.9 SUBMITTALS, BASIC MECHANICAL MATERIALS

A. General: See Article in this section, Submittals, General Requirements for general requirements of Product Data, Shop Drawings, Reports and Certificates, and Operation and Maintenance data submittals.

B. Product Data: Provide submittals of the following:
1. Dielectric Unions
2. Dielectric Flanges
3. Dielectric Couplings
4. Dielectric Nipples
5. Braided Flexible Hose Connectors
6. Rubber Flexible Connectors
7. Flexible Expansion Loops

C. Shop Drawings: None required.

D. Reports and Certificates: None required.

1.10 COORDINATION DRAWINGS

A. Detail major elements, components, and systems of mechanical equipment and materials in relationship with other systems, installations, and building components. Show space requirements for installation and access. Indicate if sequence and coordination of installations are important to efficient flow of the Work. Include the following:
1. Planned piping layout, including valve and specialty locations and valve-stem movement.
2. Planned duct layout, including fan, coil, filter, duct silencer, and damper location.
3. Clearances for installing and maintaining insulation.
4. Clearances for servicing and maintaining equipment, accessories, and specialties, including space for disassembly required for periodic maintenance.
5. Equipment and accessory service connections and support details.
6. Other systems installed in same space as mechanical systems.
7. Exterior wall and foundation penetrations.
8. Fire-rated wall and floor penetrations.
9. Ceiling and wall-mounted access doors and panels required to provide access to dampers and other operating devices.
10. Sizes and location of required concrete pads and bases.
11. Scheduling, sequencing, movement, and positioning of large equipment into building during construction.
12. Floor plans, elevations, and details to indicate penetrations in floors, walls, and ceilings and their relationship to other penetrations and installations.
13. Reflected ceiling plans to coordinate and integrate installation of air outlets and inlets, light fixtures, communication system components, sprinklers, and other ceiling-mounted items.

1.11 SUBSTITUTIONS

A. Substitutions will only be considered after project award. No substitutions will be considered during bid and/or negotiation periods.

B. In all cases in this specification where an article is followed by the words "or equal," the Engineer is the sole judge of the quality of the proposed substitution.

C. When the Engineer approves a substitution, the approval is given with the understanding that the Contractor guarantees the article or material substituted to be equal to or better in every respect than the article or material specified. The Contractor shall also assume complete responsibility that the article or material will fit the job as far as space, access and servicing requirements.

D. Where several materials are specified by name for one use, select for use any of those so specified subject to compliance with specified requirements.

E. Whenever item or class of material is specified exclusively by detail specification, trade name, manufacturer's name or by catalog reference, use only such item, unless written approval is given. Submit written requests in accordance with Division 01 substitution requirements.

F. Make no substitutions for materials, articles or process required under contract unless written approval is obtained. See the Division 01 for project substitution requirements.

1.12 RECORD DOCUMENTS

A. Prepare record documents in accordance with the requirements in Division 01. In addition to the requirements specified in Division 01, indicate the following installed conditions:
   1. Ductwork mains and branches, size and location, for both exterior and interior, locations of dampers and other control devices; filters, boxes, and terminal units requiring periodic maintenance or repair.
   2. Mains and branches of piping systems, with valves and control devices located and numbered, concealed unions located, and with items requiring maintenance located (i.e., traps, strainers, expansion compensators, tanks, etc.). Valve location diagrams, complete with valve tag chart. Indicate actual inverts and horizontal locations of underground piping.
   3. Record drawings shall incorporate all accepted change orders and RFIs; reference number on drawings is not acceptable.
   4. Equipment locations (exposed and concealed), dimensioned from prominent building lines.
   5. Approved substitutions, Contract Modifications, and actual equipment and materials installed.
   6. Contract Modifications, actual equipment and materials installed.
   7. Record the locations and invert elevations of underground installations.

1.13 OPERATION AND MAINTENANCE MANUALS

A. Prepare maintenance manuals in accordance with Division 01 and the following requirements. Division 23 manuals shall be hard cover, 3-post binder, and indexed by systems. Pages shall be same size, with exception of allowable foldout pages for control and flow diagrams. Cover shall be inscribed with name of project, Owner, description of contents, Architect, General Con-

tractor, Mechanical Contractor, and date. In addition to the requirements specified in Division 01, include the following information in Division 23 materials:

1. Product Data of all Division 15 equipment provided by the project as indicated in submittal requirements.
2. Manufacturer's Equipment Installation and Start-Up Manuals for all equipment provided by the project. Manufacturer's printed operating procedures to include start-up, break-in, and routine and normal operating instructions; regulation, control, stopping, shutdown, and emergency instructions; and summer and winter operating instructions.
3. Manufacturer's Equipment Service Manuals for all equipment provided by the project, including parts list, troubleshooting list and maintenance procedures for routine preventative maintenance. Include disassembly, repair, and reassembly; aligning and adjusting instructions; servicing instructions and lubrication charts and schedules
4. Reports and Certificates of all Division 23 systems and equipment as required by specifications.
5. Material Safety Data Sheets (MSDS) for all applicable materials used for Division 23 installations.
6. Warranty Certificates for all equipment where extended warranties are either offered or required; provide supplier contact information.

1.14 QUALITY ASSURANCE

A. Equipment Selection: Equipment allowed by the specifications but with different electrical characteristics, physical dimensions, capacities, and/or ratings than what is shown on the drawings may be furnished, provided such proposed equipment is approved in writing and connecting mechanical and electrical services, such as pipe and/or duct connection sizes, circuit breakers, conduit, motors, bases, and equipment spaces are revised to accommodate such equipment. All expenses shall be borne by the Contractor. Specified minimum energy ratings and/or equipment efficiencies must meet design and commissioning requirements.

1.15 DELIVERY, STORAGE, AND HANDLING

A. Deliver pipes and tubes with factory-applied end caps. Maintain end caps through shipping, storage, and handling to prevent pipe end damage and prevent entrance of dirt, debris, and moisture.

B. Protect stored mechanical equipment, ducts, pipes and tubes and other materials from moisture and dirt. Elevate above grade. Do not exceed structural capacity of floor, if stored inside.

C. Pipes, ducts, mechanical equipment, and other materials that are damaged due to improper storage shall be replaced at the Contractor's expense.

1.16 SEQUENCING AND SCHEDULING

A. Coordinate mechanical equipment installation with other building components.

B. Arrange for pipe spaces, chases, slots, and openings in building structure during progress of construction to allow for mechanical installations.

C. Coordinate installation of required supporting devices and set sleeves in poured-in-place concrete and other structural components, as they are constructed.

D. Sequence, coordinate, and integrate installations of mechanical materials and equipment for efficient flow of the Work. Coordinate installation of large equipment requiring positioning before closing in building.

E. Some equipment may require temporary installation during one phase and require relocation to final location under another phase. Provide all associated labor and materials to accommodate this phasing.

F. Coordinate connection of mechanical systems with exterior underground and overhead utilities and services. Comply with requirements of governing regulations, franchised service companies, and controlling agencies.

G. Coordinate requirements for access panels and doors if mechanical items requiring access are concealed behind finished surfaces. Access panels and doors are specified in Division 08.

H. Use of the building HVAC systems, including those being provided under this contract, for temporary heating, ventilation or cooling during construction is prohibited. When system installation is complete and ready for start-up, approval to operate the system shall be obtained from the Owner or designated Owner's representative.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
   1. Dielectric Unions:
      a. Capitol Manufacturing Co.
      b. Eclipse, Inc.; Rockford-Eclipse Div.
      c. Epco Sales Inc.
      d. Hart Industries International, Inc.
      e. Watts Industries, Inc.; Water Products Div.
      f. Zurn Industries, Inc.; Wilkins Div.
   2. Dielectric Flanges:
      a. Capitol Manufacturing Co.
      b. Central Plastics Co.
      c. Epco Sales Inc.
      d. Watts Industries, Inc.; Water Products Div.
   3. Dielectric Couplings:
      a. Calpico, Inc.
      b. Lochinvar Corp.
   4. Dielectric Nipples:
      a. Grinnell Corp.; Grinnell Supply Sales Co.
      b. Victaulic Co. of America.
   5. Braided Hose Flexible Connectors:
      a. Flex-Hose Co, Inc.
      b. Hyspan Precision Products, Inc.
      c. Mason.
      d. Mercer Rubber Co.
      e. Metraflex Co.
   6. Rubber Flexible Connectors:
      a. General Rubber Corp.

b. Flex-Hose Co., Inc.
c. Mercer Rubber Co.
d. Metraflex Co.
e. Mason.

7. Flexible Expansion Loops:
   a. Metraflex Co.
   b. Flex-Hose.
8. Mechanical Sleeve Seals:
   a. Calpico, Inc.
   b. Metraflex Co.
   c. Thunderline/Link-Seal.
   d. Innerlynx

2.2 PIPE AND PIPE FITTINGS

A. Refer to individual Division 23 piping Sections for pipe and fitting materials and joining methods.

B. Pipe Threads: ASME B1.20.1 for factory-threaded pipe and pipe fittings.

2.3 JOINING MATERIALS

A. Refer to individual Division 23 piping Sections for special joining materials not listed below.

B. Pipe-Flange Gasket Materials: Suitable for fluid type, temperature and pressure of piping system.
   1. ASME B16.21, nonmetallic, flat, asbestos-free, 1/8-inch maximum thickness, unless indicated otherwise.
      a. Full-Face Type: For flat-face, Class 125, cast-iron and cast-bronze flanges.
      b. Narrow-Face Type: For raised-face, Class 250, cast-iron and steel flanges.
   2. Flange Bolts and Nuts: ASME B18.2.1, carbon steel, unless otherwise indicated.

C. Solder Filler Metals: ASTM B 32.
   1. Alloy Sn95 or Alloy Sn94: Approximately 95 percent tin and 5 percent silver, with 0.10 percent lead content.
   2. Alloy E: Approximately 95 percent tin and 5 percent copper, with 0.10 percent maximum lead content.

D. Brazing Filler Metals: AWS A5.8.
   1. BCuP Series: Copper-phosphorus alloys.
   2. BAg1: Silver alloy.

E. Welding Filler Metals: Comply with AWS D10.12 for welding materials appropriate for wall thickness and chemical analysis of steel pipe being welded.

F. Flanged, Ductile-Iron Pipe Gasket, Bolts, and Nuts: AWWA C110, rubber gasket, carbon-steel bolts and nuts.

G. Couplings: Iron-body sleeve assembly, fabricated to match OD of plain-end, pressure pipes.
   1. Sleeve: ASTM A 126, Class B, gray iron.
   2. Followers: ASTM A 47 malleable iron or ASTM A 536 ductile iron.
   3. Gaskets: Rubber.
   4. Bolts and Nuts: AWWA C111.

5. Finish: Enamel paint.

2.4 DIELECTRIC FITTINGS

A. General: Assembly or fitting with insulating material isolating joined dissimilar metals, to prevent galvanic action and stop corrosion.

B. Description: Combination of copper alloy and ferrous; threaded, solder, plain, and weld-neck end types and matching piping system materials.

C. Insulating Material: Suitable for system fluid, pressure, and temperature.

D. Dielectric Unions: Factory-fabricated, union assembly, for 250-psig minimum working pressure at 180 deg F.

E. Dielectric Flanges: Factory-fabricated, companion-flange assembly, for 150- or 300-psig minimum working pressure as required to suit system pressures.

F. Dielectric Couplings: Galvanized-steel coupling with inert and noncorrosive, thermoplastic lining; threaded ends; and 300-psig minimum working pressure at 225 deg F.

G. Dielectric Nipples: Electroplated steel nipple with inert and noncorrosive, thermoplastic lining; plain, threaded, or grooved ends; and 300-psig minimum working pressure at 225 deg F.

2.5 FLEXIBLE CONNECTORS

A. Braided Hose Flexible Connectors: Stainless steel bellows with woven, flexible, wire-reinforcing protective jacket; 150-psig minimum working pressure and 250 deg F maximum operating temperature. Connectors shall have flanged or threaded-end connections to match equipment connected and shall be capable of 3/4-inch misalignment. Bronze braiding for copper tubing applications and stainless steel braiding for steel pipe applications.

B. Rubber Flexible Connectors: Mason SFU for ¾ to 2-inch NPS or equal by other specified manufacturers; Mason SFDEJ for 2-1/2-inch NPS and larger or equal by other specified manufacturers. Fiber-reinforced EPDM rubber body; capable of handling operating temperatures up to 250 deg F and pressures up to 150 psig. Joint type to match system specification.

C. Flexible Expansion Loops: Stainless steel flexible hose and braid consisting of two flexible sections, two 90 degree elbows and one 180 degree return bend. Pipe connection material and joint type to match system specification, see application section of individual sections. Bronze braiding for copper tubing applications and stainless steel braiding for steel pipe applications. Provide pipe guides as recommended by manufacturer. Loops installed hanging down shall have a drain plug. Units shall be double braided. Movement and/or loop lengths are indicated.

D. Flexible Expansion Loops: Three equal length sections of annular corrugated stainless steel hose and braid, Provide with four 90 degree elbows and support per manufacturer's recommendations. Ends flanged, screwed, welded, sweat, or grooved. Suitable for operating temperatures up to 850 F. Designed for pressure testing to 1.5 times their maximum rated working pressure with a minimum 4 to 1 (burst to working) safety factor. Factory tested using air-underwater and hydrostatic pressure. Manufacturer: Flex-Hose Company.

2.6 MECHANICAL SLEEVE SEALS

A. Description: Modular design, with interlocking EPDM rubber links shaped to continuously fill annular space between pipe and sleeve. Stainless steel connecting bolts and composite pressure plates.

2.7 PIPING SPECIALTIES

A. Sleeves: The following materials are for wall, floor, slab, and roof penetrations:
   1. Steel Sheet Metal: 0.0239-inch minimum thickness, galvanized, round tube closed with welded longitudinal joint.
   2. Steel Pipe: ASTM A 53, Type E, Grade A, Schedule 40, galvanized, plain ends.
   3. Cast Iron: Cast or fabricated "wall pipe" equivalent to ductile-iron pressure pipe, with plain ends and integral waterstop, unless otherwise indicated.
   4. Stack Sleeve Fittings: Manufactured, cast-iron sleeve with integral clamping flange. Include clamping ring and bolts and nuts for membrane flashing.
      a. Underdeck Clamp: Clamping ring with set screws.

B. Escutcheons: Manufactured wall, ceiling, and floor plates; deep-pattern type if required to conceal protruding fittings and sleeves.
   1. ID: Closely fit around pipe, tube, and insulation of insulated piping.
   2. OD: Completely cover opening.
   3. Cast Brass: One piece, with set screw.
      a. Finish: Rough brass.
      b. Finish: Polished chrome-plate.
   4. Cast-Iron Floor Plate: One-piece casting.

2.8 GROUT

A. Nonshrink, Nonmetallic Grout: ASTM C 1107, Grade B.
   1. Characteristics: Post-hardening, volume-adjusting, dry, hydraulic-cement grout, nonstaining, noncorrosive, nongaseous, and recommended for interior and exterior applications.
   2. Design Mix: 5000-psig, 28-day compressive strength.

PART 3 - EXECUTION

3.1 GENERAL MECHANICAL INSTALLATIONS

A. General: Sequence, coordinate, and integrate the various elements of mechanical systems, materials, and equipment. Comply with the following requirements:
   1. Coordinate mechanical systems, equipment, and materials installation with other building components.
   2. Verify all dimensions by field measurements.
   3. Arrange for chases, slots, and openings in other building components during progress of construction, to allow for mechanical installations.
   4. Coordinate the installation of required supporting devices and sleeves to be set in poured-in-place concrete and other structural components, as they are constructed.

5. Sequence, coordinate, and integrate installations of mechanical materials and equipment for efficient flow of the work. Give particular attention to large equipment requiring positioning prior to closing in the building.
6. Where mounting heights are not detailed or dimensioned, install systems, materials, and equipment to provide the maximum headroom possible.
7. Coordinate connection of mechanical systems with exterior underground and overhead utilities and services. Comply with requirements of governing regulations, franchised service companies, and controlling agencies. Provide required connection for each service.
8. Install systems, materials, and equipment to conform with approved submittal data, including coordination drawings, to greatest extent possible. Conform to arrangements indicated by the Contract Documents, recognizing that portions of the work are shown only in diagrammatic form. Where coordination requirements conflict with individual system requirements, refer conflict to the Architect.
9. Install systems, materials, and equipment level and plumb, parallel and perpendicular to other building systems and components, where installed exposed in finished spaces.
10. Install mechanical equipment to facilitate servicing, maintenance, and repair or replacement of equipment components. As much as practical, connect equipment for ease of disconnecting, with minimum of interference with other installations. Extend grease fittings to an accessible location.
11. Install access panel or doors where units are concealed behind finished surfaces. Notify General Contractor on the number, location and size of access panels or doors.
12. Install systems, materials, and equipment giving right-of-way priority to systems required to be installed at a specified slope.
13. Replace all air filters with new filters upon Owner taking occupancy of the building or at a time mutually agreed upon between the Owner and Contractor.
14. Do not install ductwork in elevator machine rooms, electrical and/or communication rooms unless it directly services that room.

B. Locate wall, floor and ceiling fire ratings from architectural drawings for appropriate hourly rating of combination fire/smoke dampers or fire dampers shown on mechanical drawings.

3.2 PIPING SYSTEMS - COMMON REQUIREMENTS

A. General: Install piping as described below, unless piping Sections specify otherwise. Individual Division 23 piping Sections specify unique piping installation requirements.

B. General Locations and Arrangements: Drawing plans, schematics, and diagrams indicate general location and arrangement of piping systems. Indicated locations and arrangements were used to size pipe and calculate friction loss, expansion, pump sizing, and other design considerations. Install piping as indicated, unless deviations to layout are approved on Coordination Drawings.

C. Install piping in concealed locations, unless otherwise indicated and except in equipment rooms and service areas.

D. Install piping indicated to be exposed and piping in equipment rooms and service areas at right angles or parallel to building walls. Diagonal runs are prohibited unless specifically indicated otherwise.

E. Install piping above accessible ceilings to allow sufficient space for ceiling panel removal.

F. Locate groups of pipes parallel to each other, spaced to permit valve servicing.

G. Install piping free of sags and bends.

H. Install fittings for changes in direction and branch connections.

I. Install piping to allow application of insulation plus 1-inch clearance around insulation.

J. Select system components with pressure rating equal to or greater than system operating pressure.

K. Install piping tight to slabs, beams, joists, columns, walls, and other building elements. Allow sufficient space above removable ceiling panels to allow for ceiling panel removal.

L. Install sleeves for pipes passing through concrete and masonry walls, gypsum-board partitions, and concrete floor and roof slabs.

M. Install flexible connectors according to manufacturer's written instructions where indicated and specified in other Division 23 sections.

N. Install couplings according to manufacturer's written instructions.

O. Install Portable Instrument Connections in all piping systems where DDC temperature and/or pressure sensors and thermometers and/or pressure gauges are located.

P. Do not route piping through elevator equipment rooms, unless specifically allowed by local authority.

Q. Do not route piping over electrical panels, transformers, switchgear or other electrical equipment.

R. Install pipe escutcheons for pipe penetrations of concrete and masonry walls, wall board partitions, and suspended ceilings according to the following:
   1. Uninsulated Piping Wall Escutcheons: Cast brass or stamped steel, with set screw.
   2. Uninsulated Piping Floor Plates in Utility Areas: Cast-iron floor plates.
   3. Insulated Piping: Cast brass or stamped steel; with concealed hinge, spring clips, and chrome-plated finish.
   4. Piping in Utility Areas: Cast brass or stamped steel, with set-screw or spring clips.

S. Install sleeves for pipes passing through concrete and masonry walls, gypsum-board partitions, and concrete floor and roof slabs.
   1. Cut sleeves to length for mounting flush with both surfaces.
      a. Exception: Extend sleeves installed in floors of mechanical equipment areas or other wet areas 2 inches above finished floor level. Extend cast-iron sleeve fittings below floor slab as required to secure clamping ring if ring is specified.
   2. Build sleeves into new walls and slabs as work progresses.
   3. Install sleeves large enough to provide 1/4-inch annular clear space between sleeve and pipe or pipe insulation. Use the following sleeve materials:
      a. Steel Pipe Sleeves: For pipes smaller than 6-inch NPS.
      b. Stack Sleeve Fittings: For pipes penetrating floors with membrane waterproofing. Secure flashing between clamping flanges. Install section of cast-iron soil pipe to extend sleeve to 2 inches above finished floor level. Refer to Division 07 Section "Sheet Metal Flashing and Trim" for flashing.
         1) Seal space outside of sleeve fittings with nonshrink, nonmetallic grout.

4. Except for underground wall penetrations, seal annular space between sleeve and pipe or pipe insulation, using elastomeric joint sealants. Use Type S, Grade NS, Class 25, Use O, neutral-curing silicone sealant, unless otherwise indicated.

T. Fire-Barrier Penetrations: Maintain indicated fire rating of walls, partitions, ceilings, and floors at pipe penetrations. Seal pipe penetrations with firestopping materials. Refer to Division 07 Section "Penetration Firestopping" for materials.

U. Verify final equipment locations for roughing-in.

V. Refer to equipment specifications in other Sections of these Specifications for roughing-in requirements.

3.3 PIPING JOINT CONSTRUCTION

A. Join pipe and fittings as follows and as specifically required in individual piping specification Sections:

B. Ream ends of pipes and tubes and remove burrs.

C. Remove scale, slag, dirt, and debris from inside and outside of pipe and fittings before assembly.

D. Soldered Joints: Construct joints according to AWS's "Soldering Manual," Chapter "The Soldering of Pipe and Tube"; or CDA's "Copper Tube Handbook."

E. Threaded Joints: Thread pipe with tapered pipe threads according to ASME B1.20.1. Cut threads full and clean using sharp dies. Ream threaded pipe ends to remove burrs and restore full ID. Join pipe fittings and valves as follows:
1. Note internal length of threads in fittings or valve ends, and proximity of internal seat or wall, to determine how far pipe should be threaded into joint.
2. Apply appropriate tape or thread compound to external pipe threads, unless dry seal threading is specified.
3. Align threads at point of assembly.
4. Tighten joint with wrench. Apply wrench to valve end into which pipe is being threaded.
5. Damaged Threads: Do not use pipe or pipe fittings with threads that are corroded or damaged. Do not use pipe sections that have cracked or open welds.

F. Flanged Joints: Align flange surfaces parallel. Select appropriate gasket material, size, type, and thickness for service application. Install gasket concentrically positioned. Assemble joints by sequencing bolt tightening to make initial contact of flanges and gaskets as flat and parallel as possible. Use suitable lubricants on bolt threads. Tighten bolts gradually and uniformly using torque wrench to recommended torque valves.

3.4 PIPING CONNECTIONS

A. Make connections according to the following, unless otherwise indicated:
1. Install unions, in piping 2-inch NPS and smaller, adjacent to each valve and at final connection to each piece of equipment with 2-inch NPS or smaller threaded pipe connection.
2. Install flanges, in piping 2-1/2-inch NPS and larger, adjacent to flanged valves and at final connection to each piece of equipment with flanged pipe connection.

3. Wet Piping Systems: Install dielectric coupling and nipple fittings to connect piping materials of dissimilar metals.

3.5 EQUIPMENT INSTALLATION - COMMON REQUIREMENTS

A. Install equipment to provide maximum possible headroom, if mounting heights are not indicated.

B. Install equipment according to approved submittal data.

C. Install equipment level and plumb, parallel and perpendicular to other building systems and components in exposed interior spaces, unless otherwise indicated.

D. Install mechanical equipment to facilitate service, maintenance, and repair or replacement of components. Connect equipment for ease of disconnecting, with minimum interference to other installations. Extend grease fittings to accessible locations.

E. Install equipment giving right of way to piping installed at required slope.

3.6 PAINTING AND FINISHING

A. Refer to Division 09 for paint materials, surface preparation, and application of paint.

B. Apply paint to exposed piping, ductwork and supports according to the following, unless otherwise indicated:
1. Interior, Ferrous Supports: Use semigloss, acrylic-enamel finish. Include finish coat over enamel undercoat and primer. Paint not required on interior galvanized supports.
2. Exterior, Ferrous Piping and ductwork: Use semigloss, acrylic-enamel finish. Include two finish coats over rust-inhibitive metal primer.
3. Exterior, Ferrous Supports: Use semigloss, acrylic-enamel finish. Include two finish coats over rust-inhibitive metal primer.

C. Do not paint piping specialties with factory-applied finish.

D. Damage and Touchup: Repair marred and damaged factory-painted finishes with materials and procedures to match original factory finish.

3.7 CONCRETE BASES

A. Construct concrete bases of dimensions indicated, but not less than 4 inches larger in both directions for all floor-supported units. Follow supported equipment manufacturer's setting templates for anchor bolt and tie locations. Concrete and reinforcement as specified in Division 03.

3.8 ERECTION OF METAL SUPPORTS AND ANCHORAGE

A. Cut, fit, and place miscellaneous metal supports accurately in location, alignment, and elevation to support and anchor mechanical materials and equipment.

B. Field Welding: Comply with AWS D1.1, "Structural Welding Code--Steel."

3.9 CUTTING AND PATCHING

A. General: Perform cutting and patching in accordance with Division 01. In addition to the requirements specified in Division 01, the following requirements apply:
   1. Protection of Installed Work: During cutting and patching operations, protect adjacent installations.

B. Perform cutting, fitting, and patching of mechanical equipment and materials required to:
   1. Uncover Work to provide for installation of ill-timed Work.
   2. Remove and replace defective Work.
   3. Remove and replace Work not conforming to requirements of the Contract Documents.
   4. Remove samples of installed Work as specified for testing.
   5. Install equipment and materials in existing structures.
   6. Upon written instructions from the Architect, uncover and restore Work to provide for Architect/Engineer observation of concealed Work.

C. Cut, remove and legally dispose off-site of selected mechanical equipment, components, and materials, including but not limited to removal of mechanical piping, heating units, plumbing fixtures and trim, and other mechanical items made obsolete by the new Work.

D. Protect the structure, furnishings, finishes, and adjacent materials not indicated or scheduled to be removed.

E. Cut, channel, chase, and drill floors, walls, partitions, ceilings, and other surfaces necessary for mechanical installations. Perform cutting by skilled mechanics of trades involved.

F. Repair cut surfaces to match adjacent surfaces.

3.10 GROUTING

A. Install nonmetallic, nonshrink, grout for mechanical equipment base bearing surfaces, pump and other equipment base plates, and anchors. Mix grout according to manufacturer's written instructions.

B. Clean surfaces that will come into contact with grout.

C. Provide forms as required for placement of grout.

D. Avoid air entrapment during placing of grout.

E. Place grout, completely filling equipment bases.

F. Place grout on concrete bases to provide smooth bearing surface for equipment.

G. Place grout around anchors.

H. Cure placed grout according to manufacturer's written instructions.

END OF SECTION 230500

SECTION 230529 - HANGERS AND SUPPORTS FOR HVAC PIPING AND EQUIPMENT

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 pipe hangers and supports.
2. Trapeze pipe hangers.
3. Thermal-hanger shield inserts.
4. Fastener systems.
5. Pipe stands.
6. Equipment stands.
7. Equipment supports.

B. Related Requirements:

1. Section 055000 "Metal Fabrications" for structural-steel shapes and plates for trapeze hangers for pipe and equipment supports.
2. Section 230516 "Expansion Fittings and Loops for HVAC Piping" for pipe guides and anchors.
3. Section 230548 "Vibration and Seismic Controls for HVAC" for vibration isolation devices.
4. Section 233113 "Metal Ducts" for duct hangers and supports.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product.

1.4 INFORMATIONAL SUBMITTALS

1.5 QUALITY ASSURANCE

A. Structural-Steel Welding Qualifications: Qualify procedures and personnel according to AWS D1.1/D1.1M, "Structural Welding Code - Steel."

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Delegated Design: Engage a qualified professional engineer, as defined in Section 014000 "Quality Requirements," to design trapeze pipe hangers and equipment supports.

2.2 METAL PIPE HANGERS AND SUPPORTS

A. Carbon-Steel Pipe Hangers and Supports:

1. Description: MSS SP-58, Types 1 through 58, factory-fabricated components.
2. Galvanized Metallic Coatings: Pregalvanized, hot-dip galvanized, or electro-galvanized.
3. Nonmetallic Coatings: Plastic coated, or epoxy powder-coated.
4. Padded Hangers: Hanger with fiberglass or other pipe insulation pad or cushion to support bearing surface of piping.
5. Hanger Rods: Continuous-thread rod, nuts, and washer made of carbon steel .

B. Stainless Steel Pipe Hangers and Supports:

1. Description: MSS SP-58, Types 1 through 58, factory-fabricated components.
2. Padded Hangers: Hanger with fiberglass or other pipe insulation pad or cushion to support bearing surface of piping.
3. Hanger Rods: Continuous-thread rod, nuts, and washer made of stainless steel .

2.3 TRAPEZE PIPE HANGERS

A. Description: MSS SP-58, Type 59, shop- or field-fabricated pipe-support assembly made from structural carbon-steel shapes with MSS SP-58 carbon-steel hanger rods, nuts, saddles, and U-bolts.

2.4 THERMAL-HANGER SHIELD INSERTS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Carpenter & Paterson, Inc.
2. National Pipe Hanger Corporation.
3. Rilco Manufacturing Co., Inc.

B. Insulation-Insert Material for Cold Piping: ASTM C552, Type II cellular glass with 100-psi minimum compressive strength and vapor barrier.

C. Insulation-Insert Material for Hot Piping: ASTM C552, Type II cellular glass with 100-psi minimum compressive strength.

D. For Trapeze or Clamped Systems: Insert and shield shall cover entire circumference of pipe.

E. For Clevis or Band Hangers: Insert and shield shall cover lower 180 degrees of pipe.

F. Insert Length: Extend 2 inches beyond sheet metal shield for piping operating below ambient air temperature.

2.5 FASTENER SYSTEMS

A. Mechanical-Expansion Anchors: Insert-wedge-type anchors for use in hardened portland cement concrete; with pull-out, tension, and shear capacities appropriate for supported loads and building materials where used.

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
   a. Cooper B-line; brand of Eaton, Electrical Sector.
   b. Empire Industries, Inc.
   c. Hilti, Inc.
2. Indoor Applications: Zinc-coated or stainless steel.
3. Outdoor Applications: Stainless steel.

2.6 PIPE STANDS

A. General Requirements for Pipe Stands: Shop- or field-fabricated assemblies made of manufactured corrosion-resistant components to support roof-mounted piping.

B. Compact Pipe Stand:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
   a. MIRO Industries.
   b. PHP Systems/Design.
2. Description: Single base unit with integral-rod roller, pipe clamps, or V-shaped cradle to support pipe, for roof installation without membrane penetration.
3. Base: Single, vulcanized rubber, molded polypropylene, or polycarbonate.
4. Hardware: Galvanized steel or polycarbonate.
5. Accessories: Protection pads.

2.7 EQUIPMENT SUPPORTS

A. Description: Welded, shop- or field-fabricated equipment support made from structural carbon-steel shapes.

2.8 OUTDOOR EQUIPMENT STANDS

A. Manufacturers: Subject to compliance with requirements, provide products by the following:

1. MIRO Industries.
2. Description: Individual foot supports with elevated adjustable channel cross bars and clamps/fasteners/bolts for ground or roof supported outdoor equipment components, without roof membrane penetration, in a pre-fabricated system that can be modularly-assembled on site.
3. Foot Material: Rubber or polypropylene.
4. Rails Material: Hot dip galvanized carbon steel.

5. Wind/Sliding Load Resistance: Up to 100 mph <**Insert value>** minimum.

2.9 MATERIALS

A. Aluminum: ASTM B221.

B. Carbon Steel: ASTM A1011/A1011M.

C. Structural Steel: ASTM A36/A36M, carbon-steel plates, shapes, and bars; galvanized.

D. Stainless Steel: ASTM A240/A240M.

E. Threaded Rods: Continuously threaded. Zinc-plated or galvanized steel for indoor applications and stainless steel for outdoor applications. Mating nuts and washers of similar materials as rods.

F. Grout: ASTM C1107/C1107M, factory-mixed and -packaged, dry, hydraulic-cement, nonshrink and nonmetallic grout; suitable for interior and exterior applications.

1. Properties: Nonstaining, noncorrosive, and nongaseous.
2. Design Mix: 5000-psi, 28-day compressive strength.

PART 3 - EXECUTION

3.1 APPLICATION

A. Comply with requirements in Section 078413 "Penetration Firestopping" for firestopping materials and installation for penetrations through fire-rated walls, ceilings, and assemblies.

B. 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 .

3.2 HANGER AND SUPPORT INSTALLATION

A. Metal Pipe-Hanger Installation: Comply with MSS SP-58. Install hangers, supports, clamps, and attachments as required to properly support piping from the building structure.

B. Metal Trapeze Pipe-Hanger Installation: Comply with MSS SP-58. Arrange for grouping of parallel runs of horizontal piping, and support together on field-fabricated trapeze pipe hangers.

1. Pipes of Various Sizes: Support together and space trapezes for smallest pipe size or install intermediate supports for smaller diameter pipes as specified for individual pipe hangers.
2. Field fabricate from ASTM A36/A36M, carbon-steel shapes selected for loads being supported. Weld steel according to AWS D1.1/D1.1M.

C. Framing System Installation: Arrange for grouping of parallel runs of piping, and support together on field-assembled strut systems.

D. Thermal-Hanger Shield Installation: Install in pipe hanger or shield for insulated piping.

E. Fastener System Installation:

1. Install mechanical-expansion anchors in concrete after concrete is placed and completely cured. Install fasteners according to manufacturer's written instructions.

F. Pipe Stand Installation:

1. Pipe Stand Types except Curb-Mounted Type: Assemble components and mount on smooth roof surface. Do not penetrate roof membrane.
2. Curb-Mounted-Type Pipe Stands: Assemble components or fabricate pipe stand and mount on permanent, stationary roof curb. See Section 077200 "Roof Accessories" for curbs.

G. Install hangers and supports complete with necessary attachments, inserts, bolts, rods, nuts, washers, and other accessories.

H. Equipment Support Installation: Fabricate from welded-structural-steel shapes.

I. Install hangers and supports to allow controlled thermal and seismic movement of piping systems, to permit freedom of movement between pipe anchors, and to facilitate action of expansion joints, expansion loops, expansion bends, and similar units.

J. Install lateral bracing with pipe hangers and supports to prevent swaying.

K. Install building attachments within concrete slabs or attach to structural steel. Install additional attachments at concentrated loads, including valves, flanges, and strainers, NPS 2-1/2 and larger and at changes in direction of piping. Install concrete inserts before concrete is placed; fasten inserts to forms and install reinforcing bars through openings at top of inserts.

L. Load Distribution: Install hangers and supports so that piping live and dead loads and stresses from movement will not be transmitted to connected equipment.

M. Pipe Slopes: Install hangers and supports to provide indicated pipe slopes and to not exceed maximum pipe deflections allowed by ASME B31.9 for building services piping.

N. Insulated Piping:

1. Attach clamps and spacers to piping.
   a. Piping Operating above Ambient Air Temperature: Clamp may project through insulation.
   b. Piping Operating below Ambient Air Temperature: Use thermal-hanger shield insert with clamp sized to match OD of insert.
   c. Do not exceed pipe stress limits allowed by ASME B31.9 for building services piping.
2. Install MSS SP-58, Type 39, protection saddles if insulation without vapor barrier is indicated. Fill interior voids with insulation that matches adjoining insulation.
   a. Option: Thermal-hanger shield inserts may be used. Include steel weight-distribution plate for pipe NPS 4 and larger if pipe is installed on rollers.
3. Install MSS SP-58, Type 40, protective shields on cold piping with vapor barrier. Shields shall span an arc of 180 degrees.
   a. Option: Thermal-hanger shield inserts may be used. Include steel weight-distribution plate for pipe NPS 4 and larger if pipe is installed on rollers.

4. Shield Dimensions for Pipe: Not less than the following:
   a. NPS 1/4 to NPS 3-1/2: 12 inches long and 0.048 inch thick.
   b. NPS 4: 12 inches long and 0.06 inch thick.
   c. NPS 5 and NPS 6: 18 inches long and 0.06 inch thick.
   d. NPS 8 to NPS 14: 24 inches long and 0.075 inch thick.
   e. NPS 16 to NPS 24: 24 inches long and 0.105 inch thick.
5. Pipes NPS 8 and Larger: Include wood or reinforced calcium-silicate-insulation inserts of length at least as long as protective shield.
6. Thermal-Hanger Shields: Install with insulation same thickness as piping insulation.

3.3 EQUIPMENT SUPPORTS

A. Fabricate structural-steel stands to suspend equipment from structure overhead or to support equipment above floor.

B. Grouting: Place grout under supports for equipment and make bearing surface smooth.

C. Provide lateral bracing, to prevent swaying, for equipment supports.

3.4 METAL FABRICATIONS

A. Cut, drill, and fit miscellaneous metal fabrications for trapeze pipe hangers and equipment supports.

B. Fit exposed connections together to form hairline joints. Field weld connections that cannot be shop welded because of shipping size limitations.

C. Field Welding: Comply with AWS D1.1/D1.1M procedures for shielded, metal arc welding; appearance and quality of welds; and methods used in correcting welding work; and with the following:

1. Use materials and methods that minimize distortion and develop strength and corrosion resistance of base metals.
2. Obtain fusion without undercut or overlap.
3. Remove welding flux immediately.
4. Finish welds at exposed connections so no roughness shows after finishing and so contours of welded surfaces match adjacent contours.

3.5 ADJUSTING

A. Hanger Adjustments: Adjust hangers to distribute loads equally on attachments and to achieve indicated slope of pipe.

B. Trim excess length of continuous-thread hanger and support rods to 1-1/2 inches .

3.6 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 a minimum dry film thickness of 2.0 mils.

B. Touchup: Comply with requirements in Section 099113 "Exterior Painting" 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 A780/A780M.

3.7 HANGER AND SUPPORT SCHEDULE

A. Specific hanger and support requirements are in Sections specifying piping systems and equipment.

B. Comply with MSS SP-58 for pipe-hanger selections and applications that are not specified in piping system Sections.

C. Use hangers and supports with galvanized metallic coatings for piping and equipment that will not have field-applied finish.

D. Use nonmetallic coatings on attachments for electrolytic protection where attachments are in direct contact with copper tubing.

E. Use carbon-steel pipe hangers and supports metal trapeze pipe hangers and attachments for general service applications.

F. Use stainless steel pipe hangers and or corrosion-resistant attachments for hostile environment applications.

G. Use padded hangers for piping that is subject to scratching.

H. Use thermal-hanger shield inserts for insulated piping and tubing.

I. Horizontal-Piping Hangers and Supports: Unless otherwise indicated and except as specified in piping system Sections, install the following types:

1. Adjustable, Steel Clevis Hangers (MSS Type 1): For suspension of noninsulated or insulated, stationary pipes NPS 1/2 to NPS 30.
2. Steel Pipe Clamps (MSS Type 4): For suspension of cold and hot pipes NPS 1/2 to NPS 24 if little or no insulation is required.
3. Pipe Hangers (MSS Type 5): For suspension of pipes NPS 1/2 to NPS 4, to allow off-center closure for hanger installation before pipe erection.
4. Adjustable, Steel Band Hangers (MSS Type 7): For suspension of noninsulated, stationary pipes NPS 1/2 to NPS 8.
5. U-Bolts (MSS Type 24): For support of heavy pipes NPS 1/2 to NPS 30.
6. Pipe Saddle Supports (MSS Type 36): For support of pipes NPS 4 to NPS 36, with steel-pipe base stanchion support and cast-iron floor flange or carbon-steel plate.
7. Pipe Stanchion Saddles (MSS Type 37): For support of pipes NPS 4 to NPS 36, with steel-pipe base stanchion support and cast-iron floor flange or carbon-steel plate, and with U-bolt to retain pipe.
8. Adjustable Pipe Saddle Supports (MSS Type 38): For stanchion-type support for pipes NPS 2-1/2 to NPS 36 if vertical adjustment is required, with steel-pipe base stanchion support and cast-iron floor flange.

9. Single-Pipe Rolls (MSS Type 41): For suspension of pipes NPS 1 to NPS 30, from two rods if longitudinal movement caused by expansion and contraction might occur.
10. Adjustable Roller Hangers (MSS Type 43): For suspension of pipes NPS 2-1/2 to NPS 24, from single rod if horizontal movement caused by expansion and contraction might occur.
11. Complete Pipe Rolls (MSS Type 44): For support of pipes NPS 2 to NPS 42 if longitudinal movement caused by expansion and contraction might occur but vertical adjustment is unnecessary.

J. Vertical-Piping Clamps: Unless otherwise indicated and except as specified in piping system Sections, install the following types:

1. Extension Pipe or Riser Clamps (MSS Type 8): For support of pipe risers NPS 3/4 to NPS 24.

K. Hanger-Rod Attachments: Unless otherwise indicated and except as specified in piping system Sections, install the following types:

1. Steel Turnbuckles (MSS Type 13): For adjustment up to 6 inches for heavy loads.
2. Steel Clevises (MSS Type 14): For 120 to 450 deg F piping installations.
3. Malleable-Iron Sockets (MSS Type 16): For attaching hanger rods to various types of building attachments.
4. Steel Weldless Eye Nuts (MSS Type 17): For 120 to 450 deg F piping installations.

L. Building Attachments: Unless otherwise indicated and except as specified in piping system Sections, install the following types:

1. Steel or Malleable Concrete Inserts (MSS Type 18): For upper attachment to suspend pipe hangers from concrete ceiling.
2. Center-Beam Clamps (MSS Type 21): For attaching to center of bottom flange of beams.
3. Welded Beam Attachments (MSS Type 22): For attaching to bottom of beams if loads are considerable and rod sizes are large.
4. Top-Beam Clamps (MSS Type 25): For top of beams if hanger rod is required tangent to flange edge.
5. Welded-Steel Brackets: For support of pipes from below or for suspending from above by using clip and rod. Use one of the following for indicated loads:
    a. Light (MSS Type 31): 750 lb.
    b. Medium (MSS Type 32): 1500 lb.
    c. Heavy (MSS Type 33): 3000 lb.

M. Saddles and Shields: Unless otherwise indicated and except as specified in piping system Sections, install the following types:

1. Protection Shields (MSS Type 40): Of length recommended in writing by manufacturer to prevent crushing insulation.
2. Thermal-Hanger Shield Inserts: For supporting insulated pipe.

N. Spring Hangers and Supports: Unless otherwise indicated and except as specified in piping system Sections, install the following types:

1. Spring-Cushion Roll Hangers (MSS Type 49): For equipping Type 41, roll hanger with springs.
2. Variable-Spring Hangers (MSS Type 51): Preset to indicated load and limit variability factor to 25 percent to allow expansion and contraction of piping system from hanger.

3. Variable-Spring Trapeze Hangers (MSS Type 53): Preset to indicated load and limit variability factor to 25 percent to allow expansion and contraction of piping system from trapeze support.

O. Comply with MSS SP-58 for trapeze pipe-hanger selections and applications that are not specified in piping system Sections.

P. Comply with MFMA-103 for metal framing system selections and applications that are not specified in piping system Sections.

Q. Use mechanical-expansion anchors instead of building attachments where required in concrete construction.

END OF SECTION 230529

SECTION 230548 - VIBRATION AND SEISMIC CONTROLS FOR HVAC

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:
   1. This Section includes vibration isolators, vibration isolation bases, vibration isolation roof curbs.
   2. This Section includes seismic restraint requirements for suspended pipes, ducts, and mechanical equipment with and without vibration isolation.

1.2 DEFINITIONS

A. IBC: International Building Code.

B. ICC-ES: ICC-Evaluation Service.

C. OSHPD: Office of Statewide Health Planning & Development (for the State of California).

D. SEI/ASCE 7: American Society of Civil Engineers; Minimum Design Loads for Buildings and Other Structures.

1.3 ACTION SUBMITTALS

A. General: See Section 23 05 00 for general requirements of Product Data, Shop Drawings, Reports and Certificates, and Operation and Maintenance data submittals.
   1. Include rated load, rated deflection, and overload capacity for each vibration isolation device.
   2. Illustrate and indicate style, material, strength, fastening provision, and finish for each type and size of seismic-restraint component used.
      a. Tabulate types and sizes of seismic restraints, complete with report numbers and rated strength in tension and shear as evaluated by OSHPD.
      b. Annotate to indicate application of each product submitted and compliance with requirements.
   3. Interlocking Snubbers: Include ratings for horizontal, vertical, and combined loads.

B. Product Data: Provide submittals of the following:
   1. Vibration isolators.
   2. Anchor Bolts, Washers, and Bushings
   3. Restrained Vibration Isolation Roof Curb Rails.
   4. Seismic Restraint Devices
   5. Vibration Isolation Equipment Bases.

C. Shop Drawings: In addition to requirements set forth in Section 23 05 00, shop drawings for the listed systems shall also include detailing of riser supports, vibration isolation base details, seismic-restraint systems, and suspended elements. Provide submittals of the following piping systems within the entire building:
   1. For Vibration Isolated Elements:

a. Riser Supports: Include riser diagrams and calculations showing anticipated expansion and contraction at each support point, initial and final loads on building structure, spring deflection changes, and seismic loads. Include certification that riser system has been examined for excessive stress and that none will exist.
b. Vibration Isolation Base Details: Detail fabrication, including anchorages and attachments to structure and to supported equipment. Include auxiliary motor slides and rails, base weights, equipment static loads, power transmission, component misalignment, and cantilever loads.
c. Seismic-Restraint Details: Detail fabrication and attachment of seismic restraints and snubbers. Show anchorage details and indicate layout, quantity, diameter, anchor depth of embedment and, if mounted on housekeeping pads, indicate anchor minimum edge distance requirements.
d. Coordinate seismic-restraint and vibration isolation details with wind-restraint details required for equipment mounted outdoors. Comply with requirements in other Division 22 Sections for equipment mounted outdoors.

2. For Suspended Elements: Prior to installation, submit seismic restraint manufacturer's layout of all required bracing locations on contractor shop drawings. Layout to be signed and sealed by a qualified professional engineer. Layout to include manufacturer's bracing legend indicating:
a. Type of braced element.
b. Seismic restraint hardware call-out.
c. Minimum required vertical support rod diameter.
d. Maximum allowable brace spacing.
e. Brace reaction at full design load.
f. Minimum required seismic restraint anchorage.
g. Installation detail drawing number.
h. Anchorage installation detail drawing number.

D. Design Calculations: For vibration isolation and seismic-restraint details indicated to comply with performance requirements and design criteria, including analysis data signed and sealed by the qualified professional engineer responsible for their preparation.
1. Design Calculations: Calculate static and dynamic loading due to equipment weight and operation, seismic and wind forces required to select vibration isolators, seismic and wind restraints, and for designing vibration isolation bases.
a. Coordinate design calculations with wind load calculations required for equipment mounted outdoors. Comply with requirements in other Division 23 Sections for equipment mounted outdoors.
b. To support selection and arrangement of seismic and wind restraints. Include calculations of combined tensile and shear loads.
c. Pre-approval and Evaluation Documentation: By OSHPD, showing maximum ratings of restraint items and the basis for approval (tests or calculations).

1.4 INFORMATIONAL SUBMITTALS

A. Qualification Data: For professional engineer.

B. Welding certificates.

1.5 QUALITY ASSURANCE

A. Professional Engineer Qualifications: A professional engineer who is legally qualified to practice in the jurisdiction where the Project is located and who is experienced in providing engineering services of the kind indicated. Engineering services are defined as those performed for installations of vibration isolation bases and seismic restraints that are similar to those indicated for this Project in material, design, and extent. This professional engineer shall develop a Quality Assurance Plan.

B. Testing Agency Qualifications (Owner will engage): An independent agency, with the experience and capability to conduct the testing indicated, that is a nationally recognized testing laboratory (NRTL) as defined by OSHA in 29 CFR 1910.7, and that is acceptable to authorities having jurisdiction.

C. Comply with seismic-restraint requirements in the IBC unless requirements in this Section are more stringent.

D. Welding: Qualify procedures and personnel according to AWS D1.1/D1.1M, "Structural Welding Code - Steel."

E. Any device that provides seismic-restraint devices shall have horizontal and vertical load testing and analysis and shall bear anchorage preapproval OPA number from OSHPD, showing maximum seismic-restraint ratings. If preapproved ratings are not available, submittals based on independent testing are preferred. Calculations (including combining shear and tensile loads) to support seismic-restraint designs must be signed and sealed by a qualified professional engineer.

1.6 FIELD QUALITY CONTROL

A. Provide a Quality Assurance Plan that complies with SEI/ASCE 7, Appendix 11A for the following mechanical systems or equipment.
   1. Flammable, combustible, or highly toxic piping systems and their associated mechanical units in Seismic Design Categories C, D, E, or F.
   2. Installation of HVAC ductwork that will contain hazardous materials in Seismic Design Categories C, D, E, or F.
   3. Installation of vibration isolation systems where the maximum clearance (air gap) between the equipment support frame and restraint is less than or equal to 1/4-inch.
   4. Installation of seismic restraint systems for Seismic Use Group II and III.

B. The Contractor shall submit a written Contractor’s statement of responsibility to the regulatory authority having jurisdiction and the Owner prior to the commencement of work. The Contractor’s statement of responsibility shall contain the following:
   1. Acknowledgement of awareness of the special requirements contained in the Quality Assurance Plan.
   2. Acknowledgement that control will be exercised to obtain conformance with the design documents approved by the authority having jurisdiction.
   3. Procedure for exercising control within the Contractor’s organization, the method and frequency of reporting, and the distribution of the reports.
   4. Identification and qualifications of the person exercising such control and their position in the organization.

C. The Owner shall employ a special inspector to observe the construction of all seismic systems in accordance with the Quality Assurance Plan.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Design seismic and vibration isolation systems, including drawings, calculations, and material specifications prepared according to current IBC and SEI/ASCE 7 for obtaining approval from authorities having jurisdiction. Seismic and vibration systems shall be selected for the approved Project equipment, piping and ductwork components.

B. Wind-Restraint Loading:
1. Basic Wind Speed: 98 MPH.
2. Minimum 10 lb/sq. ft.multiplied by the maximum area of the HVAC component projected on a vertical plane that is normal to the wind direction, and 45 degrees either side of normal.

C. Seismic-Restraint Loading:
1. Site Class as Defined in the IBC: **D**.
2. Assigned Seismic Use Group or Building Risk Category as Defined in the IBC: **II**.
   a. Component Importance Factor: 1.5 for all life safety systems and equipment required to function after an earthquake and all mechanical equipment that would impede egress from building. All systems and equipment that contain hazardous content. All other systems, equipment, piping and ductwork shall be Ip=1.0.
3. Component Response Modification Factor (Rp) and Component Amplification Factor (Ap): From SEI/ASCE 7 (2005), Table 13.6-1, Seismic Coefficients for Mechanical and Electrical Components.
4. Seismic Design Category: **D**.

2.2 MANUFACTURERS

A. Vibration Isolation: Subject to compliance with requirements, provide products by the manufacturers specified.
1. Amber/Booth Company, Inc.
2. Kinetics Noise Control, Inc.
3. Korfund/Vibration Mountings and Controls, Inc.
4. Mason Industries, Inc.

B. Seismic Restraint for Suspended Elements: Subject to compliance with requirements, provide products by the manufacturers specified.
1. International Seismic Application Technology (ISAT).
2. Kinetics Noise Control, Inc.
3. Korfund/Vibration Mountings and Controls, Inc.
4. Mason Industries, Inc.Tolco.

2.3 VIBRATION ISOLATORS

A. Type V-1, Elastomeric Isolator Pads: Oil- and water-resistant neoprene or natural rubber, molded with a nonslip, ribbed or waffle-pattern steel load distribution plates of sufficient stiffness for uniform loading over pad area, factory cut to sizes that match requirements of supported equipment.

1. Basis of Design: Mason Models W and WM.
2. Material: Standard neoprene.

3. Durometer Rating: 40.
4. Thickness: 5/16 inch thick.
5. Isolator shall be loaded to limit surface pressure to a maximum of 50 psi.

B. Type V-2, Elastomeric Isolator Pads: Oil- and water-resistant neoprene or natural rubbermolded with a nonslip, ribbed or waffle-pattern steel load distribution plates of sufficient stiffness for uniform loading over pad area factory cut to sizes that match requirements of supported equipment.
1. Basis of Design: Mason Model Super W and Super WM.
2. Material: Standard neoprene.
3. Durometer Rating: 50.
4. Thickness: 3/4-inch thick.
5. Isolator shall be loaded to limit surface pressure to a maximum of 50 psi.

C. Type V-9, Spring Hangers: Combination coil-spring and elastomeric-insert hanger with spring and insert in compression.
1. Basis of Design: Mason Model 30N.
2. Frame: Steel, fabricated for connection to threaded hanger rods and to allow for a maximum of 30 degrees of angular hanger-rod misalignment without binding or reducing isolation efficiency.
3. Outside Spring Diameter: Not less than 80 percent of the compressed height of the spring at rated load.
4. Minimum Additional Travel: 50 percent of the required deflection at rated load.
5. Overload Capacity: Support 200 percent of rated load, fully compressed, without deformation or failure.
6. Elastomeric Elements: Molded, oil-resistant rubber or neoprene. Steel-washer-reinforced cup to support spring and bushing projecting through bottom of frame.
7. Self-centering hanger rod cap to ensure concentricity between hanger rod and support spring coil.

D. Type V-10, Spring Hangers with Vertical-Limit Stop: Combination coil-spring and elastomeric-insert hanger with spring and insert in compression and with a vertical-limit stop and deflection scale.
1. Basis of Design: Mason Model PC30N.
2. Frame: Steel, fabricated for connection to threaded hanger rods and to allow for a maximum of 30 degrees of angular hanger-rod misalignment without binding or reducing isolation efficiency.
3. Outside Spring Diameter: Not less than 80 percent of the compressed height of the spring at rated load.
4. Minimum Additional Travel: 50 percent of the required deflection at rated load.
5. Overload Capacity: Support 200 percent of rated load, fully compressed, without deformation or failure.
6. Elastomeric Elements: Molded, oil-resistant rubber or neoprene. Steel-washer-reinforced cup to support spring and bushing projecting through bottom of frame.
7. Adjustable Vertical Stop: Steel washer encapsulated in a molded neoprene rebound washer on lower threaded rod.
8. Self-centering hanger rod cap to ensure concentricity between hanger rod and support spring coil.

E. Type TR-1, Thrust Restraint: Combination coil spring and elastomeric insert with spring and insert in compression and with a load stop. Include rod and angle-iron brackets for attaching to equipment.
1. Basis of Design: Mason Models WBI and WBD.
2. Frame: Steel, fabricated for connection to threaded rods.
3. Outside Spring Diameter: Not less than 80 percent of the compressed height of the spring at rated load.
4. Minimum Additional Travel: 50 percent of the required deflection at rated load.

5. Overload Capacity: Support 200 percent of rated load, fully compressed, without deformation or failure.
6. Elastomeric Element: Molded, oil-resistant rubber or neoprene.
7. Coil Spring: Factory set and field adjustable for a maximum of 1/4-inch movement at start and stop.

F. Pipe Riser Resilient Support: All-directional, acoustical pipe anchor consisting of 2 steel tubes separated by a minimum of 1/2-inch- thick, 60 durometer neoprene. Include steel and neoprene vertical-limit stops arranged to prevent vertical travel in both directions. Design support for a maximum load on the isolation material of 500 psi and for equal resistance in all directions.

1. Basis of Design: Mason Model ADA.

G. Resilient Pipe Guides: Telescopic arrangement of 2 steel tubes separated by a minimum of 1/2-inch- thick, 60-durometer neoprene. Factory set guide height with a shear pin to allow vertical motion due to pipe expansion and contraction. Shear pin shall be removable and reinsertable to allow for selection of pipe movement. Guides shall be capable of motion to meet location requirements.
1. Basis of Design: Mason Model VSG.

2.4 ANCHOR BOLTS, WASHERS, AND BUSHINGS

A. Resilient Isolation Washers and Bushings: 1-piece, molded, bridge-bearing neoprene complying with AASHTO M 251 and having a durometer rating of 50 with a flat washer face.
1. Basis of Design: Mason Model HG.
2. Bushings for Floor-Mounted Equipment Anchor Bolts: Neoprene bushings designed for rigid equipment mountings, and matched to type and size of anchor bolts and studs.
3. Bushing Assemblies for Wall-Mounted Equipment Anchorage: Assemblies of neoprene elements and steel sleeves designed for rigid equipment mountings, and matched to type and size of attachment devices used.

B. Mechanical Anchor Bolts: Drilled-in and stud-wedge or female-wedge type in zinc-coated steel for interior applications and stainless steel for exterior applications. Select anchor bolts with strength required for anchor and as tested according to ASTM E 488. Minimum length of eight times diameter.
1. Basis of Design: Hilti Kwik Bolt TZ Mechanical Anchor for seismic restraints.
2. Basis of Design: Hilti Undercut HDA anchors for direct attachment to equipment 10 hp and greater.

2.5 SEISMIC-RESTRAINT DEVICES

A. General Requirements for Restraint Components: Rated strengths, features, and applications shall be as defined in OSHPD pre-approval.
1. Structural Safety Factor: Allowable strength in tension, shear, and pullout force of components shall be at least four times the maximum seismic forces to which they will be subjected.

B. Type S-1, Seismic Snubbers: Factory fabricated using welded structural-steel shapes and plates, anchor bolts, and replaceable resilient isolation washers and bushings.
1. Basis of Design: Mason Model Z-1011.
2. Anchor bolts for attaching to concrete shall be seismic-rated, drill-in, and female-wedge or stud-wedge type.

3. Resilient Isolation Washers and Bushings: 1-piece, molded, bridge-bearing neoprene complying with AASHTO M 251 and having a durometer rating of 50.

C. Type S-2, Suspended Elements:
1. Design Requirements: Seismic restraint hardware to be furnished in manufacturer's pre-assembled "kits" labeled for installer cross reference with manufacturer's layout performed on contractor shop drawings. Kits to be labeled as to "kit number," "trade" and "floor." Kits to include:
a. All required seismic bracketry correctly sized for attachment to vertical support rods.
b. Rod stiffeners as required based on rod diameter and length.
c. Correct anchorage hardware for connection to concrete deck, structural steel, or wood structural members.
d. Complete installation instructions.
2. Rigid seismic restraint brace arm assemblies: Designed for strut nut attachment to minimum 12 gage steel channel with pregalvanized zinc finish per ASTM A525, solid, punched or short slot per engineering calculations.
a. Basis of Design: Pre-engineered brackets with OSHPD pre-approval. Hinged seismic brackets.
b. Assembly: Brackets to be provided from manufacturer with integral 1/2" hex bolts and strut nuts.
3. Cable seismic restraint brace arm assemblies: Minimum 7 x 19 pre-stretched galvanized steel aircraft cable appropriately sized for the system load.
a. Basis of Design: Pre engineered brackets with OSHPD pre-approval.
b. Design Requirements: Hinged seismic brackets.
c. Assembly: Brackets factory pre-tied to made-to-length aircraft cable, with integral method for length adjustment by installer.
4. Cast-In Place Deck Inserts: For vertical supports and seismic restraint anchorage.
a. Basis of Design: Pre-engineered inserts with OSHPD pre-approval.
b. Design Requirements: For form pour slabs, for metal decks with concrete, internally threaded to accept threaded rod diameters, with an OSHPD approval or other enforcement agency approval. Coordinate installation locations with manufacturer's lay out of seismic restraint locations on contractor's shop drawings.

2.6 FACTORY FINISHES

A. Finish: Manufacturer's standard paint applied to factory-assembled and -tested equipment before shipping.
1. Epoxy Powder coating or electro-galvanized isolation on springs and housings. Zinc plate all bolts, nuts and washers.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine areas and equipment to receive vibration isolation and seismic and wind-control devices for compliance with requirements for installation tolerances and other conditions affecting performance.

B. Examine roughing-in of reinforcement and cast-in-place anchors to verify actual locations before installation.

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

3.2 APPLICATIONS

A. Multiple Pipe Supports: Secure pipes to trapeze member with clamps approved for application by OSHPD.

B. Hanger Rod Stiffeners: Install hanger rod stiffeners where required to prevent buckling of hanger rods due to seismic forces.

C. Strength of Support and Seismic-Restraint Assemblies: Select sizes of components so strength will be adequate to carry present and future static and seismic loads within specified loading limits.

3.3 VIBRATION CONTROL AND SEISMIC-RESTRAINT DEVICE INSTALLATION

A. Coordinate the location of embedded connection hardware with supported equipment attachment and mounting points and with requirements for concrete reinforcement and formwork specified in Division 03.

B. Comply with requirements in Division 07 Section “Roof Accessories” for installation of roof curbs, equipment supports, and roof penetrations.

C. Installation of vibration isolators must not cause any change of position of equipment, piping, or ductwork resulting in stresses or misalignment.

D. Equipment Restraints:
1. Install seismic snubbers on HVAC equipment mounted on vibration isolators. Locate snubbers as close as possible to vibration isolators and bolt to equipment base and supporting structure
2. Install resilient bolt isolation washers on equipment anchor bolts where clearance between anchor and adjacent surface exceeds 0.125 inch.
3. Install seismic-restraint devices using methods approved by an agency acceptable to authorities having jurisdiction that provides required submittals for component.

E. Piping Restraints:
1. Comply with requirements in MSS SP-127.
2. Space lateral supports a maximum of 40 feet o.c., and longitudinal supports a maximum of 80 feet o.c.
3. Brace a change of direction longer than 12 feet.

F. Ductwork Restraints:

1. Comply with requirements of SMACNA “Seismic Restraint Manual Guidelines for Mechanical Systems.”
2. Use Seismic Hazard Level A.

G. Install seismic-restraint devices using methods approved by an agency acceptable to authorities having jurisdiction that provides required submittals for component.

H. Install bushing assemblies for anchor bolts for floor-mounted equipment, arranged to provide resilient media between anchor bolt and mounting hole in concrete base.

I. Install bushing assemblies for mounting bolts for wall-mounted equipment, arranged to provide resilient media where equipment or equipment-mounting channels are attached to wall.

J. Attachments to Structure:
1. Install cables so they do not bend across edges of adjacent equipment or building structure.
2. Install seismic-restraint devices using anchor bolts that meet building code requirements for testing and approval.
3. Install bushing assemblies for anchor bolts for floor-mounted equipment, arranged to provide resilient media between anchor bolt and oversize mounting hole.
4. Install bushing assemblies for mounting bolts for wall-mounted equipment, arranged to provide resilient media where equipment or equipment-mounting channels are attached to wall.
5. If specific attachment to structure is not indicated, anchor bracing to structure at flanges of beams at upper chords of bar joists, or at concrete members. Obtain approval of the structural engineer prior to installation.

K. Drilled-in Anchors:
1. Identify position of reinforcing steel and other embedded items prior to drilling holes for anchors. Do not damage existing reinforcing or embedded items during coring or drilling. Notify the structural engineer if reinforcing steel or other embedded items are encountered during drilling. Locate and avoid prestressed tendons, electrical and telecommunications conduit, and gas lines.
2. Do not drill holes in concrete or masonry until concrete, mortar, or grout has achieved full design strength.
3. Wedge Anchors: Protect threads from damage during anchor installation. Heavy-duty sleeve anchors shall be installed with sleeve fully engaged in the structural element to which anchor is to be fastened.
4. Set anchors to manufacturer's recommended torque, using a torque wrench.
5. Install zinc-coated steel anchors for interior and stainless-steel anchors for exterior applications.

3.4 ACCOMMODATION OF DIFFERENTIAL SEISMIC MOTION

A. Install flexible connections in piping where they cross seismic joints, where adjacent sections or branches are supported by different structural elements, and where the connections terminate with connection to equipment that is anchored to a different structural element from the one supporting the connections as they approach equipment. Comply with requirements in Section 230500 "Common Work Results for HVAC".

3.5 ADJUSTING

A. Adjust isolators after piping system is at operating weight.

B. Adjust limit stops on restrained spring isolators to mount equipment at normal operating height. After equipment installation is complete, adjust limit stops so they are out of contact during normal operation.

C. Adjust active height of spring isolators.

D. Adjust restraints to permit free movement of equipment within normal mode of operation.

3.6 EXAMPLE TABLE ONLY. CONTRACTOR TO PROVIDE EQUIPMENT SCHEDULE.

EQUIPMENT DESCRIPTION	MARK	VIBRATION ISOLATOR TYPE	MINIMUM DEFLECTION (INCHES)	BASE/ CURB TYPE	SEISMIC RESTRAINT DEVICE TYPE	NOTES
CONDENSING UNITS						
CONDENSING UNITS	CU-X	V-2	0.11	N/A	N/A	
AIR-COOLED CONDENSERS						
AIR-COOLED CONDENSERS	HP-X	V-2	0.11	N/A	N/A	
FA-COIL UNITS						
FAN-COIL UNITS	FCU-X	V-9	1.0	N/A	S-2	
FANS						
FANS	EF-1	V-9	0.75	N/A	S-2	
ENERGY RECOVERY UNITS						
ENERGY RECOVERY UNITS	L-X	V-9	1.0	N/A	S-2	

A. Vibration Isolator and Seismic Restraint Schedule Notes:
   1. Seismic restraints are required for all systems and equipment. Seismic restraints for equipment without scheduled seismic snubbers shall be provided by the anchor bolts, vibration isolators, or devices as specified for suspended elements.
   2. Provide vibration isolators and seismic restraints for all equipment as specified, including, but not limited to, the specific equipment marks listed above. Where a piece of equipment is included on the project but is not listed above, provide vibration isolators and seismic restraints as specified and as described for similar equipment.
   3. Internal vibration isolators, snubbers, and bases for custom air handling units and custom exhaust fans shall be provided and installed at the fan manufacturer's factory, except concrete for inertia bases will be field installed as specified in this section.
   4. Provide vibration isolators as indicated for suspended piping attached to any piece of vibrating equipment 5 horsepower or larger within mechanical rooms or within 50 feet of equipment, whichever provides the greater length. For piping supported from the floor, provide isolators similar to those used on the equipment. Applicable vibrating equipment includes items that are not internally isolated such as chillers, pumps, and air compressors.
   5. The indicated equipment will be provided with internal vibration isolators.

END OF SECTION 23 05 48

SECTION 230553 - IDENTIFICATION FOR HVAC PIPING AND EQUIPMENT

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Equipment labels.
2. Warning signs and labels.
3. Pipe labels.
4. Duct labels.
5. Valve tags.
6. Warning tags.

1.2 ACTION SUBMITTALS

A. Product Data: For each type of product.

PART 2 - PRODUCTS

2.1 EQUIPMENT LABELS

A. Plastic Labels for Equipment:

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
   a. Brady Corporation.
   b. Brimar Industries, Inc.
   c. Craftmark Pipe Markers.
   d. Seton Identification Products; a Brady Corporation company.
2. Material and Thickness: Multilayer, multicolor, plastic labels for mechanical engraving, 1/16 inch thick, with predrilled holes for attachment hardware.
3. Letter and Background Color: As indicated for specific application under Part 3.
4. Maximum Temperature: Able to withstand temperatures of up to 160 deg F.
5. Minimum Label Size: Length and width vary for required label content, but not less than 2-1/2 by 3/4 inch.
6. Minimum Letter Size: 1/4 inch for name of units if viewing distance is less than 24 inches, 1/2 inch for viewing distances of up to 72 inches, and proportionately larger lettering for greater viewing distances. Include secondary lettering two-thirds to three-fourths the size of principal lettering.
7. Fasteners: Stainless steel rivets or self-tapping screws.
8. Adhesive: Contact-type permanent adhesive, compatible with label and with substrate.

B. Label Content: Include equipment's Drawing designation or unique equipment number, Drawing numbers where equipment is indicated (plans, details, and schedules), and the Specification Section number and title where equipment is specified.

2.2 WARNING SIGNS AND LABELS

A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

1. Brady Corporation.
2. Brimar Industries, Inc.
3. Craftmark Pipe Markers.
4. Seton Identification Products; a Brady Corporation company.

B. Material and Thickness: Multilayer, multicolor, plastic labels for mechanical engraving, 1/16 inch thick, with predrilled holes for attachment hardware.

C. Letter and Background Color: As indicated for specific application under Part 3.

D. Maximum Temperature: Able to withstand temperatures of up to 160 deg F.

E. Minimum Label Size: Length and width vary for required label content, but not less than 2-1/2 by 3/4 inch.

F. Minimum Letter Size: 1/4 inch for name of units if viewing distance is less than 24 inches, 1/2 inch for viewing distances of up to 72 inches, and proportionately larger lettering for greater viewing distances. Include secondary lettering two-thirds to three-fourths the size of principal lettering.

G. Fasteners: Stainless steel rivets or self-taping screws.

H. Adhesive: Contact-type permanent adhesive, compatible with label and with substrate.

I. Arc-Flash Warning Signs: Provide arc-flash warning signs in locations and with content in accordance with requirements of OSHA and NFPA70E and other applicable codes and standards.

J. Label Content: Include caution and warning information plus emergency notification instructions.

2.3 PIPE LABELS

A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

1. Brady Corporation.
2. Brimar Industries, Inc.
3. Craftmark Pipe Markers.
4. Seton Identification Products; a Brady Corporation company.

B. General Requirements for Manufactured Pipe Labels: Preprinted, color coded, with lettering indicating service and showing flow direction in accordance with ASME A13.1.

C. Letter and Background Color: As indicated for specific application under Part 3.

D. Pretensioned Pipe Labels: Precoiled, semirigid plastic formed to circumference of pipe and to attach to pipe without fasteners or adhesive.

E. Self-Adhesive Pipe Labels: Printed plastic with contact-type, permanent-adhesive backing.

F. Pipe Label Contents: Include identification of piping service using same designations or abbreviations as used on Drawings. Also include:

1. Pipe size.
2. Flow-Direction Arrows: Include flow-direction arrows on main distribution piping. Arrows may be either integral with label or applied separately.
3. Lettering Size: Size letters in accordance with ASME A13.1 for piping .

2.4 DUCT LABELS

A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

1. Brady Corporation.
2. Brimar Industries, Inc.
3. Craftmark Pipe Markers.
4. Seton Identification Products; a Brady Corporation company.

B. Letter and Background Color: As indicated for specific application under Part 3.

C. Maximum Temperature: Able to withstand temperatures up to 160 deg F.

D. Minimum Label Size: Length and width vary for required label content, but not less than 2-1/2 by 3/4 inch.

E. Minimum Letter Size: 1/4 inch for name of units if viewing distance is less than 24 inches, 1/2 inch for viewing distances of up to 72 inches, and proportionately larger lettering for greater viewing distances. Include secondary lettering two-thirds to three-fourths the size of principal lettering.

F. Fasteners: Stainless steel rivets or self-tapping screws.

G. Adhesive: Contact-type permanent adhesive, compatible with label and with substrate.

H. Duct Label Contents: Include identification of duct service using same designations or abbreviations as used on Drawings. Also include the following:

1. Duct size.
2. Flow-Direction Arrows: Include flow-direction arrows on main distribution ducts. Arrows may be either integral with label or may be applied separately.
3. Lettering Size: Size letters in accordance with ASME A13.1 for piping .

2.5 VALVE TAGS

A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

1. Brady Corporation.
2. Brimar Industries, Inc.
3. Craftmark Pipe Markers.

4. Seton Identification Products; a Brady Corporation company.

B. Description: Stamped or engraved with 1/4-inch letters for piping system abbreviation and 1/2-inch numbers.

1. Tag Material: aluminum, 0.031-inch minimum thickness, with predrilled or stamped holes for attachment hardware.
2. Fasteners: Brass beaded chain .

C. Letter and Background Color: As indicated for specific application under Part 3.

D. Valve Schedules: For each piping system, on 8-1/2-by-11-inch bond paper. Tabulate valve number, piping system, system abbreviation (as shown on valve tag), location of valve (room or space), normal-operating position (open, closed, or modulating), and variations for identification. Mark valves for emergency shutoff and similar special uses.

1. Include valve-tag schedule in operation and maintenance data.

2.6 WARNING TAGS

A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

1. Brady Corporation.
2. Brimar Industries, Inc.
3. Craftmark Pipe Markers.
4. Seton Identification Products; a Brady Corporation company.

B. Description: Preprinted or partially preprinted accident-prevention tags of plasticized card stock with matte finish suitable for writing.

1. Size: Approximately 4 by 7 inches .
2. Fasteners: Brass grommet and wire .
3. Nomenclature: Large-size primary caption, such as "DANGER," "CAUTION," or "DO NOT OPERATE."
4. Letter and Background Color: As indicated for specific application under Part 3.

PART 3 - EXECUTION

3.1 PREPARATION

A. Clean piping and equipment surfaces of incompatible primers, paints, and encapsulants, as well as dirt, oil, grease, release agents, and other substances that could impair bond of identification devices.

3.2 INSTALLATION, GENERAL REQUIREMENTS

A. Coordinate installation of identifying devices with completion of covering and painting of surfaces where devices are to be applied.

B. Coordinate installation of identifying devices with locations of access panels and doors.

C. Install identifying devices before installing acoustical ceilings and similar concealment.

D. Locate identifying devices so that they are readily visible from the point of normal approach.

3.3 INSTALLATION OF EQUIPMENT LABELS, WARNING SIGNS, AND LABELS

A. Permanently fasten labels on each item of mechanical equipment.

B. Sign and Label Colors:

1. White letters on an ANSI Z535.1 safety-blue background .

C. Locate equipment labels where accessible and visible.

D. Arc-Flash Warning Signs: Provide arc-flash warning signs on electrical disconnects and other equipment where arc-flash hazard exists, as indicated on Drawings, and in accordance with requirements of OSHA and NFPA 70E , and other applicable codes and standards.

3.4 INSTALLATION OF PIPE LABELS

A. Install pipe labels showing service and flow direction with permanent adhesive on pipes.

B. Pipe-Label Locations: Locate pipe labels where piping is exposed or above accessible ceilings in finished spaces; machine rooms; accessible maintenance spaces such as shafts, tunnels, and plenums; and exterior exposed locations as follows:

1. Within 3 ft. of each valve and control device.
2. At access doors, manholes, and similar access points that permit view of concealed piping.
3. Within 3 ft. of equipment items and other points of origination and termination.
4. Spaced at maximum intervals of 25 ft. along each run. Reduce intervals to 10 ft. in areas of congested piping, ductwork, and equipment.

C. Do not apply plastic pipe labels or plastic tapes directly to bare pipes conveying fluids at temperatures of 125 deg F or higher. Where these pipes are to remain uninsulated, use a short section of insulation or use stenciled labels.

D. Flow-Direction Arrows: Use arrows to indicate direction of flow in pipes, including pipes where flow is allowed in both directions.

E. Pipe-Label Color Schedule:

1. Refrigerant Piping: White letters on an ANSI Z535.1 safety-blue background .
2. Potable and Other Water: White letters on an ANSI Z535.1 safety-green background .
3. Compressed Air: White letters on an ANSI Z535.1 safety-blue background .
4. Natural Gas: Per ASME A13.1 .

3.5 INSTALLATION OF DUCT LABELS

A. Install self-adhesive duct labels showing service and flow direction with permanent adhesive on air ducts.

1. Provide labels in the following color codes:
   a. For air supply ducts: White letters on blue background .
   b. For air return ducts: White letters on blue background .
   c. For exhaust-, outside-, relief-, return-, and mixed-air ducts: White letters on blue background .

B. Locate label near each point where ducts enter into and exit from concealed spaces and at maximum intervals of 20 ft. where exposed or are concealed by removable ceiling system.

C. Stenciled Access Panels and Door Labels, Equipment Labels, and Similar Operational Instructions:

1. Black letters on White background .

3.6 INSTALLATION OF VALVE TAGS

A. Install tags on valves and control devices in piping systems, except check valves, valves within factory-fabricated equipment units, shutoff valves, and HVAC terminal devices and similar roughing-in connections of end-use fixtures and units. List tagged valves in a valve schedule in the operating and maintenance manual.

B. Valve-Tag Application Schedule: Tag valves according to size, shape, and color scheme and with captions similar to those indicated in "Valve-Tag Size and Shape" Subparagraph below.

1. Valve-Tag Size and Shape:
   a. Hot Water: 2 inches , round .
   b. Gas: 2 inches , round .
2. Valve-Tag Colors:
   a. For each piping system, use the same lettering and background coloring system on valve tags as used for the Pipe Label Schedule text and background.

3.7 INSTALLATION OF WARNING TAGS

A. Warning Tag Color: Black letters on an ANSI Z535.1 safety-yellow background .

B. Attach warning tags, with proper message, to equipment and other items where required .

END OF SECTION 230553

SECTION 230593 - TESTING, ADJUSTING, AND BALANCING FOR HVAC

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. Testing, Adjusting, and Balancing of Air Systems:
   a. Constant-volume air systems.
2. Testing, adjusting, and balancing of equipment.

1.3 DEFINITIONS

A. AABC: Associated Air Balance Council.

B. NEBB: National Environmental Balancing Bureau.

C. TAB: Testing, adjusting, and balancing.

D. TABB: Testing, Adjusting, and Balancing Bureau.

E. TAB Specialist: An independent entity meeting qualifications to perform TAB work.

F. TDH: Total dynamic head.

G. UFAD: Underfloor air distribution.

1.4 ACTION SUBMITTALS

1.5 INFORMATIONAL SUBMITTALS

A. Qualification Data: Within 90 days of Contractor's Notice to Proceed, submit documentation that the TAB specialist and this Project's TAB team members meet the qualifications specified in "Quality Assurance" Article.

B. Examination Report: Submit a summary report of the examination review required in "Examination" Article.

C. Certified TAB reports.

1.6 QUALITY ASSURANCE

A. TAB Specialists Qualifications, Certified by NEBB :

1. TAB Field Supervisor: Employee of the TAB specialist and certified by NEBB .
2. TAB Technician: Employee of the TAB specialist and certified by NEBB .

B. Instrumentation Type, Quantity, Accuracy, and Calibration: Comply with requirements in ASHRAE 111, Section 4, "Instrumentation."

C. ASHRAE/IES 90.1 Compliance: Applicable requirements in ASHRAE/IES 90.1, Section 6.7.2.3 - "System Balancing."

D. Code and AHJ Compliance: TAB is required to comply with governing codes and requirements of authorities having jurisdiction.

1.7 FIELD CONDITIONS

A. Full Owner Occupancy: Owner will occupy the site and existing building during entire TAB period. Cooperate with Owner during TAB operations to minimize conflicts with Owner's operations.

B. Partial Owner Occupancy: Owner may occupy completed areas of building before Substantial Completion. Cooperate with Owner during TAB operations to minimize conflicts with Owner's operations.

PART 2 - PRODUCTS (Not Applicable)

PART 3 - EXECUTION

3.1 TAB SPECIALISTS

3.2 EXAMINATION

A. Examine the Contract Documents to become familiar with Project requirements and to discover conditions in systems designs that may preclude proper TAB of systems and equipment.

B. Examine installed systems for balancing devices, such as test ports, gauge cocks, thermometer wells, flow-control devices, balancing valves and fittings, and manual volume dampers. Verify that locations of these balancing devices are applicable for intended purpose and are accessible.

C. Examine the approved submittals for HVAC systems and equipment.

D. Examine design data, including HVAC system descriptions, statements of design assumptions for environmental conditions and systems output, and statements of philosophies and assumptions about HVAC system and equipment controls.

E. Examine ceiling plenums and underfloor air plenums used for HVAC to verify that they are properly separated from adjacent areas and sealed.

F. Examine equipment performance data, including fan and pump curves.

1. Relate performance data to Project conditions and requirements, including system effects that can create undesired or unpredicted conditions that cause reduced capacities in all or part of a system.
2. Calculate system-effect factors to reduce performance ratings of HVAC equipment when installed under conditions different from the conditions used to rate equipment performance. To calculate system effects for air systems, use tables and charts found in AMCA 201, "Fans and Systems," or in SMACNA's "HVAC Systems - Duct Design." Compare results with the design data and installed conditions.

G. Examine system and equipment installations and verify that field quality-control testing, cleaning, and adjusting specified in individual Sections have been performed.

H. Examine test reports specified in individual system and equipment Sections.

I. Examine HVAC equipment and verify that bearings are greased, belts are aligned and tight, filters are clean, and equipment with functioning controls is ready for operation.

J. Examine terminal units, such as variable-air-volume boxes, and verify that they are accessible and their controls are connected and functioning.

K. Examine temporary and permanent strainers. Verify that temporary strainer screens used during system cleaning and flushing have been removed and permanent strainer baskets are installed and clean.

L. Examine control valves for proper installation for their intended function of isolating, throttling, diverting, or mixing fluid flows.

M. Examine heat-transfer coils for correct piping connections and for clean and straight fins.

N. Examine system pumps to ensure absence of entrained air in the suction piping.

O. Examine operating safety interlocks and controls on HVAC equipment.

P. Examine control dampers for proper installation for their intended function of isolating, throttling, diverting, or mixing air flows.

Q. Report deficiencies discovered before and during performance of TAB procedures. Observe and record system reactions to changes in conditions. Record default set points if different from indicated values.

3.3 PREPARATION

A. Prepare a TAB plan that includes the following:

1. Equipment and systems to be tested.
2. Strategies and step-by-step procedures for balancing the systems.
3. Instrumentation to be used.
4. Sample forms with specific identification for all equipment.

B. Perform system-readiness checks of HVAC systems and equipment to verify system readiness for TAB work. Include, at a minimum, the following:

1. Airside:
   a. Verify that leakage and pressure tests on air distribution systems have been satisfactorily completed.
   b. Duct systems are complete with terminals installed.
   c. Volume, smoke, and fire dampers are open and functional.
   d. Clean filters are installed.
   e. Fans are operating, free of vibration, and rotating in correct direction.
   f. Variable-frequency controllers' startup is complete and safeties are verified.
   g. Automatic temperature-control systems are operational.
   h. Ceilings are installed.
   i. Windows and doors are installed.
   j. Suitable access to balancing devices and equipment is provided.
2. Hydronics:
   a. Verify leakage and pressure tests on water distribution systems have been satisfactorily completed.
   b. Piping is complete with terminals installed.
   c. Water treatment is complete.
   d. Systems are flushed, filled, and air purged.
   e. Strainers are pulled and cleaned.
   f. Control valves are functioning in accordance with the sequence of operation.
   g. Shutoff and balance valves have been verified to be 100 percent open.
   h. Pumps are started and proper rotation is verified.
   i. Pump gauge connections are installed directly at pump inlet and outlet flanges or in discharge and suction pipe prior to valves or strainers.
   j. Variable-frequency controllers' startup is complete and safeties are verified.
   k. Suitable access to balancing devices and equipment is provided.

3.4 GENERAL PROCEDURES FOR TESTING AND BALANCING

A. Perform testing and balancing procedures on each system in accordance with the procedures contained in NEBB's "Procedural Standards for Testing, Adjusting, and Balancing of Environmental Systems" and in this Section.

B. Cut insulation, ducts, pipes, and equipment casings for installation of test probes to the minimum extent necessary for TAB procedures.

1. After testing and balancing, patch probe holes in ducts with same material and thickness as used to construct ducts.
2. After testing and balancing, install test ports and duct access doors that comply with requirements in Section 233300 "Air Duct Accessories."
3. Where holes for probes are required in piping or hydronic equipment, install pressure and temperature test plugs to seal systems.
4. Install and join new insulation that matches removed materials. Restore insulation, coverings, vapor barrier, and finish in accordance with Section 230713 "Duct Insulation," Section 230716 "HVAC Equipment Insulation," and Section 230719 "HVAC Piping Insulation."

C. Mark equipment and balancing devices, including damper-control positions, valve position indicators, fan-speed-control levers, and similar controls and devices, with paint or other suitable, permanent identification material to show final settings.

D. Take and report testing and balancing measurements in inch-pound (IP) units.

3.5 TESTING, ADJUSTING, AND BALANCING OF HVAC EQUIPMENT

A. Test, adjust, and balance HVAC equipment indicated on Drawings, including, but not limited to, the following:

1. Motors.
2. Pumps.
3. Fans and ventilators.
4. Air curtains.
5. Terminal units.
6. Commercial kitchen hoods.
7. Deaerators.
8. Furnaces.
9. Radiant heaters.
10. Unit heaters.
11. Solar collectors.
12. Heat exchangers.
13. Condensing units.
14. Energy-recovery units.
15. Air-handling units.
16. Heating and ventilating units.
17. Rooftop air-conditioning units.
18. Heating-only makeup air units.
19. Dedicated outdoor-air units.
20. Packaged air conditioners.
21. Self-contained air conditioners.
22. Computer-room air conditioners.
23. Split-system air conditioners.
24. Variable-refrigerant-flow systems.
25. Heat pumps.
26. Valance heating and cooling units.
27. Chilled beams.
28. Coils.
29. Fan coil units.
30. Unit ventilators.
31. Radiators.
32. Convectors.
33. Finned-tube radiation heaters.
34. Humidifiers.
35. Dehumidification units.

3.6 GENERAL PROCEDURES FOR BALANCING AIR SYSTEMS

A. Prepare test reports for both fans and outlets. Obtain manufacturer's outlet factors and recommended testing procedures. Crosscheck the summation of required outlet volumes with required fan volumes.

B. Prepare schematic diagrams of systems' Record drawings duct layouts.

C. For variable-air-volume systems, develop a plan to simulate diversity.

D. Determine the best locations in main and branch ducts for accurate duct-airflow measurements.

E. Check airflow patterns from the outdoor-air louvers and dampers and the return- and exhaust-air dampers through the supply-fan discharge and mixing dampers.

F. Locate start-stop and disconnect switches, electrical interlocks, and motor starters.

G. Verify that motor starters are equipped with properly sized thermal protection.

H. Check dampers for proper position to achieve desired airflow path.

I. Check for airflow blockages.

J. Check condensate drains for proper connections and functioning.

K. Check for proper sealing of air-handling-unit components.

3.7 PROCEDURES FOR CONSTANT-VOLUME AIR SYSTEMS

A. Adjust fans to deliver total indicated airflows within the maximum allowable fan speed listed by fan manufacturer.

1. Measure total airflow.
    a. Set outside-air, return-air, and relief-air dampers for proper position that simulates minimum outdoor-air conditions.
    b. Where duct conditions allow, measure airflow by main Pitot-tube traverse. If necessary, perform multiple Pitot-tube traverses close to the fan and prior to any outlets, to obtain total airflow.
    c. Where duct conditions are unsuitable for Pitot-tube traverse measurements, a coil traverse may be acceptable.
2. Measure fan static pressures as follows:
    a. Measure static pressure directly at the fan outlet or through the flexible connection.
    b. Measure static pressure directly at the fan inlet or through the flexible connection.
    c. Measure static pressure across each component that makes up the air-handling system.
    d. Report artificial loading of filters at the time static pressures are measured.
3. Review Contractor-prepared shop drawings and Record drawings to determine variations in design static pressures versus actual static pressures. Calculate actual system-effect factors. Recommend adjustments to accommodate actual conditions.
4. Do not make fan-speed adjustments that result in motor overload. Consult equipment manufacturers about fan-speed safety factors. Modulate dampers and measure fan-motor amperage to ensure that no overload occurs. Measure amperage in full-cooling, full-heating, economizer, and any other operating mode to determine the maximum required brake horsepower.

B. Adjust volume dampers for main duct, submain ducts, and major branch ducts to indicated airflows.

1. Measure airflow of submain and branch ducts.
2. Adjust submain and branch duct volume dampers for specified airflow.
3. Re-measure each submain and branch duct after all have been adjusted.

C. Adjust air inlets and outlets for each space to indicated airflows.

1. Set airflow patterns of adjustable outlets for proper distribution without drafts.
2. Measure inlets and outlets airflow.
3. Adjust each inlet and outlet for specified airflow.
4. Re-measure each inlet and outlet after they have been adjusted.

D. Verify final system conditions.

1. Re-measure and confirm that minimum outdoor, return, and relief airflows are within design. Readjust to design if necessary.
2. Re-measure and confirm that total airflow is within design.
3. Re-measure all final fan operating data, speed, volts, amps, and static profile.
4. Mark all final settings.
5. Test system in economizer mode. Verify proper operation and adjust if necessary.
6. Measure and record all operating data.
7. Record final fan-performance data.

3.8 GENERAL PROCEDURES FOR HYDRONIC SYSTEMS

A. Prepare test reports for pumps, coils, and other equipment. Obtain approved submittals and manufacturer-recommended testing procedures. Crosscheck the summation of required coil and equipment flow rates with pump design flow rate.

B. Prepare schematic diagrams of systems' Record drawings piping layouts.

C. In addition to requirements in "Preparation" Article, prepare hydronic systems for testing and balancing as follows:

1. Check expansion tank for proper setting.
2. Check highest vent for adequate pressure.
3. Check flow-control valves for proper position.
4. Locate start-stop and disconnect switches, electrical interlocks, and motor controllers.
5. Verify that motor controllers are equipped with properly sized thermal protection.
6. Check that air has been purged from the system.

D. Measure and record upstream and downstream pressure of each piece of equipment.

E. Measure and record upstream and downstream pressure of pressure-reducing valves.

F. Check settings and operation of automatic temperature-control valves, self-contained control valves, and pressure-reducing valves. Record final settings.

1. Check settings and operation of each safety valve. Record settings.

3.9 PROCEDURES FOR STEAM AND CONDENSATE SYSTEMS

A. Measure and record upstream and downstream pressure of each piece of equipment.

B. Measure and record upstream and downstream steam pressure of pressure-reducing valves.

C. Check settings and operation of automatic temperature-control valves, self-contained control valves, and pressure-reducing valves. Record final settings.

D. Check settings and operation of each safety valve. Record settings.

E. Verify the operation of each steam trap.

3.10 PROCEDURES FOR STEAM-TO-WATER HEAT EXCHANGERS

A. Adjust and record water flow to within specified tolerances.

B. Measure and record inlet and outlet water temperatures.

C. Measure and record inlet steam pressure and condensate outlet pressure.

D. Check and record settings and operation of safety and relief valves.

3.11 PROCEDURES FOR WATER-TO-WATER HEAT EXCHANGERS

A. Adjust and record water flow to within specified tolerances.

B. Measure and record inlet and outlet water temperatures.

C. Measure and record pressure drop.

D. Check and record settings and operation of safety and relief valves.

3.12 PROCEDURES FOR MOTORS

A. Motors 1/2 HP and Larger: Test at final balanced conditions and record the following data:

1. Manufacturer's name, model number, and serial number.
2. Motor horsepower rating.
3. Motor rpm.
4. Phase and hertz.
5. Nameplate and measured voltage, each phase.
6. Nameplate and measured amperage, each phase.
7. Starter size and thermal-protection-element rating.
8. Service factor and frame size.

B. Motors Driven by Variable-Frequency Controllers: Test manual bypass of controller to prove proper operation.

3.13 PROCEDURES FOR AIR-COOLED CONDENSING UNITS

A. Verify proper rotation of fan(s).

B. Measure and record entering- and leaving-air temperatures.

C. Measure and record entering and leaving refrigerant pressures.

D. Measure and record operating data of compressor(s), fan(s), and motors.

3.14 TOLERANCES

A. Set HVAC system's airflow rates and water flow rates within the following tolerances:

1. Supply, Return, and Exhaust Fans and Equipment with Fans: Plus or minus 10 percent . If design value is less than 100 cfm, within 10 cfm.
2. Air Outlets and Inlets: Plus or minus 10 percent . If design value is less than 100 cfm, within 10 cfm.
3. Heating-Water Flow Rate: Plus or minus 5 percent . If design value is less than 10 gpm, within 10 percent.
4. Chilled-Water Flow Rate: Plus or minus 5 percent . If design value is less than 10 gpm, within 10 percent.
5. Condenser-Water Flow Rate: Plus or minus 5 percent .

B. Maintaining pressure relationships as designed shall have priority over the tolerances specified above.

3.15 PROGRESS REPORTING

A. Initial Construction-Phase Report: Based on examination of the Contract Documents as specified in "Examination" Article, prepare a report on the adequacy of design for system-balancing devices. Recommend changes and additions to system-balancing devices, to facilitate proper performance measuring and balancing. Recommend changes and additions to HVAC systems and general construction to allow access for performance-measuring and -balancing devices.

B. Status Reports: Prepare monthly progress reports to describe completed procedures, procedures in progress, and scheduled procedures. Include a list of deficiencies and problems found in systems being tested and balanced. Prepare a separate report for each system and each building floor for systems serving multiple floors.

3.16 FINAL REPORT

A. General: Prepare a certified written report; tabulate and divide the report into separate sections for tested systems and balanced systems.

1. Include a certification sheet at the front of the report's binder, signed and sealed by the certified testing and balancing engineer.
2. Include a list of instruments used for procedures, along with proof of calibration.
3. Certify validity and accuracy of field data.

B. Final Report Contents: In addition to certified field-report data, include the following:

1. Pump curves.
2. Fan curves.
3. Manufacturers' test data.
4. Field test reports prepared by system and equipment installers.
5. Other information relative to equipment performance; do not include Shop Drawings and Product Data.

C. General Report Data: In addition to form titles and entries, include the following data:

1. Title page.
2. Name and address of the TAB specialist.
3. Project name.
4. Project location.
5. Architect's name and address.
6. Engineer's name and address.
7. Contractor's name and address.
8. Report date.
9. Signature of TAB supervisor who certifies the report.
10. Table of Contents with the total number of pages defined for each section of the report. Number each page in the report.
11. Summary of contents, including the following:
    a. Indicated versus final performance.
    b. Notable characteristics of systems.
    c. Description of system operation sequence if it varies from the Contract Documents.
12. Nomenclature sheets for each item of equipment.
13. Data for terminal units, including manufacturer's name, type, size, and fittings.
14. Notes to explain why certain final data in the body of reports vary from indicated values.
15. Test conditions for fans performance forms, including the following:
    a. Settings for outdoor-, return-, and exhaust-air dampers.
    b. Conditions of filters.
    c. Cooling coil, wet- and dry-bulb conditions.
    d. Heating coil, dry-bulb conditions.
    e. Face and bypass damper settings at coils.
    f. Fan drive settings, including settings and percentage of maximum pitch diameter.
    g. Variable-frequency controller settings for variable-air-volume systems.
    h. Settings for pressure controller(s).
    i. Other system operating conditions that affect performance.
16. Test conditions for pump performance forms, including the following:
    a. Variable-frequency controller settings for variable-flow hydronic systems.
    b. Settings for pressure controller(s).
    c. Other system operating conditions that affect performance.

D. System Diagrams: Include schematic layouts of air and hydronic distribution systems. Present each system with single-line diagram and include the following:

1. Quantities of outdoor, supply, return, and exhaust airflows.
2. Water and steam flow rates.
3. Duct, outlet, and inlet sizes.
4. Pipe and valve sizes and locations.
5. Terminal units.
6. Balancing stations.
7. Position of balancing devices.

E. Air-Handling-Unit Test Reports: For air-handling units, include the following:

1. Unit Data:
    a. Unit identification.
    b. Location.
    c. Make and type.
    d. Model number and unit size.
    e. Manufacturer's serial number.
    f. Unit arrangement and class.
    g. Discharge arrangement.

h. Sheave make, size in inches, and bore.
i. Center-to-center dimensions of sheave and amount of adjustments in inches.
j. Number, make, and size of belts.
k. Number, type, and size of filters.

2. Motor Data:
   a. Motor make, and frame type and size.
   b. Horsepower and speed.
   c. Volts, phase, and hertz.
   d. Full-load amperage and service factor.
   e. Sheave make, size in inches, and bore.
   f. Center-to-center dimensions of sheave and amount of adjustments in inches.
3. Test Data (Indicated and Actual Values):
   a. Total airflow rate in cfm.
   b. Total system static pressure in inches wg.
   c. Fan speed.
   d. Inlet and discharge static pressure in inches wg.
   e. For each filter bank, filter static-pressure differential in inches wg.
   f. Preheat-coil static-pressure differential in inches wg.
   g. Cooling-coil static-pressure differential in inches wg.
   h. Heating-coil static-pressure differential in inches wg.
   i. List for each internal component with pressure-drop, static-pressure differential in inches wg.
   j. Outdoor airflow in cfm.
   k. Return airflow in cfm.
   l. Outdoor-air damper position.
   m. Return-air damper position.

F. Apparatus-Coil Test Reports:

1. Coil Data:
   a. System identification.
   b. Location.
   c. Coil type.
   d. Number of rows.
   e. Fin spacing in fins per inch o.c.
   f. Make and model number.
   g. Face area in sq. ft..
   h. Tube size in NPS.
   i. Tube and fin materials.
   j. Circuiting arrangement.
2. Test Data (Indicated and Actual Values):
   a. Airflow rate in cfm.
   b. Average face velocity in fpm.
   c. Air pressure drop in inches wg.
   d. Outdoor-air, wet- and dry-bulb temperatures in deg F.
   e. Return-air, wet- and dry-bulb temperatures in deg F.
   f. Entering-air, wet- and dry-bulb temperatures in deg F.
   g. Leaving-air, wet- and dry-bulb temperatures in deg F.
   h. Water flow rate in gpm.
   i. Water pressure differential in feet of head or psig.
   j. Entering-water temperature in deg F.
   k. Leaving-water temperature in deg F.
   l. Refrigerant expansion valve and refrigerant types.
   m. Refrigerant suction pressure in psig.
   n. Refrigerant suction temperature in deg F.

o. Inlet steam pressure in psig.

G. Gas- and Oil-Fired Heat Apparatus Test Reports: In addition to manufacturer's factory startup equipment reports, include the following:

1. Unit Data:
   a. System identification.
   b. Location.
   c. Make and type.
   d. Model number and unit size.
   e. Manufacturer's serial number.
   f. Fuel type in input data.
   g. Output capacity in Btu/h.
   h. Ignition type.
   i. Burner-control types.
   j. Motor horsepower and speed.
   k. Motor volts, phase, and hertz.
   l. Motor full-load amperage and service factor.
   m. Sheave make, size in inches, and bore.
   n. Center-to-center dimensions of sheave and amount of adjustments in inches.
2. Test Data (Indicated and Actual Values):
   a. Total airflow rate in cfm.
   b. Entering-air temperature in deg F.
   c. Leaving-air temperature in deg F.
   d. Air temperature differential in deg F.
   e. Entering-air static pressure in inches wg.
   f. Leaving-air static pressure in inches wg.
   g. Air static-pressure differential in inches wg.
   h. Low-fire fuel input in Btu/h.
   i. High-fire fuel input in Btu/h.
   j. Manifold pressure in psig.
   k. High-temperature-limit setting in deg F.
   l. Operating set point in Btu/h.
   m. Motor voltage at each connection.
   n. Motor amperage for each phase.
   o. Heating value of fuel in Btu/h.

H. Electric-Coil Test Reports: For electric furnaces, duct coils, and electric coils installed in central-station air-handling units, include the following:

1. Unit Data:
   a. System identification.
   b. Location.
   c. Coil identification.
   d. Capacity in Btu/h.
   e. Number of stages.
   f. Connected volts, phase, and hertz.
   g. Rated amperage.
   h. Airflow rate in cfm.
   i. Face area in sq. ft..
   j. Minimum face velocity in fpm.
2. Test Data (Indicated and Actual Values):
   a. Heat output in Btu/h.
   b. Airflow rate in cfm.
   c. Air velocity in fpm.

d. Entering-air temperature in deg F.
e. Leaving-air temperature in deg F.
f. Voltage at each connection.
g. Amperage for each phase.

I. Fan Test Reports: For supply, return, and exhaust fans, include the following:

1. Fan Data:
   a. System identification.
   b. Location.
   c. Make and type.
   d. Model number and size.
   e. Manufacturer's serial number.
   f. Arrangement and class.
   g. Sheave make, size in inches, and bore.
   h. Center-to-center dimensions of sheave and amount of adjustments in inches.
2. Motor Data:
   a. Motor make, and frame type and size.
   b. Horsepower and speed.
   c. Volts, phase, and hertz.
   d. Full-load amperage and service factor.
   e. Sheave make, size in inches, and bore.
   f. Center-to-center dimensions of sheave and amount of adjustments in inches.
   g. Number, make, and size of belts.
3. Test Data (Indicated and Actual Values):
   a. Total airflow rate in cfm.
   b. Total system static pressure in inches wg.
   c. Fan speed.
   d. Discharge static pressure in inches wg.
   e. Suction static pressure in inches wg.

J. Round, Flat-Oval, and Rectangular Duct Traverse Reports: Include a diagram with a grid representing the duct cross-section and record the following:

1. Report Data:
   a. System fan and air-handling-unit number.
   b. Location and zone.
   c. Traverse air temperature in deg F.
   d. Duct static pressure in inches wg.
   e. Duct size in inches.
   f. Duct area in sq. ft..
   g. Indicated airflow rate in cfm.
   h. Indicated velocity in fpm.
   i. Actual airflow rate in cfm.
   j. Actual average velocity in fpm.
   k. Barometric pressure in psig.

K. Air-Terminal-Device Reports:

1. Unit Data:
   a. System and air-handling unit identification.
   b. Location and zone.
   c. Apparatus used for test.
   d. Area served.
   e. Make.

f. Number from system diagram.
g. Type and model number.
h. Size.
i. Effective area in sq. ft..

2. Test Data (Indicated and Actual Values):
   a. Airflow rate in cfm.
   b. Air velocity in fpm.
   c. Preliminary airflow rate as needed in cfm.
   d. Preliminary velocity as needed in fpm.
   e. Final airflow rate in cfm.
   f. Final velocity in fpm.
   g. Space temperature in deg F.

L. System-Coil Reports: For reheat coils and water coils of terminal units, include the following:

1. Unit Data:
   a. System and air-handling-unit identification.
   b. Location and zone.
   c. Room or riser served.
   d. Coil make and size.
   e. Flowmeter type.
2. Test Data (Indicated and Actual Values):
   a. Airflow rate in cfm.
   b. Entering-water temperature in deg F.
   c. Leaving-water temperature in deg F.
   d. Water pressure drop in feet of head or psig.
   e. Entering-air temperature in deg F.
   f. Leaving-air temperature in deg F.

M. Pump Test Reports: Calculate impeller size by plotting the shutoff head on pump curves, and include the following:

1. Unit Data:
   a. Unit identification.
   b. Location.
   c. Service.
   d. Make and size.
   e. Model number and serial number.
   f. Water flow rate in gpm.
   g. Water pressure differential in feet of head or psig.
   h. Required net positive suction head in feet of head or psig.
   i. Pump speed.
   j. Impeller diameter in inches.
   k. Motor make and frame size.
   l. Motor horsepower and rpm.
   m. Voltage at each connection.
   n. Amperage for each phase.
   o. Full-load amperage and service factor.
   p. Seal type.
2. Test Data (Indicated and Actual Values):
   a. Static head in feet of head or psig.
   b. Pump shutoff pressure in feet of head or psig.
   c. Actual impeller size in inches.
   d. Full-open flow rate in gpm.
   e. Full-open pressure in feet of head or psig.

f. Final discharge pressure in feet of head or psig.
g. Final suction pressure in feet of head or psig.
h. Final total pressure in feet of head or psig.
i. Final water flow rate in gpm.
j. Voltage at each connection.
k. Amperage for each phase.

N. Instrument Calibration Reports:

1. Report Data:
   a. Instrument type and make.
   b. Serial number.
   c. Application.
   d. Dates of use.
   e. Dates of calibration.

3.17 ADDITIONAL TESTS

A. Within 90 days of completing TAB, perform additional TAB to verify that balanced conditions are being maintained throughout and to correct unusual conditions.

B. Seasonal Periods: If initial TAB procedures were not performed during near-peak summer and winter conditions, perform additional TAB during near-peak summer and winter conditions.

END OF SECTION 230593

SECTION 230713 - DUCT INSULATION

PART 1 - GENERAL

1.1 SUMMARY

A. Section includes insulating the following duct services:

1. Indoor, concealed supply and outdoor air.
2. Indoor, concealed exhaust between isolation damper and penetration of building exterior.

B. Related Requirements:

1. Section 230716 "HVAC Equipment Insulation."
2. Section 230719 "HVAC Piping Insulation."
3. Section 233113 "Metal Ducts" for duct liners.

1.2 ACTION SUBMITTALS

A. Product Data: For each type of product indicated. Include thermal conductivity, water-vapor permeance thickness, and jackets (both factory- and field-applied if any).

1.3 INFORMATIONAL SUBMITTALS

1.4 QUALITY ASSURANCE

1.5 DELIVERY, STORAGE, AND HANDLING

A. Packaging: Insulation material containers are to be marked with the manufacturer's name, appropriate ASTM standard designation, type and grade, and maximum use temperature.

1.6 COORDINATION

A. Coordinate sizes and locations of supports, hangers, and insulation shields specified in Section 230529 "Hangers and Supports for HVAC Piping and Equipment."

B. Coordinate clearance requirements with duct Installer for duct insulation application. Before preparing ductwork Shop Drawings, establish and maintain clearance requirements for installation of insulation and field-applied jackets and finishes and for space required for maintenance.

C. Coordinate installation and testing of heat tracing.

1.7 SCHEDULING

A. Schedule insulation application after pressure testing systems and, where required, after installing and testing heat tracing. Insulation application may begin on segments that have satisfactory test results.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Surface-Burning Characteristics: For insulation and related materials, as determined by testing identical products in accordance with ASTM E84, by a testing agency acceptable to authorities having jurisdiction. Factory label insulation, jacket materials, adhesive, mastic, tapes, and cement material containers with appropriate markings of applicable testing agency.

1. All Insulation Installed Indoors: Flame-spread index of 25 or less, and smoke-developed index of 50 or less.

2.2 INSULATION MATERIALS

A. Comply with requirements in "Duct Insulation Schedule, General," "Indoor Duct and Plenum Insulation Schedule," and "Aboveground, Outdoor Duct and Plenum Insulation Schedule" articles for where insulating materials are to be applied.

B. Products do not contain asbestos, lead, mercury, or mercury compounds.

C. Products that come in contact with stainless steel have a leachable chloride content of less than 50 ppm when tested in accordance with ASTM C871.

D. Insulation materials for use on austenitic stainless steel are qualified as acceptable in accordance with ASTM C795.

E. Glass-Fiber Blanket: Glass fibers bonded with a thermosetting resin; suitable for maximum use temperature up to 450 deg F in accordance with ASTM C411. Comply with ASTM C553, Type II, and ASTM C1290, Type III with factory-applied FSK jacket . Factory-applied jacket requirements are specified in "Factory-Applied Jackets" Article.

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
   a. Johns Manville; a Berkshire Hathaway company.
   b. Knauf Insulation.
   c. Owens Corning.

F. Mineral Wool Blanket: Basalt volcanic rock-derived fibers bonded with a thermosetting resin, unfaced; suitable for maximum use temperature up to 1200 deg F in accordance with ASTM C447. Comply with ASTM C553.

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

a. Johns Manville; a Berkshire Hathaway company.
b. Owens Corning.
c. ROCKWOOL.

G. Glass-Fiber Board Insulation: Glass fibers bonded with a thermosetting resin; suitable for maximum use temperature between 35 deg F and 250 deg F for jacketed and between 35 deg F and 450 deg F for unfaced in accordance with ASTM C411. Comply with ASTM C612, Type IA or Type IB. For duct and plenum applications, provide insulation with factory-applied FSK jacket. Factory-applied jacket requirements are specified in "Factory-Applied Jackets" Article.

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
   a. Johns Manville; a Berkshire Hathaway company.
   b. Knauf Insulation.
   c. Owens Corning.

H. Mineral Wool Board: Basalt volcanic rock-derived fibers bonded with a thermosetting resin; suitable for maximum use temperature up to 1100 deg F in accordance with ASTM C411. Comply with ASTM C612, Type III, unfaced.

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
   a. Johns Manville; a Berkshire Hathaway company.
   b. Owens Corning.
   c. ROCKWOOL.

2.3 ADHESIVES

A. Materials are compatible with insulation materials, jackets, and substrates and for bonding insulation to itself and to surfaces to be insulated unless otherwise indicated.

B. Glass-Fiber and Mineral Wool Adhesive: Comply with MIL-A-3316C, Class 2, Grade A.

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
   a. Childers Brand; H. B. Fuller Construction Products.
   b. Eagle Bridges - Marathon Industries.
   c. Foster Brand; H. B. Fuller.
   d. Mon-Eco Industries, Inc.

2.4 MASTICS AND COATINGS

A. Materials are compatible with insulation materials, jackets, and substrates.

B. Vapor-Retarder Mastic, Water Based, Interior Use: Suitable for indoor use on below ambient services.

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
   a. Childers Brand; H. B. Fuller Construction Products.
   b. Knauf Insulation.
   c. Vimasco Corporation.
2. Water-Vapor Permeance: Comply with ASTM C755, Section 7.2.2, Table 2, for insulation type and service conditions.
3. Service Temperature Range: Minus 20 to plus 180 deg F.

2.5 TAPES

A. Aluminum-Foil Tape: Vapor-retarder tape with acrylic adhesive.

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
   a. 3M Industrial Adhesives and Tapes Division.
   b. Ideal Tape Co., Inc., an American Biltrite Company.
   c. Knauf Insulation.

2.6 SECUREMENTS

A. Bands:

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
   a. Johns Manville; a Berkshire Hathaway company.
   b. RPR Products, Inc.
2. Aluminum: ASTM B209, Alloy 3003, 3005, 3105, or 5005; Temper H-14, 0.020 inch thick, 3/4 inch wide with wing seal or closed seal.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates and conditions for compliance with requirements for installation tolerances and other conditions affecting performance of insulation application.

1. Verify that systems to be insulated have been tested and are free of defects.
2. Verify that surfaces to be insulated are clean and dry.

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

3.2 PREPARATION

A. Surface Preparation: Clean and dry surfaces to receive insulation. Remove materials that will adversely affect insulation application.

3.3 GENERAL INSTALLATION REQUIREMENTS

A. Install insulation materials, accessories, and finishes with smooth, straight, and even surfaces; free of voids throughout the length of ducts and fittings.

B. Install insulation materials, vapor barriers or retarders, jackets, and thicknesses required for each item of duct system as specified in insulation system schedules.

C. Install accessories compatible with insulation materials and suitable for the service. Install accessories that do not corrode, compress, or otherwise damage insulation or jacket.

D. Install insulation with longitudinal seams at top and bottom of horizontal runs.

E. Install multiple layers of insulation with longitudinal and end seams staggered.

F. Keep insulation materials dry during application and finishing. Replace insulation materials that get wet during storage or in the installation process before being properly covered and sealed in accordance with Contract Documents.

G. Install insulation with tight longitudinal seams and end joints. Bond seams and joints with adhesive recommended by insulation material manufacturer.

H. Install insulation with least number of joints practical.

I. Where vapor barrier is indicated, seal joints, seams, and penetrations in insulation at hangers, supports, anchors, and other projections with vapor-barrier mastic.

1. Install insulation continuously through hangers and around anchor attachments.
2. For insulation application where vapor barriers are indicated, extend insulation on anchor legs from point of attachment to supported item to point of attachment to structure. Taper and seal ends at attachment to structure with vapor-barrier mastic.
3. Install insert materials and install insulation to tightly join the insert. Seal insulation to insulation inserts with adhesive or sealing compound recommended by insulation material manufacturer.

J. Apply adhesives, mastics, and sealants at manufacturer's recommended coverage rate and wet and dry film thicknesses.

K. Install insulation with factory-applied jackets as follows:

1. Draw jacket tight and smooth, but not to the extent of creating wrinkles or areas of compression in the insulation.
2. Cover circumferential joints with 3-inch- wide strips, of same material as insulation jacket. Secure strips with adhesive and outward clinching staples along both edges of strip, spaced 4 inches o.c.
3. Overlap jacket longitudinal seams at least 1-1/2 inches. Clean and dry surface to receive self-sealing lap. Staple laps with outward clinching staples along edge at 4 inches o.c.
   a. For below ambient services, apply vapor-barrier mastic over staples.
4. Cover joints and seams with tape, according to insulation material manufacturer's written instructions, to maintain vapor seal.
5. Where vapor barriers are indicated, apply vapor-barrier mastic on seams and joints and at ends adjacent to duct flanges and fittings.

L. Cut insulation in a manner to avoid compressing insulation.

M. Finish installation with systems at operating conditions. Repair joint separations and cracking due to thermal movement.

N. Repair damaged insulation facings by applying same facing material over damaged areas. Extend patches at least 4 inches beyond damaged areas. Adhere, staple, and seal patches similar to butt joints.

3.4 PENETRATIONS

A. Insulation Installation at Roof Penetrations: Install insulation continuously through roof penetrations.

1. Seal penetrations with flashing sealant.
2. For applications requiring only indoor insulation, terminate insulation above roof surface and seal with joint sealant. For applications requiring indoor and outdoor insulation, install insulation for outdoor applications tightly joined to indoor insulation ends. Seal joint with joint sealant.
3. Extend jacket of outdoor insulation outside roof flashing at least 2 inches below top of roof flashing.
4. Seal jacket to roof flashing with flashing sealant.

3.5 INSTALLATION OF GLASS-FIBER AND MINERAL-WOOL INSULATION

A. Blanket Insulation Installation on Ducts and Plenums: Secure with adhesive and insulation pins.

B. Comply with manufacturer's written installation instructions.

1. Apply adhesive to entire circumference of ducts and to all surfaces of fittings and transitions.
2. Install either capacitor-discharge-weld pins and speed washers or cupped-head, capacitor-discharge-weld pins on sides and bottom of horizontal ducts and sides of vertical ducts as follows:
    a. On duct sides with dimensions 18 inches and smaller, place pins along longitudinal centerline of duct. Space 3 inches maximum from insulation end joints, and 16 inches o.c.
    b. On duct sides with dimensions larger than 18 inches, place pins 16 inches o.c. each way, and 3 inches maximum from insulation joints. Install additional pins to hold insulation tightly against surface at cross bracing.
    c. Pins may be omitted from top surface of horizontal, rectangular ducts and plenums.
    d. Do not overcompress insulation during installation.
    e. Impale insulation over pins and attach speed washers.
    f. Cut excess portion of pins extending beyond speed washers or bend parallel with insulation surface. Cover exposed pins and washers with tape matching insulation facing.
3. For ducts and plenums with surface temperatures below ambient, install a continuous unbroken vapor barrier. Create a facing lap for longitudinal seams and end joints with insulation by removing 2 inches from one edge and one end of insulation segment. Secure laps to adjacent insulation section with 1/2-inch outward-clinching staples, 1 inch o.c. Install vapor barrier consisting of factory- or field-applied jacket, adhesive, vapor-barrier mastic, and sealant at joints, seams, and protrusions.
    a. Repair punctures, tears, and penetrations with tape or mastic to maintain vapor-barrier seal.

b. Install vapor stops for ductwork and plenums operating below 50 deg F at 18-foot intervals. Vapor stops consist of vapor-barrier mastic applied in a Z-shaped pattern over insulation face, along butt end of insulation, and over the surface. Cover insulation face and surface to be insulated a width equal to two times the insulation thickness, but not less than 3 inches.

4. Overlap unfaced blankets a minimum of 2 inches on longitudinal seams and end joints. At end joints, secure with steel bands spaced a maximum of 18 inches o.c.
5. Install insulation on rectangular duct elbows and transitions with a full insulation section for each surface. Install insulation on round and flat-oval duct elbows with individually mitered gores cut to fit the elbow.
6. Insulate duct stiffeners, hangers, and flanges that protrude beyond insulation surface with 6-inch- wide strips of same material used to insulate duct. Secure on alternating sides of stiffener, hanger, and flange with pins spaced 6 inches o.c.

C. Board Insulation Installation on Ducts and Plenums: Secure with adhesive and insulation pins.

1. Apply adhesive to entire circumference of ducts and to all surfaces of fittings and transitions.
2. Install either capacitor-discharge-weld pins and speed washers or cupped-head, capacitor-discharge-weld pins on sides and bottom of horizontal ducts and sides of vertical ducts as follows:
   a. On duct sides with dimensions 18 inches and smaller, place pins along longitudinal centerline of duct. Space 3 inches maximum from insulation end joints, and 16 inches o.c.
   b. On duct sides with dimensions larger than 18 inches, space pins 16 inches o.c. each way, and 3 inches maximum from insulation joints. Install additional pins to hold insulation tightly against surface at cross bracing.
   c. Pins may be omitted from top surface of horizontal, rectangular ducts and plenums.
   d. Do not overcompress insulation during installation.
   e. Cut excess portion of pins extending beyond speed washers or bend parallel with insulation surface. Cover exposed pins and washers with tape matching insulation facing.
3. For ducts and plenums with surface temperatures below ambient, install a continuous unbroken vapor barrier. Create a facing lap for longitudinal seams and end joints with insulation by removing 2 inches from one edge and one end of insulation segment. Secure laps to adjacent insulation section with 1/2-inch outward-clinching staples, 1 inch o.c. Install vapor barrier consisting of factory- or field-applied jacket, adhesive, vapor-barrier mastic, and sealant at joints, seams, and protrusions.
   a. Repair punctures, tears, and penetrations with tape or mastic to maintain vapor-barrier seal.
   b. Install vapor stops for ductwork and plenums operating below 50 deg F at 18-foot intervals. Vapor stops consist of vapor-barrier mastic applied in a Z-shaped pattern over insulation face, along butt end of insulation, and over the surface. Cover insulation face and surface to be insulated a width equal to two times the insulation thickness, but not less than 3 inches.
4. Install insulation on rectangular duct elbows and transitions with a full insulation section for each surface. Groove and score insulation to fit as closely as possible to outside and inside radius of elbows. Install insulation on round and flat-oval duct elbows with individually mitered gores cut to fit the elbow.
5. Insulate duct stiffeners, hangers, and flanges that protrude beyond insulation surface with 6-inch- wide strips of same material used to insulate duct. Secure on alternating sides of stiffener, hanger, and flange with pins spaced 6 inches o.c.

3.6 FIELD-APPLIED JACKET INSTALLATION

A. Where glass-cloth jackets are indicated, install directly over bare insulation or insulation with factory-applied jackets.

1. Draw jacket smooth and tight to surface with 2-inch overlap at seams and joints.
2. Embed glass cloth between two 0.062-inch- thick coats of lagging adhesive.
3. Completely encapsulate insulation with coating, leaving no exposed insulation.

B. Where FSK jackets are indicated, install as follows:

1. Draw jacket material smooth and tight.
2. Install lap or joint strips with same material as jacket.
3. Secure jacket to insulation with manufacturer's recommended adhesive.
4. Install jacket with 1-1/2-inch laps at longitudinal seams and 3-inch- wide joint strips at end joints.
5. Seal openings, punctures, and breaks in vapor-retarder jackets and exposed insulation with vapor-barrier mastic.

C. Where PVC jackets are indicated, install with 1-inch overlap at longitudinal seams and end joints; for horizontal applications, install with longitudinal seams along top and bottom of tanks and vessels. Seal with manufacturer's recommended adhesive.

1. Apply two continuous beads of adhesive to seams and joints, one bead under lap and the finish bead along seam and joint edge.

D. Where metal jackets are indicated, install with 2-inch overlap at longitudinal seams and end joints. Overlap longitudinal seams arranged to shed water. Seal end joints with weatherproof sealant recommended by insulation manufacturer. Secure jacket with stainless steel bands 12 inches o.c. and at end joints.

3.7 FINISHES

A. Insulation with ASJ, Glass-Cloth, or Other Paintable Jacket Material: Paint jacket with paint system identified below and as specified in Section 099113 "Exterior Painting" and Section 099123 "Interior Painting."

B. Flexible Elastomeric Thermal Insulation: After adhesive has fully cured, apply two coats of insulation manufacturer's recommended protective coating.

C. Color: Final color as selected by Architect. Vary first and second coats to allow visual inspection of the completed Work.

D. Do not field paint aluminum or stainless steel jackets.

3.8 DUCT INSULATION SCHEDULE, GENERAL

A. Plenums and Ducts Requiring Insulation:

1. Indoor, concealed supply and outdoor air.
2. Indoor, concealed exhaust between isolation damper and penetration of building exterior.

B. Items Not Insulated:

1. Metal ducts with duct liner of sufficient thickness to comply with energy code and ASHRAE/IESNA 90.1.
2. Factory-insulated flexible ducts.
3. Flexible connectors.
4. Vibration-control devices.
5. Factory-insulated access panels and doors.

3.9 INDOOR DUCT AND PLENUM INSULATION SCHEDULE

A. All duct's insulation R-values shall comply with the current version of the WSEC. See tables C403.10.1.1 and C403.10.1.2.

3.10 ABOVEGROUND, OUTDOOR DUCT AND PLENUM INSULATION SCHEDULE

A. Insulation materials and thicknesses are identified below. If more than one material is listed for a duct system, selection from materials listed is Contractor's option.

END OF SECTION 230713

SECTION 230816 - COMMISSIONING OF MECHANICAL SYSTEMS SUPPORT

PART 1 - GENERAL

1.1 SCOPE OF THE WORK

A. The purpose of this section is to specify Division 21, 22, and 23 responsibilities and participation in the commissioning process.

B. Commissioning is the responsibility of the Contractor (including subcontractors and vendors). The Contractor is responsible for providing all scheduling, coordination and support required for start-up, testing, and commissioning (see Division 01). Commissioning Section is intended to provide an indication of the tests which must be performed by the Contractor prior to and including verification by the Owner's Representative. The commissioning process requires Division 21, 22, and 23 participation to ensure all portions of the work have been completed in a satisfactory and fully operational manner.

C. Work of Division 21, 22, and 23 includes the following:
1. Attend commissioning scoping meetings. At a minimum, the Mechanical, TAB, and Controls Contractors shall participate. Equipment vendor representatives shall also attend upon request of the Commissioning Agent and Test Engineer. These meetings shall further define the testing requirements and participation of each contractor and sub-contractors for each commissioning activity.
2. Attend other meetings as required to facilitate the commissioning process. This shall include bi-monthly meetings during the startup period and weekly meetings starting at the beginning of the Owner-witnessed point to point and Functional Testing period. Other meetings may be required as problems arise, apart from the regularly-scheduled commissioning meetings.
3. Controls Contractor shall be required to attend additional meetings intended to clarify the controls sequences of operation and reconcile any differences with the design intent. This meeting shall take place after the first Controls sequence of operations is submitted and reviewed.
4. Provide Commissioning Authority and Test Engineer additional requested data, prior to normal O&M Manual submittal, in a timely manner for the development of the startup plan and the functional performance testing procedures.
5. During the normal submittal processes, provide an additional copy of all equipment submittals, startup forms, field static testing reports (duct static pressure test reports, pipe static pressure test reports, chemical treatment reports, etc.), and TAB reports to the Commissioning Authority and Test Engineer for review.
6. Mechanical Contractor shall install pressure/temperature test ports (i.e. - Pete’s plugs) in all piping systems and at all locations where DDC controls pressure and temperature sensors are located.
7. The Mechanical Prime Contractor shall be responsible for development of a comprehensive startup plan, incorporating the controls contractor point-to-point startup plan. The startup plan shall be developed with the help of the Test Engineer in order to integrate startup activities with the Test Engineer’s commissioning plan. Mechanical Sub-Contractors shall assist the Mechanical Prime Contractor in development of the startup plan.
8. The Mechanical Contractor shall provided detailed startup forms and clearly document all completed startup activities. The controls startup forms shall include detailed checkout forms with descriptions for each controlled device. All forms shall be submitted for review by the Test Engineer and Commissioning Authority prior to use.

9. Provide skilled technicians, including equipment vendor representatives, equipment, and materials to perform startup and execute functional performance tests. Controls contractor shall provide skilled technicians, familiar with the project, for both startup (Owner-witnessed point-to-point testing) and functional performance testing. Commissioning functional performance testing participation from the controls contractor shall be required in addition to the point-to-point testing.
10. Correct deficiencies found during startup and functional performance testing in a timely manner to facilitate retesting activities within the commissioning schedule.
11. Submit startup documentation to General Contractor, Test Engineer, and Commissioning Authority to verify functional testing prerequisite requirements are fulfilled before functional testing for the associated equipment or system is scheduled to start. Refer to Section “General Commissioning Requirements,” for commissioning procedure. Startup documentation (point-to-point testing) shall also be required from the controls contractor as a prerequisite to functional performance testing.
12. TAB Contractor shall report any deficiencies found in a timely manner to the Mechanical Contractor. The Mechanical Contractor shall correct these deficiencies in a timely manner to facilitate functional performance testing within the commissioning schedule.
13. TAB Contractor shall coordinate all setpoint value requirements for input into the controls system, including minimum outside air damper positions, return/supply fan VFD speed mapping, pumping loop differential pressure setpoints, duct system static pressure setpoints, air terminal unit flow sensor calibration factors, etc.
14. Maintain and update as-built drawings during construction including controls as-built drawings.
15. Provide final O&M manuals that incorporate all system changes including controls sequence of operations.
16. Providing training, for equipment and systems specified under this section, with coordination by the Contractor and Owner's Representative

1.2 RELATED WORK

A. Division 23 Section “Commissioning of Mechanical Systems – General Requirements.”

B. Division 23 Section “Commissioning of Mechanical Systems – Functional Performance Testing.”

C. All start-up and testing procedures and documentation requirements specified within Division 23.

D. Cooperate with the Testing, Adjusting and Balancing (TAB) firm in the following manner:
1. Allow sufficient time before final commissioning dates so that testing, adjusting and balancing can be accomplished.
2. Put all heating, ventilating, and air conditioning equipment and systems into full operation and continue the operation during each working day of testing, adjusting, balancing and commissioning.
3. Provide labor and material to make corrections when required, without undue delay.
4. Include the cost of exchange sheaves and belts as may be required by the TAB firm.

PART 2 - PRODUCTS

2.1 TEST EQUIPMENT

A. Provide test equipment as necessary for start-up and commissioning of the mechanical equipment and systems. The TAB firm will provide the test equipment required to perform TAB services.

B. Proprietary test equipment required by the mechanical equipment manufacturer, whether specified or not, shall be provided by the manufacturer of the equipment. Manufacturer shall demonstrate its use and assist the Contractor in the commissioning process.

PART 3 - EXECUTION

3.1 WORK PRIOR TO COMMISSIONING

A. Complete all phases of work so each system can be started, tested, adjusted, balanced, and otherwise commissioned. Division 23 has primary start-up responsibilities with obligations to complete systems, including all sub-systems, so they are fully functional. This includes the complete installation of all equipment, materials, pipe, duct, wire, insulation, controls, etc., per the contract documents and related directives, clarifications, change orders, etc.

B. A commissioning plan will be developed by the Test Engineer and approved by the Owner's Representative.
   1. Division 23 shall be obligated to assist the Test Engineer in preparing the commissioning plan by providing all necessary information pertaining to the actual equipment and installation, identification of parties responsible for startup activities, and schedule dates for equipment startup activities.
   2. If system modifications/clarifications are called for in the contractual requirements of this and related sections of work, they will be made at no additional cost to the Owner.
   3. If Contractor-initiated system changes have been made that alter the commissioning process, the Contractor will notify the Owner's Representative for approval.

3.2 PARTICIPATION IN COMMISSIONING

A. Provide skilled technicians to start up all systems within Division 23.
   1. These same technicians shall be made available to assist the Contractor and Commissioning Authority in completing the commissioning program as it relates to each system and their technical specialty.
   2. Work schedules, time required for testing, etc., will be requested and coordinated by the Contractor.
   3. Division 23 will ensure that qualified technician(s) are available and present during the agreed-upon schedules and for sufficient duration to complete the necessary tests, adjustment, and problem resolutions.

B. System problems and discrepancies may require additional technician time which shall be made available for the subsequent commissioning periods until required system performance is obtained.

C. The Owner's Representative reserves the right to judge the appropriateness and qualifications of the technicians relative to each item of equipment or system. Such qualifications 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 Contractor to get the job done.

3.3 WORK TO RESOLVE DEFICIENCIES

A. In some systems, misadjustments, misapplied equipment and/or deficient performance under varying loads will result in additional work being required to commission the systems. This work will be completed under the direction of the Owner's Representative and the Architect, with input from the Contractor and equipment supplier. Whereas all members will have input and the opportunity to discuss the work and resolve problems, the Architect will have final jurisdiction on the work needed to achieve performance.

B. Corrective work shall be completed in a timely fashion to permit timely completion of the commissioning process.
   1. Experimentation to render system performance will be permitted.
      a. If the Architect deems the experimentation work to be ineffective or untimely as it relates to the commissioning process, the Architect will notify the Owner indicating the nature of the problem, expected steps to be taken, and the deadline for completion of activities.
      b. If deadlines pass without resolution of the problem, the Owner reserves the right to obtain supplementary services and/or equipment to resolve the problem.
      c. Costs incurred to solve the problem in an expeditious manner will be the Contractor's responsibility.

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.
   1. Initial commissioning will be done as soon as contract work is completed regardless of season.
   2. Commissioning under conditions representing other than the current season may be undertaken at a later time by the Test Engineer and Commissioning Authority.
   3. Discrepancies discovered with the Contractor’s equipment or workmanship will be handled as warranty items.

3.5 RETESTING AND RECOMMISSIONING

A. Any fault in material or in any part of the installation revealed by commissioning tests shall be investigated, replaced, or repaired by the Contractor, and the same test repeated at the Contractor’s expense until no fault appears.

3.6 TRAINING

A. Participate in the training of the Owner's engineering and maintenance staff, as required in Divisions 01 and 23, on each system and related components. Training, in part, will be conducted in a classroom setting, with system and component documentation, and suitable classroom training aids.

B. Training shall be conducted jointly by the Contractor, the Design Engineers, and the equipment vendors. The Contractor will be responsible for highlighting system peculiarities specific to this project.

3.7 MISCELLANEOUS SUPPORT

A. Division 23 shall remove and replace covers of mechanical equipment, open access panels, etc., to permit Contractor, Architect and Owner's Representative to observe equipment and controllers provided. Furnish ladders and flashlights as necessary.

END OF SECTION 230816

SECTION 232300 - REFRIGERANT PIPING

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 tube and fittings.
2. Steel pipe and fittings.
3. Valves and specialties.
4. Refrigerants.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of valve, refrigerant piping, and piping specialty.

1. Include pressure drop, based on manufacturer's test data, for the following:
   a. Thermostatic expansion valves.
   b. Solenoid valves.
   c. Hot-gas bypass valves.
   d. Filter dryers.
   e. Strainers.
   f. Pressure-regulating valves.

1.4 INFORMATIONAL SUBMITTALS

1.5 CLOSEOUT SUBMITTALS

1.6 QUALITY ASSURANCE

A. Welding Qualifications: Qualify procedures and personnel according to 2010 ASME Boiler and Pressure Vessel Code: Section IX, "Welding and Brazing Qualifications."

B. Comply with ASHRAE 15, "Safety Code for Refrigeration Systems."

C. Comply with ASME B31.5, "Refrigeration Piping and Heat Transfer Components."

1.7 PRODUCT STORAGE AND HANDLING

A. Store piping with end caps in place to ensure that piping interior and exterior are clean when installed.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Line Test Pressure for Refrigerant R-410A:

1. Hot-Gas and Liquid Lines: 535 psig.

2.2 COPPER TUBE AND FITTINGS

A. Copper Tube: ASTM B 280, Type ACR.

B. Wrought-Copper Fittings, Solder-Joint: ASME B16.22.

C. Wrought-Copper Fittings, Brazed-Joint: ASME B16.50.

D. Wrought-Copper Unions: ASME B16.22.

E. Solder Filler Metals: ASTM B 32. Use 95-5 tin antimony or alloy HB solder to join copper socket fittings on copper pipe.

F. Brazing Filler Metals: AWS A5.8/A5.8M.

G. Flexible Connectors:

1. Body: Tin-bronze bellows with woven, flexible, tinned-bronze-wire-reinforced protective jacket.
2. End Connections: Socket ends.
3. Offset Performance: Capable of minimum 3/4-inch misalignment in minimum 7-inch- long assembly.
4. Working Pressure Rating: Factory test at minimum 500 psig.
5. Maximum Operating Temperature: 250 deg F.

H. Copper-Tube, Pressure-Seal-Joint Fittings for Refrigerant Piping:

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
   a. Conex Banninger - USA.
2. Standard: UL 207; certified by UL for field installation. Certification as a UL-recognized component alone is unacceptable.
3. Housing: Copper.
4. O-Rings: HNBR or compatible with specific refrigerant.
5. Tools: Manufacturer's approved special tools.
6. Minimum Rated Pressure: 700 psig.

2.3 STEEL PIPE AND FITTINGS

A. Steel Pipe: ASTM A 53/A 53M, black steel with plain ends; type, grade, and wall thickness as selected in piping application articles.

B. Wrought-Steel Fittings: ASTM A 234/A 234M, for welded joints.

C. Steel Flanges and Flanged Fittings: ASME B16.5, steel, including bolts, nuts, and gaskets, bevel-welded end connection, and raised face.

D. Welding Filler Metals: Comply with AWS D10.12M/D10.12 for welding materials appropriate for wall thickness and chemical analysis of steel pipe being welded.

E. Flanged Unions:

1. Body: Forged-steel flanges for NPS 1 to NPS 1-1/2 and ductile iron for NPS 2 to NPS 3. Apply rust-resistant finish at factory.
2. Gasket: Fiber asbestos free.
3. Fasteners: Four plated-steel bolts, with silicon bronze nuts. Apply rust-resistant finish at factory.
4. End Connections: Brass tailpiece adapters for solder-end connections to copper tubing.
5. Offset Performance: Capable of minimum 3/4-inch misalignment in minimum 7-inch- long assembly.
6. Pressure Rating: Factory test at minimum 400 psig.
7. Maximum Operating Temperature: 330 deg F.

F. Flexible Connectors:

1. Body: Stainless-steel bellows with woven, flexible, stainless-steel-wire-reinforced protective jacket.
2. End Connections:
   a. NPS 2 and Smaller: With threaded-end connections.
   b. NPS 2-1/2 and Larger: With flanged-end connections.
3. Offset Performance: Capable of minimum 3/4-inch misalignment in minimum 7-inch- long assembly.
4. Pressure Rating: Factory test at minimum 500 psig.
5. Maximum Operating Temperature: 250 deg F.

2.4 VALVES AND SPECIALTIES

A. Diaphragm Packless Valves:

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
   a. Danfoss Inc.
   b. Parker Hannifin Corp.
2. Body and Bonnet: Forged brass or cast bronze; globe design with straight-through or angle pattern.
3. Diaphragm: Phosphor bronze and stainless steel with stainless-steel spring.
4. Operator: Rising stem and hand wheel.
5. Seat: Nylon.
6. End Connections: Socket, union, or flanged.

7. Working Pressure Rating: 500 psig.
8. Maximum Operating Temperature: 275 deg F.

B. Packed-Angle Valves:

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
   a. Danfoss Inc.
   b. Heldon Products; Henry Technologies.
   c. Parker Hannifin Corp.
2. Body and Bonnet: Forged brass or cast bronze.
3. Packing: Molded stem, back seating, and replaceable under pressure.
4. Operator: Rising stem.
5. Seat: Nonrotating, self-aligning polytetrafluoroethylene.
6. Seal Cap: Forged-brass or valox hex cap.
7. End Connections: Socket, union, threaded, or flanged.
8. Working Pressure Rating: 500 psig.
9. Maximum Operating Temperature: 275 deg F.

C. Check Valves:

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
   a. Danfoss Inc.
   b. Emerson Climate Technologies.
   c. Heldon Products; Henry Technologies.
   d. Parker Hannifin Corp.
2. Body: Ductile iron, forged brass, or cast bronze; globe pattern.
3. Bonnet: Bolted ductile iron, forged brass, or cast bronze; or brass hex plug.
4. Piston: Removable polytetrafluoroethylene seat.
5. Closing Spring: Stainless steel.
6. Manual Opening Stem: Seal cap, plated-steel stem, and graphite seal.
7. End Connections: Socket, union, threaded, or flanged.
8. Maximum Opening Pressure: 0.50 psig.
9. Working Pressure Rating: 500 psig.
10. Maximum Operating Temperature: 275 deg F.

D. Service Valves:

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
   a. Danfoss Inc.
   b. Emerson Climate Technologies.
   c. Heldon Products; Henry Technologies.
   d. Parker Hannifin Corp.
2. Body: Forged brass with brass cap including key end to remove core.
3. Core: Removable ball-type check valve with stainless-steel spring.
4. Seat: Polytetrafluoroethylene.
5. End Connections: Copper spring.
6. Working Pressure Rating: 500 psig.

E. Refrigerant Locking Caps:

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
   a. C & D Valve, LLC.
   b. JB Industries.
   c. RectorSeal HVAC; a CSW Industrials Company.
2. Description: Locking-type, tamper-resistant, threaded caps to protect refrigerant charging ports from unauthorized refrigerant access and leakage.
3. Material: Brass, with protective shroud or sleeve.
4. Refrigerant Identification: Color-coded, refrigerant specific design.
5. Special Tool: For installing and unlocking.

F. Solenoid Valves: Comply with AHRI 760 and UL 429; listed and labeled by a National Recognized Testing Laboratory (NRTL).

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
   a. Danfoss Inc.
   b. Emerson Climate Technologies.
   c. Heldon Products; Henry Technologies.
   d. Parker Hannifin Corp.
2. Body and Bonnet: Plated steel.
3. Solenoid Tube, Plunger, Closing Spring, and Seat Orifice: Stainless steel.
4. Seat: Polytetrafluoroethylene.
5. End Connections: Threaded.
6. Electrical: Molded, watertight coil in NEMA 250 enclosure of type required by location with 1/2-inch conduit adapter, and 24 -V ac coil.
7. Working Pressure Rating: 400 psig.
8. Maximum Operating Temperature: 240 deg F.

G. Safety Relief Valves: Comply with 2010 ASME Boiler and Pressure Vessel Code; listed and labeled by an NRTL.

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
   a. Danfoss Inc.
   b. Heldon Products; Henry Technologies.
   c. Parker Hannifin Corp.
2. Body and Bonnet: Ductile iron and steel, with neoprene O-ring seal.
3. Piston, Closing Spring, and Seat Insert: Stainless steel.
4. Seat: Polytetrafluoroethylene.
5. End Connections: Threaded.
6. Working Pressure Rating: 400 psig.
7. Maximum Operating Temperature: 240 deg F.

H. Thermostatic Expansion Valves: Comply with AHRI 750.

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
   a. Danfoss Inc.
   b. Emerson Climate Technologies.
   c. Heldon Products; Henry Technologies.

2. Body, Bonnet, and Seal Cap: Forged brass or steel.
3. Diaphragm, Piston, Closing Spring, and Seat Insert: Stainless steel.
4. Packing and Gaskets: Non-asbestos.
5. Capillary and Bulb: Copper tubing filled with refrigerant charge.
6. Suction Temperature: 40 deg F .
7. Superheat: Adjustable .
8. Reverse-flow option (for heat-pump applications).
9. End Connections: Socket, flare, or threaded union.
10. Working Pressure Rating: 700 psig .

I. Hot-Gas Bypass Valves: Comply with UL 429; listed and labeled by an NRTL.

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
   a. Danfoss Inc.
   b. Heldon Products; Henry Technologies.
   c. Parker Hannifin Corp.
2. Body, Bonnet, and Seal Cap: Ductile iron or steel.
3. Diaphragm, Piston, Closing Spring, and Seat Insert: Stainless steel.
4. Packing and Gaskets: Non-asbestos.
5. Solenoid Tube, Plunger, Closing Spring, and Seat Orifice: Stainless steel.
6. Seat: Polytetrafluoroethylene.
7. Equalizer: Internal .
8. Electrical: Molded, watertight coil in NEMA 250 enclosure of type required by location with 1/2-inch conduit adapter and 24 -V ac coil.
9. End Connections: Socket.
10. Throttling Range: Maximum 5 psig.
11. Working Pressure Rating: 500 psig.
12. Maximum Operating Temperature: 240 deg F.

J. Straight-Type Strainers:

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
   a. Danfoss Inc.
   b. Heldon Products; Henry Technologies.
   c. Parker Hannifin Corp.
2. Body: Welded steel with corrosion-resistant coating.
3. Screen: 100-mesh stainless steel.
4. End Connections: Socket or flare.
5. Working Pressure Rating: 500 psig.
6. Maximum Operating Temperature: 275 deg F.

K. Angle-Type Strainers:

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
   a. Danfoss Inc.
   b. Heldon Products; Henry Technologies.
   c. Parker Hannifin Corp.
2. Body: Forged brass or cast bronze.
3. Drain Plug: Brass hex plug.

4. Screen: 100-mesh monel.
5. End Connections: Socket or flare.
6. Working Pressure Rating: 500 psig.
7. Maximum Operating Temperature: 275 deg F.

L. Moisture/Liquid Indicators:

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
   a. Danfoss Inc.
   b. Emerson Climate Technologies.
   c. Heldon Products; Henry Technologies.
   d. Parker Hannifin Corp.
2. Body: Forged brass.
3. Window: Replaceable, clear, fused glass window with indicating element protected by filter screen.
4. Indicator: Color coded to show moisture content in parts per million (ppm).
5. Minimum Moisture Indicator Sensitivity: Indicate moisture above 60 ppm.
6. End Connections: Socket or flare.
7. Working Pressure Rating: 500 psig.
8. Maximum Operating Temperature: 240 deg F.

M. Replaceable-Core Filter Dryers: Comply with AHRI 730.

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
   a. Danfoss Inc.
   b. Heldon Products; Henry Technologies.
   c. Parker Hannifin Corp.
2. Body and Cover: Painted-steel shell with ductile-iron cover, stainless-steel screws, and neoprene gaskets.
3. Filter Media: 10 micron, pleated with integral end rings; stainless-steel support.
4. Desiccant Media: Activated charcoal.
5. Designed for reverse flow (for heat-pump applications).
6. End Connections: Socket.
7. Access Ports: NPS 1/4 connections at entering and leaving sides for pressure differential measurement.
8. Maximum Pressure Loss: 2 psig .
9. Working Pressure Rating: 500 psig.
10. Maximum Operating Temperature: 240 deg F.

N. Permanent Filter Dryers: Comply with AHRI 730.

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
   a. Danfoss Inc.
   b. Heldon Products; Henry Technologies.
   c. Parker Hannifin Corp.
2. Body and Cover: Painted-steel shell.
3. Filter Media: 10 micron, pleated with integral end rings; stainless-steel support.
4. Desiccant Media: Activated charcoal.
5. Designed for reverse flow (for heat-pump applications).

6. End Connections: Socket.
7. Access Ports: NPS 1/4 connections at entering and leaving sides for pressure differential measurement.
8. Maximum Pressure Loss: 2 psig .
9. Working Pressure Rating: 500 psig.
10. Maximum Operating Temperature: 240 deg F.

O. Mufflers:

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
   a. Danfoss Inc.
   b. Emerson Climate Technologies.
   c. Heldon Products; Henry Technologies.
2. Body: Welded steel with corrosion-resistant coating.
3. End Connections: Socket or flare.
4. Working Pressure Rating: 500 psig.
5. Maximum Operating Temperature: 275 deg F.

P. Receivers: Comply with AHRI 495.

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
   a. Heldon Products; Henry Technologies.
2. Comply with 2010 ASME Boiler and Pressure Vessel Code; listed and labeled by an NRTL.
3. Comply with UL 207; listed and labeled by an NRTL.
4. Body: Welded steel with corrosion-resistant coating.
5. Tappings: Inlet, outlet, liquid level indicator, and safety relief valve.
6. End Connections: Socket or threaded.
7. Working Pressure Rating: 500 psig.
8. Maximum Operating Temperature: 275 deg F.

Q. Liquid Accumulators: Comply with AHRI 495.

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
   a. Emerson Climate Technologies.
   b. Heldon Products; Henry Technologies.
   c. Parker Hannifin Corp.
2. Body: Welded steel with corrosion-resistant coating.
3. End Connections: Socket or threaded.
4. Working Pressure Rating: 500 psig.
5. Maximum Operating Temperature: 275 deg F.

2.5 REFRIGERANTS

A. ASHRAE 34, R-410A: Pentafluoroethane/Difluoromethane.

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
   a. DuPont Fluorochemicals Div.
   b. Genetron Refrigerants; Honeywell International Inc.

PART 3 - EXECUTION

3.1 PIPING APPLICATIONS FOR REFRIGERANT R-410A

A. Hot-Gas and Liquid Lines , and Suction Lines for Heat-Pump Applications:

1. Copper, , annealed- or drawn-temper tubing and wrought-copper fittings with brazed or soldered joints.
2. Copper, , drawn-temper tubing and wrought-copper fittings with 95-5 tin-antimony soldered joints.
3. Copper, Type ACR , drawn-temper tubing and wrought-copper fittings with Alloy HB soldered joints.

3.2 VALVE AND SPECIALTY APPLICATIONS

A. Install diaphragm packless packed-angle valves in suction and discharge lines of compressor.

B. Install service valves for gauge taps at inlet and outlet of hot-gas bypass valves and strainers if they are not an integral part of valves and strainers.

C. Install a check valve at the compressor discharge and a liquid accumulator at the compressor suction connection.

D. Except as otherwise indicated, install diaphragm packless packed-angle valves on inlet and outlet side of filter dryers.

E. Install a full-size, three-valve bypass around filter dryers.

F. Install solenoid valves upstream from each expansion valve and hot-gas bypass valve. Install solenoid valves in horizontal lines with coil at top.

G. Install thermostatic expansion valves as close as possible to distributors on evaporators.

1. Install valve so diaphragm case is warmer than bulb.
2. Secure bulb to clean, straight, horizontal section of suction line using two bulb straps. Do not mount bulb in a trap or at bottom of the line.
3. If external equalizer lines are required, make connection where it will reflect suction-line pressure at bulb location.

H. Install safety relief valves where required by 2010 ASME Boiler and Pressure Vessel Code. Pipe safety-relief-valve discharge line to outside according to ASHRAE 15.

I. Install moisture/liquid indicators in liquid line at the inlet of the thermostatic expansion valve or at the inlet of the evaporator coil capillary tube.

J. Install strainers upstream from and adjacent to the following unless they are furnished as an integral assembly for the device being protected:

1. Solenoid valves.
2. Thermostatic expansion valves.
3. Hot-gas bypass valves.
4. Compressor.

K. Install filter dryers in liquid line between compressor and thermostatic expansion valve , and in the suction line at the compressor.

L. Install receivers sized to accommodate pump-down charge.

M. Install flexible connectors at compressors.

N. Provide refrigerant locking caps on refrigerant charging ports that are located outdoors unless otherwise protected from unauthorized access by a means acceptable to the authority having jurisdiction.

3.3 INSTALLATION OF PIPING, GENERAL

A. Drawing plans, schematics, and diagrams indicate general location and arrangement of piping systems; indicated locations and arrangements were used to size pipe and calculate friction loss, expansion, pump sizing, and other design considerations. Install piping as indicated unless deviations to layout are approved on Shop Drawings.

B. Install refrigerant piping according to ASHRAE 15.

C. Install piping in concealed locations unless otherwise indicated and except in equipment rooms and service areas.

D. Install piping indicated to be exposed and piping in equipment rooms and service areas at right angles or parallel to building walls. Diagonal runs are prohibited unless specifically indicated otherwise.

E. Install piping above accessible ceilings to allow sufficient space for ceiling panel removal.

F. Install piping adjacent to machines to allow service and maintenance.

G. Install piping free of sags and bends.

H. Install fittings for changes in direction and branch connections.

I. Select system components with pressure rating equal to or greater than system operating pressure.

J. Refer to Section 230923 "Direct Digital Control (DDC) System for HVAC" and Section 230993.11 "Sequence of Operations for HVAC DDC" for solenoid valve controllers, control wiring, and sequence of operation.

K. Install piping as short and direct as possible, with a minimum number of joints, elbows, and fittings.

L. Arrange piping to allow inspection and service of refrigeration equipment. Install valves and specialties in accessible locations to allow for service and inspection. Install access doors or panels as specified in Section 083113 "Access Doors and Frames" if valves or equipment requiring maintenance is concealed behind finished surfaces.

M. Install refrigerant piping in protective conduit where installed belowground.

N. Install refrigerant piping in rigid or flexible conduit in locations where exposed to mechanical injury.

O. Slope refrigerant piping as follows:

1. Install horizontal hot-gas discharge piping with a uniform slope downward away from compressor.
2. Install horizontal suction lines with a uniform slope downward to compressor.
3. Install traps and double risers to entrain oil in vertical runs.
4. Liquid lines may be installed level.

P. When brazing or soldering, remove solenoid-valve coils and sight glasses; also remove valve stems, seats, and packing, and accessible internal parts of refrigerant specialties. Do not apply heat near expansion-valve bulb.

Q. Before installation of steel refrigerant piping, clean pipe and fittings using the following procedures:

1. Shot blast the interior of piping.
2. Remove coarse particles of dirt and dust by drawing a clean, lintless cloth through tubing by means of a wire or electrician's tape.
3. Draw a clean, lintless cloth saturated with trichloroethylene through the tube or pipe. Continue this procedure until cloth is not discolored by dirt.
4. Draw a clean, lintless cloth, saturated with compressor oil, squeezed dry, through the tube or pipe to remove remaining lint. Inspect tube or pipe visually for remaining dirt and lint.
5. Finally, draw a clean, dry, lintless cloth through the tube or pipe.
6. Safety-relief-valve discharge piping is not required to be cleaned but is required to be open to allow unrestricted flow.

R. Install piping with adequate clearance between pipe and adjacent walls and hangers or between pipes for insulation installation.

S. Identify refrigerant piping and valves according to Section 230553 "Identification for HVAC Piping and Equipment."

T. Install sleeves for piping penetrations of walls, ceilings, and floors. Comply with requirements for sleeves specified in Section 230517 "Sleeves and Sleeve Seals for HVAC Piping."

U. Install sleeve seals for piping penetrations of concrete walls and slabs. Comply with requirements for sleeve seals specified in Section 230517 "Sleeves and Sleeve Seals for HVAC Piping."

V. Install escutcheons for piping penetrations of walls, ceilings, and floors. Comply with requirements for escutcheons specified in Section 230518 "Escutcheons for HVAC Piping."

3.4 PIPE JOINT CONSTRUCTION

A. Ream ends of pipes and tubes and remove burrs. Bevel plain ends of steel pipe.

B. Remove scale, slag, dirt, and debris from inside and outside of pipe and fittings before assembly.

C. Fill pipe and fittings with an inert gas (nitrogen or carbon dioxide), during brazing or welding, to prevent scale formation.

D. Soldered Joints: Construct joints according to ASTM B 828 or CDA's "Copper Tube Handbook."

E. Brazed Joints: Construct joints according to AWS's "Brazing Handbook," Chapter "Pipe and Tube."

1. Use Type BCuP (copper-phosphorus) alloy for joining copper socket fittings with copper pipe.
2. Use Type BAg (cadmium-free silver) alloy for joining copper with bronze or steel.

F. Threaded Joints: Thread steel pipe with tapered pipe threads according to ASME B1.20.1. Cut threads full and clean using sharp dies. Ream threaded pipe ends to remove burrs and to restore full ID. Join pipe fittings and valves as follows:

1. Apply appropriate tape or thread compound to external pipe threads unless dry-seal threading is specified.
2. Damaged Threads: Do not use pipe or pipe fittings with threads that are corroded or damaged. Do not use pipe sections that have cracked or open welds.

G. Steel pipe can be threaded, but threaded joints must be seal brazed or seal welded.

H. Welded Joints: Construct joints according to AWS D10.12M/D10.12.

I. Flanged Joints: Select appropriate gasket material, size, type, and thickness for service application. Install gasket concentrically positioned. Use suitable lubricants on bolt threads.

3.5 INSTALLATION OF HANGERS AND SUPPORTS

A. Comply with requirements for seismic restraints in Section 230548 "Vibration and Seismic Controls for HVAC."

B. Comply with Section 230529 "Hangers and Supports for HVAC Piping and Equipment" for hangers, supports, and anchor devices.

C. Install the following pipe attachments:

1. Adjustable steel clevis hangers for individual horizontal runs less than 20 feet long.
2. Roller hangers and spring hangers for individual horizontal runs 20 feet or longer.
3. Pipe Roller: MSS SP-58, Type 44 for multiple horizontal piping 20 feet or longer, supported on a trapeze.
4. Spring hangers to support vertical runs.
5. Copper-clad hangers and supports for hangers and supports in direct contact with copper pipe.

D. Install hangers for copper tubing , with maximum horizontal spacing and minimum rod diameters, to comply with MSS-58, locally enforced codes, and authorities having jurisdiction requirements, whichever are most stringent.

E. Support horizontal piping within 12 inches of each fitting.

F. Support vertical runs of copper tubing to comply with MSS-58, locally enforced codes, and authorities having jurisdiction requirements, whichever are most stringent.

3.6 FIELD QUALITY CONTROL

A. Perform the following tests and inspections:

1. Comply with ASME B31.5, Chapter VI.
2. Test refrigerant piping, specialties, and receivers. Isolate compressor, condenser, evaporator, and safety devices from test pressure if they are not rated above the test pressure.
3. Test high- and low-pressure side piping of each system separately at not less than the pressures indicated in "Performance Requirements" Article.
    a. Fill system with nitrogen to the required test pressure.
    b. System shall maintain test pressure at the manifold gage throughout duration of test.
    c. Test joints and fittings with electronic leak detector or by brushing a small amount of soap and glycerin solution over joints.
    d. Remake leaking joints using new materials, and retest until satisfactory results are achieved.

B. Prepare test and inspection reports.

3.7 SYSTEM CHARGING

A. Charge system using the following procedures:

1. Install core in filter dryers after leak test but before evacuation.
2. Evacuate entire refrigerant system with a vacuum pump to 500 micrometers. If vacuum holds for 12 hours, system is ready for charging.
3. Break vacuum with refrigerant gas, allowing pressure to build up to 2 psig.
4. Charge system with a new filter-dryer core in charging line.

3.8 ADJUSTING

A. Adjust thermostatic expansion valve to obtain proper evaporator superheat.

B. Adjust high- and low-pressure switch settings to avoid short cycling in response to fluctuating suction pressure.

C. Adjust set-point temperature of air-conditioning or chilled-water controllers to the system design temperature.

D. Perform the following adjustments before operating the refrigeration system, according to manufacturer's written instructions:

1. Open shutoff valves in condenser water circuit.
2. Verify that compressor oil level is correct.
3. Open compressor suction and discharge valves.
4. Open refrigerant valves except bypass valves that are used for other purposes.
5. Check open compressor-motor alignment and verify lubrication for motors and bearings.

E. Replace core of replaceable filter dryer after system has been adjusted and after design flow rates and pressures are established.

END OF SECTION 232300

SECTION 233113 - METAL DUCTS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Single-wall rectangular ducts and fittings.
2. Single-wall round ducts and fittings.
3. Sheet metal materials.
4. Duct liner.
5. Sealants and gaskets.
6. Hangers and supports.

B. Related Requirements:

1. Section 230548 "Vibration and Seismic Controls for HVAC" for seismic restraint devices and installation.
2. Section 230593 "Testing, Adjusting, and Balancing for HVAC" for testing, adjusting, and balancing requirements for metal ducts.
3. Section 233116 "Nonmetal Ducts" for fibrous-glass ducts, thermoset fiber-reinforced plastic ducts, thermoplastic ducts, PVC ducts, and concrete ducts.
4. Section 233119 "HVAC Casings" for factory- and field-fabricated casings for mechanical equipment.
5. Section 233300 "Air Duct Accessories" for dampers, sound-control devices, duct-mounting access doors and panels, turning vanes, and flexible ducts.

1.2 DEFINITIONS

A. OSHPD: Office of Statewide Health Planning and Development (State of California).

1.3 ACTION SUBMITTALS

A. Product Data: For each type of the following products:

1. Liners and adhesives.
2. Sealants and gaskets.
3. Seismic-restraint devices.

B. Shop Drawings:

1. Fabrication, assembly, and installation, including plans, elevations, sections, components, and attachments to other work.
2. Factory- and shop-fabricated ducts and fittings.
3. Duct layout indicating sizes, configuration, liner material, and static-pressure classes.
4. Elevation of top of ducts.
5. Dimensions of main duct runs from building grid lines.
6. Fittings.

7. Reinforcement and spacing.
8. Seam and joint construction.
9. Penetrations through fire-rated and other partitions.
10. Equipment installation based on equipment being used on Project.
11. Locations for duct accessories, including dampers, turning vanes, and access doors and panels.
12. Hangers and supports, including methods for duct and building attachment , seismic restraints, and vibration isolation.

1.4 INFORMATIONAL SUBMITTALS

A. Coordination Drawings: A single set of plans or BIM model, drawn to scale, showing the items described in this Section, and coordinated with all building trades.

1.5 QUALITY ASSURANCE

A. Welding Qualifications: Qualify procedures and personnel in accordance with the following:

1. AWS D1.1/D1.1M, "Structural Welding Code - Steel," for hangers and supports.
2. AWS D1.2/D1.2M, "Structural Welding Code - Aluminum," for aluminum supports.
3. AWS D9.1/D9.1M, "Sheet Metal Welding Code," for duct joint and seam welding.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Delegated Duct Design: Duct construction, including sheet metal thicknesses, seam and joint construction, reinforcements, and hangers and supports, comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible" and with performance requirements and design criteria indicated in "Duct Schedule" Article.

B. Airstream Surfaces: Surfaces in contact with airstream comply with requirements in ASHRAE 62.1.

C. ASHRAE Compliance: Applicable requirements in ASHRAE 62.1, Section 5 - "Systems and Equipment," and Section 7 - "Construction and System Startup."

D. ASHRAE/IES Compliance: Applicable requirements in ASHRAE/IES 90.1, Section 6.4.4 - "HVAC System Construction and Insulation."

E. Duct Dimensions: Unless otherwise indicated, all duct dimensions indicated on Drawings are inside clear dimensions and do not include insulation or duct wall thickness.

2.2 SINGLE-WALL RECTANGULAR DUCTS AND FITTINGS

A. General Fabrication Requirements: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible" based on indicated static-pressure class unless otherwise indicated.

1. Construct ducts of galvanized sheet steel unless otherwise indicated.
2. For ducts exposed to weather, construct of Type 304 stainless steel indicated by manufacturer to be suitable for outdoor installation.

B. Transverse Joints: Fabricate joints in accordance with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 2-1, "Rectangular Duct/Transverse Joints," for static-pressure class, applicable sealing requirements, materials involved, duct-support intervals, and other provisions in SMACNA's "HVAC Duct Construction Standards - Metal and Flexible."

1. For ducts with longest side less than 36 inches, select joint types in accordance with Figure 2-1.
2. For ducts with longest side 36 inches or greater, use flange joint connector Type T-22, T-24, T-24A, T-25a, or T-25b. Factory-fabricated flanged duct connection system may be used if submitted and approved by engineer of record.
3. Where specified for specific applications, all joints are to be welded.

C. Longitudinal Seams: Select seam types and fabricate in accordance with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 2-2, "Rectangular Duct/Longitudinal Seams," for static-pressure class, applicable sealing requirements, materials involved, duct-support intervals, and other provisions in SMACNA's "HVAC Duct Construction Standards - Metal and Flexible."

1. Where specified for specific applications, all joints are to be welded.

D. Elbows, Transitions, Offsets, Branch Connections, and Other Duct Construction: Select types and fabricate in accordance with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Ch. 4, "Fittings and Other Construction," for static-pressure class, applicable sealing requirements, materials involved, duct-support intervals, and other provisions in SMACNA's "HVAC Duct Construction Standards - Metal and Flexible."

2.3 SINGLE-WALL ROUND DUCTS AND FITTINGS

A. General Fabrication Requirements: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Ch. 3, "Round, Oval, and Flexible Duct," based on indicated static-pressure class unless otherwise indicated.

1. Construct ducts of galvanized sheet steel unless otherwise indicated.
2. For ducts exposed to weather, construct of Type 304 stainless steel indicated by manufacturer to be suitable for outdoor installation.

B. Source Limitations: Obtain single-wall round ducts and fittings from single manufacturer.

C. Transverse Joints: Select joint types and fabricate in accordance with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 3-1, "Round Duct Transverse Joints," for static-pressure class, applicable sealing requirements, materials involved, duct-support intervals, and other provisions in SMACNA's "HVAC Duct Construction Standards - Metal and Flexible."

D. Longitudinal Seams: Select seam types and fabricate in accordance with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 3-2, "Round Duct Longitudinal Seams," for static-pressure class, applicable sealing requirements, materials involved, duct-support intervals, and other provisions in SMACNA's "HVAC Duct Construction Standards - Metal and Flexible."

E. Tees and Laterals: Select types and fabricate in accordance with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 3-5, "90 Degree Tees and Laterals," and Figure 3-6, "Conical Tees," for static-pressure class, applicable sealing requirements, materials involved, duct-support intervals, and other provisions in SMACNA's "HVAC Duct Construction Standards - Metal and Flexible."

2.4 SHEET METAL MATERIALS

A. General Material Requirements: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible" for acceptable materials, material thicknesses, and duct construction methods unless otherwise indicated. Sheet metal materials are to be free of pitting, seam marks, roller marks, stains, discolorations, and other imperfections.

B. Galvanized Sheet Steel: Comply with ASTM A653/A653M.

1. Galvanized Coating Designation: G90.
2. Finishes for Surfaces Exposed to View: Mill phosphatized.

C. Tie Rods: Galvanized steel, 1/4-inch- minimum diameter for lengths 36 inches or less; 3/8-inch-minimum diameter for lengths longer than 36 inches.

2.5 DUCT LINER

A. Fibrous-Glass-Free, Natural-Fiber Duct Liner: Made from partially recycled cotton or polyester products and containing no fiberglass. Airstream surface overlaid with fire-resistant facing to prevent surface erosion by airstream, complying with NFPA 90A or NFPA 90B. Treat natural-fiber products with antimicrobial coating.

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
   a. Acoustical Surfaces, Inc.
   b. Ductmate Industries, Inc; a DMI company.
2. Source Limitations: Obtain fibrous-glass-free, natural-fiber duct liner from single manufacturer.
3. Maximum Thermal Conductivity: 0.24 Btu x in./h x sq. ft. x deg F at 75 deg F mean temperature when tested in accordance with ASTM C518.
4. Surface-Burning Characteristics: Maximum flame-spread index of 25 and maximum smoke-developed index of 50 when tested in accordance with ASTM E84; certified by an NRTL.
5. Liner Adhesive: As recommended by insulation manufacturer and complying with NFPA 90A or NFPA 90B.

B. Insulation Pins and Washers:

1. Cupped-Head, Capacitor-Discharge-Weld Pins: Copper- or zinc-coated steel pin, fully annealed for capacitor-discharge welding, 0.106-inch- diameter shank, length to suit depth of insulation indicated with integral 1-1/2-inch galvanized carbon-steel washer.
2. Insulation-Retaining Washers: Self-locking washers formed from 0.016-inch- thick galvanized steel ; with beveled edge sized as required to hold insulation securely in place, but not less than 1-1/2 inches in diameter.

C. Shop Application of Duct Liner: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 7-11, "Flexible Duct Liner Installation."

1. Adhere a single layer of indicated thickness of duct liner with at least 90 percent adhesive coverage at liner contact surface area. Attaining indicated thickness with multiple layers of duct liner is prohibited.
2. Apply adhesive to transverse edges of liner facing upstream that do not receive metal nosing.
3. Butt transverse joints without gaps, and coat joint with adhesive.
4. Fold and compress liner in corners of rectangular ducts or cut and fit to ensure butted-edge overlapping.
5. Do not apply liner in rectangular ducts with longitudinal joints, except at corners of ducts, unless duct size and dimensions of standard liner make longitudinal joints necessary.
6. Secure liner with mechanical fasteners 4 inches from corners and at intervals not exceeding 12 inches transversely; at 3 inches from transverse joints and at intervals not exceeding 18 inches longitudinally.
7. Secure transversely oriented liner edges facing the airstream with metal nosings that have either channel or "Z" profiles or are integrally formed from duct wall. Fabricate edge facings at the following locations:
   a. Fan discharges.
   b. Intervals of lined duct preceding unlined duct.
8. Terminate inner ducts with buildouts attached to fire-damper sleeves, dampers, turning vane assemblies, or other devices. Fabricated buildouts (metal hat sections) or other buildout means are optional; when used, secure buildouts to duct walls with bolts, screws, rivets, or welds.

2.6 SEALANT AND GASKETS

A. General Sealant and Gasket Requirements: Surface-burning characteristics for sealants and gaskets are to be a maximum flame-spread index of 25 and a maximum smoke-developed index of 50 when tested in accordance with UL 723; certified by an NRTL.

B. Water-Based Joint and Seam Sealant:

1. Application Method: Brush on.
2. Solids Content: Minimum 65 percent.
3. Shore A Hardness: Minimum 20.
4. Water resistant.
5. Mold and mildew resistant.
6. VOC: Maximum 75 g/L (less water).
7. Maximum Static-Pressure Class: 10 inch wg, positive and negative.
8. Service: Indoor or outdoor.
9. Substrate: Compatible with galvanized sheet steel (both PVC coated and bare), stainless steel, or aluminum sheets.

C. Flange Gaskets: Butyl rubber, neoprene, or EPDM polymer with polyisobutylene plasticizer.

2.7 HANGERS AND SUPPORTS

A. Hanger Rods for Noncorrosive Environments: Galvanized-steel rods and nuts.

B. Hanger Rods for Corrosive Environments: Electrogalvanized, all-thread rods or galvanized rods with threads painted with zinc-chromate primer after installation.

C. Strap and Rod Sizes: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Table 5-1, "Rectangular Duct Hangers Minimum Size," and Table 5-2, "Minimum Hanger Sizes for Round Duct."

D. Steel Cables for Galvanized-Steel Ducts: Galvanized steel complying with ASTM A603.

E. Steel Cables for Stainless Steel Ducts: Stainless steel complying with ASTM A492.

F. Steel Cable End Connections: Galvanized-steel assemblies with brackets, swivel, and bolts designed for duct hanger service; with an automatic-locking and clamping device.

G. Duct Attachments: Sheet metal screws, blind rivets, or self-tapping metal screws; compatible with duct materials.

H. Trapeze and Riser Supports:

1. Supports for Galvanized-Steel Ducts: Galvanized-steel shapes and plates.

PART 3 - EXECUTION

3.1 DUCT INSTALLATION

A. Drawing plans, schematics, and diagrams indicate general location and arrangement of duct system. Indicated duct locations, configurations, and arrangements were used to size ducts and calculate friction loss for air-handling equipment sizing and for other design considerations. Install duct systems as indicated unless deviations to layout are approved on Shop Drawings and coordination drawings.

B. Install ducts in accordance with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible" unless otherwise indicated.

C. Install ducts in maximum practical lengths with fewest possible joints.

D. Install factory- or shop-fabricated fittings for changes in direction, size, and shape and for branch connections.

E. Unless otherwise indicated, install ducts vertically and horizontally, and parallel and perpendicular to building lines.

F. Install ducts close to walls, overhead construction, columns, and other structural and permanent enclosure elements of building.

G. Install ducts with a clearance of 1 inch, plus allowance for insulation thickness.

H. Route ducts to avoid passing through transformer vaults and electrical equipment rooms and enclosures.

I. Where ducts pass through non-fire-rated interior partitions and exterior walls and are exposed to view, cover the opening between the partition and duct or duct insulation with sheet metal flanges of same metal thickness as the duct. Overlap openings on four sides by at least 1-1/2 inches.

J. Install fire , combination fire/smoke, and smoke dampers where indicated on Drawings and as required by code, and by local authorities having jurisdiction. Comply with requirements in Section 233300 "Air Duct Accessories" for fire and smoke dampers and specific installation requirements of the damper UL listing.

K. Install heating coils, cooling coils, air filters, dampers, and all other duct-mounted accessories in air ducts where indicated on Drawings.

L. Protect duct interiors from moisture, construction debris and dust, and other foreign materials both before and after installation. Comply with SMACNA's "IAQ Guidelines for Occupied Buildings Under Construction," Appendix G, "Duct Cleanliness for New Construction Guidelines."

M. Elbows: Use long-radius elbows wherever they fit.

1. Fabricate 90-degree rectangular mitered elbows to include turning vanes.
2. Fabricate 90-degree round elbows with a minimum of three segments for 12 inches and smaller and a minimum of five segments for 14 inches and larger.

N. Branch Connections: Use lateral or conical branch connections.

3.2 INSTALLATION OF EXPOSED DUCTWORK

A. Protect ducts exposed in finished spaces from being dented, scratched, or damaged.

B. Trim duct sealants flush with metal. Create a smooth and uniform exposed bead. Do not use two-part tape sealing system.

C. Grind welds to provide smooth surface free of burrs, sharp edges, and weld splatter. When welding stainless steel with a No. 3 or 4 finish, grind the welds flush, polish the exposed welds, and treat the welds to remove discoloration caused by welding.

D. Maintain consistency, symmetry, and uniformity in arrangement and fabrication of fittings, hangers and supports, duct accessories, and air outlets.

E. Repair or replace damaged sections and finished work that does not comply with these requirements.

3.3 ADDITIONAL INSTALLATION REQUIREMENTS FOR TYPE 1 COMMERCIAL KITCHEN GREASE HOOD EXHAUST DUCT

A. Install ducts in accordance with NFPA 96, "Ventilation Control and Fire Protection of Commercial Cooking Operation"; SMACNA's "HVAC Duct Construction Standards - Metal and Flexible"; and SMACNA's "Kitchen Ventilation Systems and Food Service Equipment Fabrication and Installation Guidelines" unless otherwise indicated.

B. Install all ducts without dips and traps that may hold grease, and sloped a minimum of 2 percent to drain grease back to the hood.

C. All ducts exposed to view are to be constructed of stainless steel as per "Duct Schedule" Article. All ducts concealed from view are to be stainless steel as per "Duct Schedule" Article.

D. All joints are to be welded and are to be telescoping, bell, or flange joint as per NFPA 96.

E. Install fire-rated access panel assemblies at each change in direction and at maximum intervals of 20 feet in horizontal ducts, and at every floor for vertical ducts, or as indicated on Drawings.

F. Do not penetrate fire-rated assemblies except as allowed by applicable building codes and authorities having jurisdiction.

3.4 DUCT SEALING

A. Seal ducts at a minimum to the following seal classes in accordance with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible":

1. Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible."
2. Outdoor, Supply-Air Ducts: Seal Class A.
3. Outdoor, Exhaust Ducts: Seal Class C.
4. Outdoor, Return-Air Ducts: Seal Class C.
5. Unconditioned Space, Supply-Air Ducts in Pressure Classes 2-Inch wg and Lower: Seal Class B.
6. Unconditioned Space, Supply-Air Ducts in Pressure Classes Higher Than 2-Inch wg: Seal Class A.
7. Unconditioned Space, Exhaust Ducts: Seal Class C.
8. Unconditioned Space, Return-Air Ducts: Seal Class B.
9. Conditioned Space, Supply-Air Ducts in Pressure Classes 2-Inch wg and Lower: Seal Class C.
10. Conditioned Space, Supply-Air Ducts in Pressure Classes Higher Than 2-Inch wg: Seal Class B.
11. Conditioned Space, Exhaust Ducts: Seal Class B.
12. Conditioned Space, Return-Air Ducts: Seal Class C.

3.5 HANGER AND SUPPORT INSTALLATION

A. Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Chapter 5, "Hangers and Supports."

B. Building Attachments: Concrete inserts, powder-actuated fasteners, or structural-steel fasteners appropriate for construction materials to which hangers are being attached.

1. Where practical, install concrete inserts before placing concrete.
2. Install powder-actuated concrete fasteners after concrete is placed and completely cured.
3. Use powder-actuated concrete fasteners for standard-weight aggregate concretes or for slabs more than 4 inches thick.
4. Do not use powder-actuated concrete fasteners for lightweight-aggregate concretes or for slabs less than 4 inches thick.
5. Do not use powder-actuated concrete fasteners for seismic restraints. Coordinate with Section 230548 "Vibration and Seismic Controls for HVAC."

C. Hanger Spacing: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Table 5-1, "Rectangular Duct Hangers Minimum Size," and Table 5-2, "Minimum Hanger Sizes for Round Duct," for maximum hanger spacing; install hangers and supports within 24 inches of each elbow and within 48 inches of each branch intersection.

D. Hangers Exposed to View: Threaded rod and angle or channel supports.

E. Support vertical ducts with steel angles or channel secured to the sides of the duct with welds, bolts, sheet metal screws, or blind rivets; support at each floor and at a maximum intervals of 16 feet.

F. Install upper attachments to structures. Select and size upper attachments with pull-out, tension, and shear capacities appropriate for supported loads and building materials where used.

3.6 SEISMIC-RESTRAINT-DEVICE INSTALLATION

A. See Section 230548 "Vibration and Seismic Controls for HVAC" for seismic restraint installation requirements.

3.7 DUCTWORK CONNECTIONS

A. Make connections to equipment with flexible connectors complying with Section 233300 "Air Duct Accessories."

B. Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible" for branch, outlet and inlet, and terminal unit connections.

3.8 PAINTING

A. Paint interior of metal ducts that are visible through registers and grilles and that do not have duct liner. Apply one coat of flat, black, latex paint over a compatible galvanized-steel primer. Paint materials and application requirements are specified in Section 099113 "Exterior Painting" and Section 099123 "Interior Painting."

3.9 DUCT SCHEDULE

A. Fabricate ducts with galvanized sheet steel except as otherwise indicated and as follows:

1. Fabricate all ducts to achieve SMACNA pressure class, seal class, and leakage class as required.

B. Exhaust Ducts:

1. Ducts Connected to Commercial Kitchen Hoods: Comply with NFPA 96.
   a. Welded seams and joints.
   b. Pressure Class: Positive or negative 4- inch wg.
   c. Airtight/watertight.

C. Liner, where noted on plans:

1. Supply Fan Plenums: Fibrous-glass-free, natural fiber , 1 inch thick.
2. Return- and Exhaust-Fan Plenums: Fiberglass-free, natural fiber , 1 inches thick.
3. Transfer Ducts: Fibrous-glass-free, natural fiber , 1 inch thick.

D. Elbow Configuration:

1. Rectangular Duct - Requirements for Different Velocities: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 4-2, "Rectangular Elbows."
   a. Velocity 1000 fpm or Lower:
      1) Radius Type RE 1 with minimum 0.5 radius-to-diameter ratio.
      2) Mitered Type RE 4 without vanes.
   b. Velocity 1000 to 1500 fpm:
      1) Radius Type RE 1 with minimum 1.0 radius-to-diameter ratio.
      2) Radius Type RE 3 with minimum 0.5 radius-to-diameter ratio and two vanes.
      3) Mitered Type RE 2 with vanes complying with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 4-3, "Vanes and Vane Runners," and Figure 4-4, "Vane Support in Elbows."
   c. Velocity 1500 fpm or Higher:
      1) Radius Type RE 1 with minimum 1.5 radius-to-diameter ratio.
      2) Radius Type RE 3 with minimum 1.0 radius-to-diameter ratio and two vanes.
      3) Mitered Type RE 2 with vanes complying with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 4-3, "Vanes and Vane Runners," and Figure 4-4, "Vane Support in Elbows."
2. Round Duct: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 3-4, "Round Duct Elbows."
   a. Minimum Radius-to-Diameter Ratio and Elbow Segments: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Table 3-1, "Mitered Elbows." Elbows with less than 90-degree change of direction have proportionately fewer segments.
      1) Radius-to Diameter Ratio: 1.5.
   b. Round Elbows, 12 Inches and Smaller in Diameter: Stamped or pleated.

E. Branch Configuration:

1. Rectangular Duct: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 4-6, "Branch Connection."
   a. Rectangular Main to Rectangular Branch: 45-degree entry.
   b. Rectangular Main to Round Branch: Conical spin in.
2. Round and Flat Oval: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 3-5, "90 Degree Tees and Laterals," and Figure 3-6, "Conical Tees." Saddle taps are permitted in existing duct.

END OF SECTION 233113

SECTION 233300 - AIR DUCT ACCESSORIES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Backdraft and pressure relief dampers.
2. Barometric relief dampers.
3. Manual volume dampers.
4. Control dampers.
5. Flange connectors.
6. Turning vanes.
7. Duct-mounted access doors.
8. Duct access panel assemblies.
9. Flexible connectors.
10. Duct accessory hardware.

B. Related Requirements:

1. Section 233346 "Flexible Ducts" for insulated and non-insulated flexible ducts.
2. Section 233723 "HVAC Gravity Ventilators" for roof-mounted ventilator caps.
3. Section 284621.11 "Addressable Fire-Alarm Systems" for duct-mounted fire and smoke detectors.
4. Section 284621.13 "Conventional Fire-Alarm Systems" for duct-mounted fire and smoke detectors.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product.

1. For duct silencers, include pressure drop, dynamic insertion loss, and self-generated noise data. Include breakout noise calculations for high-transmission-loss casings.

1.4 INFORMATIONAL SUBMITTALS

1.5 CLOSEOUT SUBMITTALS

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Comply with NFPA 90A and NFPA 90B.

B. Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible" for acceptable materials, material thicknesses, and duct construction methods unless otherwise indicated. Sheet metal materials shall be free of pitting, seam marks, roller marks, stains, discolorations, and other imperfections.

2.2 BACKDRAFT AND PRESSURE RELIEF DAMPERS

A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

1. Greenheck Fan Corporation.
2. Ruskin Company.

B. Description: Gravity balanced.

C. Performance:

1. Maximum Air Velocity: 1000 fpm .
2. Maximum System Pressure: 1 inch wg .
3. Leakage:
   a. Class I: Leakage shall not exceed 4 cfm/sq. ft. against 1-inch wg differential static pressure.

D. Construction:

1. Frame:
   a. Hat shaped.
   b. 0.093-inch- thick extruded aluminum , with welded or mechanically attached corners and mounting flange.
2. Blades:
   a. Multiple single-piece blades.
3. Blade Action: Parallel.

E. Blade Seals: Extruded vinyl, mechanically locked Neoprene, mechanically locked.

F. Return Spring: Adjustable tension.

G. Bearings: Steel ball Brass sleeve or synthetic pivot bushings.

H. Damper Actuator - Electric:

1. Electric - 120 V ac 24 V ac.
2. UL 873 plenum rated.
3. Two position Fully modulating .
   a. Sufficient motor torque to drive damper fully closed with adequate force to achieve required damper seal.
   b. Minimum 90-degree drive rotation.
4. Clockwise or counterclockwise drive rotation as required for application.
5. Environmental Operating Range:
   a. Temperature: Minus 40 to plus 130 deg F.
   b. Humidity: 5 to 95 percent relative humidity noncondensing.
6. Environmental Enclosure: NEMA 2.
7. Actuator to be factory mounted and provided with a single-point wiring connection.

I. Controllers, Electrical Devices, and Wiring:

1. Comply with requirements for electrical devices and connections specified in Section 230923 "Direct Digital Control (DDC) System for HVAC."
2. Electrical Connection: 115 V, single phase, 60 Hzor24 V, 60 Hz .

2.3 BAROMETRIC RELIEF DAMPERS

A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

1. Greenheck Fan Corporation.
2. Ruskin Company.

B. General Requirements:

1. Suitable for horizontal or vertical mounting.
2. Maximum Air Velocity: 1000 fpm .
3. Maximum System Pressure: 2 inches wg .

C. Construction:

1. Frame: Hat shaped, 0.093-inch- thick extruded aluminum , with welded corners or mechanically attached and mounting flange.
2. Blades:
   a. Multiple, 0.050-inch- thick aluminum sheet .
   b. Maximum Width: 6 inches.
   c. Action: Parallel.
   d. Balance: Gravity.
   e. Eccentrically End pivoted.
3. Blade Seals: Vinyl Neoprene.
4. Bearings: Synthetic Stainless steel.

D. Pressure Adjustment: Return spring or counter weight with adjustable tension.

E. Accessories:

1. Flange on intake.
2. .

2.4 MANUAL VOLUME DAMPERS

A. Standard, Steel, Manual Volume Dampers:

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
   a. Greenheck Fan Corporation.
   b. Ruskin Company.
2. Performance:
   a. Leakage Rating Class III: Leakage not exceeding 40 cfm/sq. ft. against 1-inch wg differential static pressure.
3. Construction:
   a. Linkage out of airstream.
   b. Suitable for horizontal or vertical airflow applications.
4. Frames:
   a. Hat-shaped, 16-gauge- thick, galvanized sheet steel .
   b. Mitered and welded corners.
   c. Flanges for attaching to walls and flangeless frames for installing in ducts.
5. Blades:
   a. Multiple or single blade.
   b. Parallel- or opposed-blade design.
   c. Stiffen damper blades for stability.
   d. Galvanized steel; 16 gauge thick.
6. Blade Axles: Galvanized steel .
7. Bearings:
   a. Oil-impregnated bronze Molded synthetic .
   b. Dampers mounted with vertical blades to have thrust bearing at each end of every blade.
8. Tie Bars and Brackets: Galvanized steel.
9. Locking device to hold damper blades in a fixed position without vibration.

B. Jackshaft:

1. Size: 0.5-inch diameter.
2. Material: Galvanized-steel pipe rotating within pipe-bearing assembly mounted on supports at each mullion and at each end of multiple-damper assemblies.
3. Length and Number of Mountings: As required to connect linkage of each damper in multiple-damper assembly.

C. Damper Hardware:

1. Zinc-plated, die-cast core with dial and handle, made of 3/32-inch- thick zinc-plated steel, and a 3/4-inch hexagon locking nut.
2. Include center hole to suit damper operating-rod size.
3. Include elevated platform for insulated duct mounting.

2.5 CONTROL DAMPERS

A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

1. Carnes Company.
2. Greenheck Fan Corporation.

3. Nailor Industries Inc.
4. Ruskin; Air Distribution Technologies, Inc.; Johnson Controls, Inc.
5. Young Regulator Company.

B. General Requirements:

1. Unless otherwise indicated, use parallel-blade configuration for two-position control, equipment isolation service, and when mixing two airstreams. For other applications, use opposed-blade configuration.
2. Factory or field assemble multiple damper sections to provide a single damper assembly of size required by the application.

C. Performance:

1. Leakage:
   a. Class I: Leakage shall not exceed 4 cfm/sq. ft. against 1-inch wg differential static pressure.
2. Pressure Drop: 0.05 inch wg at 1500 fpm across a 24-by-24-inch damper when tested in accordance with AMCA 500-D, Figure 5.3.
3. Velocity: Up to 3000 fpm .
4. Temperature: Minus 25 to plus 180 deg F.
5. Pressure Rating: Damper close-off pressure equal to fan shutoff pressure with a maximum blade deflection of 1/200 of blade length.

D. Construction:

1. Linkage out of airstream.
2. Suitable for horizontal or vertical airflow applications.
3. Frames:
   a. Hat, U, or angle shaped.
   b. Flanges for attaching to walls and flangeless frames for installing in ducts.
4. Blades:
   a. Multiple blade with maximum blade width of 8 inches.
   b. Aluminum.
5. Blade Edging Seals:
   a. Replaceable Closed-cell neoprene .
6. Blade Jamb Seal: Flexible stainless steel, compression type.
7. Blade-Linkage Hardware: Zinc-plated steel and brass; ends sealed against blade bearings. Linkage mounted out of air stream.
8. Bearings:
   a. Dampers mounted with vertical blades to have thrust bearings at each end of every blade.

E. Damper Actuator - Electric:

1. UL 873, plenum rated.
2. Two position .
   a. Sufficient motor torque and spring torque to drive damper fully open and fully closed with adequate force to achieve required damper seal.
   b. Minimum 90-degree drive rotation.
3. Clockwise or counterclockwise drive rotation as required for application.
4. Environmental Operating Range:
   a. Temperature: Minus 40 to plus 130 deg F.
   b. Humidity: 5 to 95 percent relative humidity noncondensing.
5. Environmental enclosure: NEMA 2.

6. Actuator to be factory mounted and provided with a single-point wiring connection.

F. Controllers, Electrical Devices, and Wiring:

1. Comply with requirements for electrical devices and connections specified in Section 230923 "Direct Digital Control (DDC) System for HVAC."

2.6 FLANGE CONNECTORS

A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

1. CL WARD & Family Inc.
2. Ductmate Industries, Inc.
3. Ward Industries; a brand of Hart & Cooley, Inc.

B. Description: Add-on , factory fabricated, slide-on transverse flange connectors, gaskets, and components.

C. Material: Galvanized steel.

D. Gauge and Shape: Match connecting ductwork.

2.7 TURNING VANES

A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

1. CL WARD & Family Inc.
2. Ductmate Industries, Inc.
3. Duro Dyne Inc.
4. Ward Industries; a brand of Hart & Cooley, Inc.

B. Manufactured Turning Vanes for Metal Ducts: Fabricate curved blades of galvanized sheet steel; support with bars perpendicular to blades set; set into vane runners suitable for duct mounting.

1. Acoustic Turning Vanes: Fabricate airfoil-shaped aluminum extrusions with perforated faces and fibrous-glass fill.

C. General Requirements: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible"; Figure 4-3, "Vanes and Vane Runners," and Figure 4-4, "Vane Support in Elbows."

D. Vane Construction:

1. Single wall.
2. Single wall for ducts up to 48 inches wide and double wall for larger dimensions.

2.8 DUCT-MOUNTED ACCESS DOORS

A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

1. Ductmate Industries, Inc.
2. Duro Dyne Inc.
3. Ruskin Company.

B. Duct-Mounted Access Doors: Fabricate access panels in accordance with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible"; Figure 7-2 (7-2M), "Duct Access Doors and Panels," and Figure 7-3, "Access Doors - Round Duct."

1. Door:
   a. Double wall, rectangular.
   b. Galvanized sheet metal with insulation fill and thickness as indicated for duct pressure class.
   c. 24-gauge- thick galvanized steel door panel.
   d. Vision panel.
   e. Hinges and Latches: 1-by-1-inch butt or piano hinge and cam latches.
   f. Fabricate doors airtight and suitable for duct pressure class.
2. Frame: Galvanized sheet steel, with bend-over tabs and foam gaskets.
   a. 24-gauge- thick galvanized steel or 0.032-inch- thick aluminum frame.
3. Number of Hinges and Locks:
   a. Access Doors Less Than 12 Inches Square: No hinges and two sash locks.
   b. Access Doors up to 18 Inches Square: Two hinges and two sash locks.
   c. Access Doors up to 24 by 48 Inches: Continuous and two compression latches.
   d. Access Doors Larger Than 24 by 48 Inches: Continuous and two compression latches with outside and inside handles.

2.9 FLEXIBLE CONNECTORS

A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

1. CL WARD & Family Inc.
2. Ductmate Industries, Inc.
3. Duro Dyne Inc.
4. Ward Industries; a brand of Hart & Cooley, Inc.

B. Fire-Performance Characteristics: Adhesives, sealants, fabric materials, and accessory materials shall have flame-spread index not exceeding 25 and smoke-developed index not exceeding 50 when tested in accordance with ASTM E84.

C. Airstream Surfaces: Surfaces in contact with the airstream shall comply with requirements in ASHRAE 62.1.

D. Materials: Flame-retardant or noncombustible fabrics.

E. Coatings and Adhesives: Comply with UL 181, Class 1.

F. Metal-Edged Connectors: Factory fabricated with a fabric strip 5-3/4 inches wide attached to two strips of 2-3/4-inch- wide, 0.028-inch- thick, galvanized sheet steel or 0.032-inch- thick aluminum sheets. Provide metal compatible with connected ducts.

G. Thrust Limits: Combination coil spring and elastomeric insert with spring and insert in compression, and with a load stop. Include rod and angle-iron brackets for attaching to fan discharge and duct.

1. Frame: Steel, fabricated for connection to threaded rods and to allow for a maximum of 30 degrees of angular rod misalignment without binding or reducing isolation efficiency.
2. Outside Spring Diameter: Not less than 80 percent of the compressed height of the spring at rated load.
3. Minimum Additional Travel: 50 percent of the required deflection at rated load.
4. Lateral Stiffness: More than 80 percent of rated vertical stiffness.
5. Overload Capacity: Support 200 percent of rated load, fully compressed, without deformation or failure.
6. Elastomeric Element: Molded, oil-resistant rubber or neoprene.
7. Coil Spring: Factory set and field adjustable for a maximum of 1/4-inch movement at start and stop.

2.10 DUCT ACCESSORY HARDWARE

A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

1. CL WARD & Family Inc.
2. Ductmate Industries, Inc.
3. Duro Dyne Inc.
4. United Enertech.
5. Ward Industries; a brand of Hart & Cooley, Inc.

B. Instrument Test Holes: Cast iron or cast aluminum to suit duct material, including screw cap and gasket. Size to allow insertion of pitot tube and other testing instruments and of length to suit duct-insulation thickness.

C. Adhesives: High strength, quick setting, neoprene based, waterproof, and resistant to gasoline and grease.

2.11 MATERIALS

A. Galvanized Sheet Steel: Comply with ASTM A653/A653M.

1. Exposed-Surface Finish: Mill phosphatized.

B. Stainless Steel Sheets: Comply with ASTM A480/A480M, Type 304, and having a No. 2 finish for concealed ducts and finish for exposed ducts.

C. Aluminum Sheets: Comply with ASTM B209, Alloy 3003, Temper H14; with mill finish for concealed ducts and standard, one-side bright finish for exposed ducts.

D. Extruded Aluminum: Comply with ASTM B221, Alloy 6063, Temper T6.

E. Reinforcement Shapes and Plates: Galvanized-steel reinforcement where installed on galvanized sheet metal ducts; compatible materials for aluminum and stainless steel ducts.

F. Tie Rods: Galvanized steel, 1/4-inch minimum diameter for lengths 36 inches or less; 3/8-inch minimum diameter for lengths longer than 36 inches.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Install duct accessories in accordance with applicable details in SMACNA's "HVAC Duct Construction Standards - Metal and Flexible" for metal ducts and in NAIMA AH116 for fibrous-glass ducts.

B. Install duct accessories of materials suited to duct materials; use galvanized-steel accessories in galvanized-steel and fibrous-glass ducts, stainless steel accessories in stainless steel ducts, and aluminum accessories in aluminum ducts.

C. Install backdraft dampers at inlet of exhaust fans or exhaust ducts as close as possible to exhaust fan unless otherwise indicated.

D. Where multiple damper sections are necessary to achieve required dimensions, provide reinforcement to fully support damper assembly when fully closed at full system design static pressure.

E. Install volume dampers at points on supply, return, and exhaust systems where branches extend from larger ducts. Where dampers are installed in ducts having duct liner, install dampers with hat channels of same depth as liner, and terminate liner with nosing at hat channel.

1. Install steel volume dampers in steel ducts.
2. Install aluminum volume dampers in aluminum ducts.

F. Set dampers to fully open position before testing, adjusting, and balancing.

G. Install test holes at fan inlets and outlets and elsewhere as indicated and as needed for testing and balancing.

H. Install fire and smoke dampers in accordance with UL listing.

I. Install duct access doors on sides of ducts to allow for inspecting, adjusting, and maintaining accessories and equipment at the following locations:

1. On both sides of duct coils.
2. Upstream from duct filters.
3. At outdoor-air intakes and mixed-air plenums.
4. At drain pans and seals.
5. Downstream from manual volume dampers, control dampers, backdraft dampers, and equipment.
6. Adjacent to and close enough to fire or smoke dampers, to reset or reinstall fusible links. Access doors for access to fire or smoke dampers having fusible links shall be pressure relief access doors and shall be outward operation for access doors installed upstream

from dampers and inward operation for access doors installed downstream from dampers.
7. Upstream from turning vanes.
8. Upstream or downstream from duct silencers.
9. For grease ducts, install at locations and spacing as required by NFPA 96.
10. Control devices requiring inspection.
11. Elsewhere as indicated.

J. Install access doors with swing against duct static pressure.

K. Access Door Sizes:

1. One-Hand or Inspection Access: 8 by 5 inches.
2. Two-Hand Access: 12 by 6 inches.

L. Label access doors according to Section 230553 "Identification for HVAC Piping and Equipment" to indicate the purpose of access door.

M. Install flexible connectors to connect ducts to equipment.

N. For fans developing static pressures of 5 inches wg and more, cover flexible connectors with loaded vinyl sheet held in place with metal straps.

O. Install duct test holes where required for testing and balancing purposes.

P. Install thrust limits at centerline of thrust, symmetrical on both sides of equipment. Attach thrust limits at centerline of thrust and adjust to a maximum of 1/4-inch movement during start and stop of fans.

END OF SECTION 233300

SECTION 233423 - HVAC POWER VENTILATORS

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. Ceiling-mounted ventilators.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product.

1. Construction details, material descriptions, dimensions of individual components and profiles, and finishes for fans.
2. Rated capacities, operating characteristics, and furnished specialties and accessories.
3. Certified fan performance curves with system operating conditions indicated.
4. Certified fan sound-power ratings.
5. Motor ratings and electrical characteristics, plus motor and electrical accessories.
6. Material thickness and finishes, including color charts.
7. Dampers, including housings, linkages, and operators.
8. Prefabricated roof curbs.
9. Fan speed controllers.

1.4 INFORMATIONAL SUBMITTALS

1.5 CLOSEOUT SUBMITTALS

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by an NRTL, and marked for intended location and application.

B. NFPA Compliance: Comply with NFPA 90A for design, fabrication, and installation of unit components.

C. ASHRAE 62.1 Compliance: Applicable requirements in ASHRAE 62.1, Section 5 - "Systems and Equipment" and Section 7 - "Construction and Startup."

D. ASHRAE/IES 90.1 Compliance: Applicable requirements in ASHRAE/IES 90.1, Section 6 - "Heating, Ventilating, and Air-Conditioning."

2.2 CEILING-MOUNTED VENTILATORS

A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

1. Acme Engineering & Manufacturing Corp.
2. Broan-NuTone LLC.
3. Greenheck Fan Corporation.
4. Loren Cook Company.
5. PennBarry.

B. Housing: Steel, lined with acoustical insulation.

C. Fan Wheel: Centrifugal wheels directly mounted on motor shaft. Fan shrouds, motor, and fan wheel removable for service.

D. Back-draft damper: Integral.

E. Grille: Plastic , louvered grille with flange on intake and thumbscrew or spring retainer attachment to fan housing.

F. Electrical Requirements: Junction box for electrical connection on housing and receptacle for motor plug-in.

G. Accessories:

1. Variable-Frequency Motor Controller: Solid-state control to reduce speed from 100 to less than 50 percent.

2.3 MOTORS

A. Comply with NEMA designation, temperature rating, service factor, and efficiency requirements for motors specified in Section 230513 "Common Motor Requirements for HVAC Equipment."

1. Motor Sizes: Minimum size as indicated. If not indicated, large enough so driven load will not require motor to operate in service factor range above 1.0.

2.4 SOURCE QUALITY CONTROL

A. AMCA Certification for Fan Sound Performance Rating: Test, rate, and label in accordance with AMCA 311.

B. AMCA Certification for Fan Aerodynamic Performance Ratings: Test, rate, and label in accordance with AMCA 211.

C. UL Standards: Power ventilators shall comply with UL 705. Power ventilators for use for restaurant kitchen exhaust shall also comply with UL 762.

PART 3 - EXECUTION

3.1 INSTALLATION, GENERAL

A. Install power ventilators level and plumb.

B. Equipment Mounting:

1. Ceiling Units: Suspend units from structure; use steel wire or metal straps.
2. Comply with requirements for vibration isolation and seismic-control devices specified in Section 230548 "Vibration and Seismic Controls for HVAC."

C. Install units with clearances for service and maintenance.

D. Label units according to requirements specified in Section 230553 "Identification for HVAC Piping and Equipment."

3.2 DUCTWORK CONNECTIONS

A. Drawings indicate general arrangement of ducts and duct accessories. Make final duct connections with flexible connectors. Flexible connectors are specified in Section 233300 "Air Duct Accessories."

3.3 ELECTRICAL CONNECTIONS

A. Connect wiring according to Section 260519 "Low-Voltage Electrical Power Conductors and Cables."

B. Ground equipment according to Section 260526 "Grounding and Bonding for Electrical Systems."

C. Install electrical devices furnished by manufacturer, but not factory mounted, according to NFPA 70 and NECA 1.

1. Nameplate shall be laminated acrylic or melamine plastic signs, as specified in Section 260553 "Identification for Electrical Systems."
2. Nameplate shall be laminated acrylic or melamine plastic signs with a black background and engraved white letters at least 1/2 inch high.

3.4 CONTROL CONNECTIONS

A. Install control and electrical power wiring to field-mounted control devices.

B. Connect control wiring according to Section 26 05 23 "Control-Voltage Electrical Power Cables."

3.5 STARTUP SERVICE:

A. Perform startup service.

1. Complete installation and startup checks in accordance with manufacturer's written instructions.
2. Verify that shipping, blocking, and bracing are removed.
3. Verify that unit is secure on mountings and supporting devices and that connections to ducts and electrical components are complete. Verify that proper thermal-overload protection is installed in motors, starters, and disconnect switches.
4. Verify that cleaning and adjusting are complete.
5. For direct-drive fans, verify proper motor rotation direction and verify fan wheel free rotation and smooth bearing operation.
6. Adjust damper linkages for proper damper operation.
7. Verify lubrication for bearings and other moving parts.
8. Verify that manual and automatic volume control and fire and smoke dampers in connected ductwork systems are in fully open position.
9. Disable automatic temperature-control operators, energize motor and confirm proper motor rotation and unit operation, adjust fan to indicated rpm, and measure and record motor voltage and amperage.
10. Shut unit down and reconnect automatic temperature-control operators.
11. Remove and replace malfunctioning units and retest as specified above.

3.6 ADJUSTING

A. Adjust damper linkages for proper damper operation.

B. Adjust belt tension.

C. Lubricate bearings.

D. Comply with requirements in Section 230593 "Testing, Adjusting, and Balancing for HVAC."

3.7 CLEANING

A. After completing system installation and testing, adjusting, and balancing and after completing startup service, clean fans internally to remove foreign material and construction dirt and dust.

3.8 FIELD QUALITY CONTROL

A. Testing Agency: will engage a qualified testing agency to perform tests and inspections.

B. Perform tests and inspections.

1. Fan Operational Test: After electrical circuitry has been energized, start units to confirm proper motor rotation and unit operation.
2. Test and adjust controls and safeties.
3. Fans and components will be considered defective if they do not pass tests and inspections.
4. Prepare test and inspection reports.

END OF SECTION 233423

SECTION 233713 - DIFFUSERS, REGISTERS, AND GRILLES

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.

B. Related Sections include the following:
1. Division 08 for fixed and adjustable louvers and wall vents, whether or not they are connected to ducts.
2. Division 23 Section "Duct Accessories" for fire and smoke dampers and volume-control dampers not integral to diffusers and grilles.
3. Division 23 Section "Testing, Adjusting, and Balancing for HVAC" for balancing diffusers and grilles.

1.2 SUMMARY

A. This Section includes ceiling-, floor-, sill- and wall-mounted diffusers and grilles.

1.3 DEFINITIONS

A. Diffuser: Circular, square, or rectangular air distribution outlet, generally located in the ceiling and comprised of deflecting members discharging supply air in various directions and planes and arranged to promote mixing of primary air with secondary room air.

B. Grille: A louvered or perforated covering for an opening in an air passage, which can be located in a sidewall, ceiling, sill, or floor.

1.4 SUBMITTALS

A. Product Data: For each model indicated, include the following:
1. Data Sheet: For each type of air outlet and inlet, and accessory furnished; indicate construction, finish, and mounting details.
2. Performance Data: Include throw and drop, static-pressure drop, and noise ratings for each type of air outlet and inlet.
3. Schedule of diffusers and grilles indicating drawing designation, room location, quantity, model number, size, and accessories furnished.
4. Assembly Drawing: For each type of air outlet and inlet; indicate materials and methods of assembly of components.

1.5 QUALITY ASSURANCE

A. NFPA Compliance: Install diffusers and grilles according to NFPA 90A, "Standard for the Installation of Air-Conditioning and Ventilating Systems."

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
   1. Air Systems Components; Krueger.
   2. Metalaire.
   3. Titus.
   4. Price Companies.

2.2 MANUFACTURED UNITS

A. Diffusers and grilles are scheduled on Drawings.

2.3 SOURCE QUALITY CONTROL

A. Testing: Test performance according to ASHRAE 70, "Method of Testing for Rating the Performance of Air Outlets and Inlets."

2.4 CEILING DIFFUSERS

A. Performance: Provide ceiling air diffusers that have, as minimum, temperature and velocity traverses, throw and drop, and noise criteria ratings for each size device as listed in manufacturer's current data.

B. Ceiling Compatibility: Provide diffusers with border styles that are compatible with ceiling systems, and that are specifically manufactured to fit into ceiling module with accurate fit and adequate support. Refer to general construction drawings and specifications for types of ceiling systems, which will contain each type of ceiling air diffuser.

C. Types: Provide ceiling diffusers of type, construction, capacity, and with accessories and finishes as indicated.
   1. Ceiling Diffuser – Modular Core (MC)
      a. Material: 22-gauge steel modular core, back pan shall be one piece stamped 22-gauge steel.
      b. Diffuser Construction: Fixed louver directional modules, which can be easily repositioned without tools in the field for one, two, three or four way discharge. Each module shall be removable.
      c. Finish: White, anodic acrylic paint.
      d. Accessories: Opposed blade damper, operable from the face of the diffuser (OBD).

2.5 SUPPLY GRILLES

A. Performance: Provide supply grilles that have, as minimum, temperature and velocity traverses, throw and drop, and noise criteria ratings for each size device and listed in manufacturer's current data.

B. Wall Compatibility: Provide grilles with border styles that are compatible with wall systems, and that are specifically manufactured to fit into wall construction with accurate fit and adequate support. Refer to general construction drawings and specifications for types of wall construction, which will contain each type of wall grille.

C. Types: Provide supply grilles of type, construction, capacity, and with accessories and finishes as indicated.
   1. Supply Grille – Louvered
      a. Materials: 20 gauge steel or 0.050 aluminum frame with heavy duty aluminum blades
      b. Grille Construction: 1-1/4-inch wide border, corners assembled with full penetration resistance welds. Screw holes countersunk. Double deflection solid airfoil blades, front blades parallel to the long dimension, spaced on 3/4-inch centers. Blades shall extend through the side frame on each side. Blades shall be individually adjustable, held in place with tension wire, adjustable without loosening or rattling.
      c. Finish: White, anodic acrylic paint.
      d. Accessories: Opposed blade damper, operable from the face of the grille (OBD).

2.6 EXHAUST/RETURN GRILLES

A. Performance: Provide exhaust and return grilles that have, as minimum, temperature and velocity traverses, throw and drop, and noise criteria ratings for each size device and listed in manufacturer's current data.

B. Ceiling Compatibility: Provide grilles with border styles that are compatible with ceiling systems, and that are specifically manufactured to fit into ceiling module with accurate fit and adequate support. Refer to general construction drawings and specifications for types of ceiling systems, which will contain each type of grille.

C. Wall Compatibility: Provide grilles with border styles that are compatible with wall systems, and that are specifically manufactured to fit into wall construction with accurate fit and adequate support. Refer to general construction drawings and specifications for types of wall construction, which will contain each type of wall grille.

D. Types: Provide exhaust and return grilles of type, construction, capacity, and with accessories and finishes as indicated.
   1. Exhaust/Return Grille – Louvered
      a. Materials: 22-gauge roll formed steel frame and blades or 0.040 minimum extruded aluminum frame and blades.
      b. Grille Construction: 1-1/4-inch wide border, corners assembled with full penetration resistance welds. Screw holes countersunk. Blades at 35 degree deflection at 1/2-inch spacing. Blades fixed in place, parallel to the long dimension of the grille.
      c. Finish: White, anodic acrylic paint or aluminum colored paint.
      d. Accessories: Opposed blade damper, operable from the face of the grille (OBD).
   2. Exhaust/Return Grille – Eggcrate
      a. Materials: 22-gauge roll formed steel frame with aluminum grid.
      b. Grille Construction: 1-3/4-inch wide border, corners assembled with full penetration resistance welds. Screw holes countersunk. Eggcrate core shall provide a minimum of 90% free area with 1/2 x 1/2 x 1-inch aluminum grid.
      c. Finish: White, anodic acrylic paint.

2.7 SPECIALTY DIFFUSERS

A. Performance: Provide diffusers that have, as minimum, temperature and velocity traverses, throw and drop, and noise criteria ratings for each size device and listed in manufacturer's current data.

B. Wall Compatibility: Provide diffusers with border styles that are compatible with wall systems, and that are specifically manufactured to fit into wall construction with accurate fit and adequate support. Refer to general construction drawings and specifications for types of wall construction, which will contain each type of wall diffuser.

C. Ceiling Compatibility: Provide diffusers with border styles that are compatible with ceiling systems, and that are specifically manufactured to fit into ceiling module with accurate fit and adequate support. Refer to general construction drawings and specifications for types of ceiling systems, which will contain each type of ceiling diffuser.

D. Types: Provide diffusers of type, construction, capacity, and with accessories and finishes as indicated.
   1. Spot Diffusers
      a. Materials: Manufacturer's standard heavy gauge extruded aluminum frame and adjustable blades. Not welded, fastened or riveted.
      b. Diffuser Construction: Multi-directional capable of directing airstream up to a minimum of 39º from diffuser centerline to any direction. Flange-to-body gasket shall be two tandem felt strips and flange mounting gasket shall be close-cell neoprene or felt. Provide internal damper under stainless steel leaf spring.
      c. Finishes: Coordinate exact color with Architect.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine areas where diffusers and grilles are to be installed for compliance with requirements for installation tolerances and other conditions affecting performance of equipment. Do not proceed with installation until unsatisfactory conditions have been corrected.

3.2 INSTALLATION

A. Install diffusers and grilles level and plumb, according to manufacturer's written instructions, project Coordination Drawings, original design, and referenced standards.

B. Ceiling-Mounted Outlets and Inlets: Drawings indicate general arrangement of ducts, fittings, and accessories. Air outlet and inlet locations have been indicated to achieve design requirements for air volume, noise criteria, airflow pattern, throw, and pressure drop. Make final locations where indicated, as much as practicable. For units installed in lay-in ceiling panels, locate units in the center of the panel. Where architectural features or other items conflict with installation, notify Architect for a determination of final location.

C. Duct-Mounted Supply and Exhaust/Return Grilles: Mount to duct branch with 16-gauge steel angle collar. Mounting screws to match grille frame. Screws shall not protrude more than 1/4-inch past angle collar.

D. Install diffusers and grilles with airtight connection to ducts and to allow service and maintenance of dampers, air extractors, and fire dampers.

3.3 ADJUSTING

A. After installation, adjust diffusers and grilles to air patterns indicated, or as directed, before starting air balancing.

3.4 CLEANING

A. After installation of diffusers and grilles, inspect exposed finish. Clean exposed surfaces to remove burrs, dirt, and smudges. Replace diffusers and grilles that have damaged finishes.

END OF SECTION 233713

SECTION 238126 - SPLIT-SYSTEM AIR-CONDITIONERS

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 split-system air-conditioning consisting of separate evaporator-fan and compressor-condenser components.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product indicated. Include rated capacities, operating characteristics, and furnished specialties and accessories. Include performance data in terms of capacities, outlet velocities, static pressures, sound power characteristics, motor requirements, and electrical characteristics.

1.4 INFORMATIONAL SUBMITTALS

1.5 CLOSEOUT SUBMITTALS

A. Operation and Maintenance Data: For split-system air-conditioning units to include in emergency, operation, and maintenance manuals.

1.6 QUALITY ASSURANCE

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. ASHRAE Compliance:

1. Fabricate and label refrigeration system to comply with ASHRAE 15, "Safety Standard for Refrigeration Systems."
2. ASHRAE Compliance: Applicable requirements in ASHRAE 62.1, Section 4 - "Outdoor Air Quality," Section 5 - "Systems and Equipment," Section 6 - " Procedures," and Section 7 - "Construction and System Start-up."

C. ASHRAE/IES Compliance: Applicable requirements in ASHRAE/IES 90.1.

1.7 COORDINATION

A. Coordinate sizes and locations of concrete bases with actual equipment provided. Cast anchor-bolt inserts into bases. Concrete, reinforcement, and formwork are specified in Section 033000 "Cast-in-Place Concrete."

B. Coordinate sizes and locations of roof curbs, equipment supports, and roof penetrations with actual equipment provided.

1.8 WARRANTY

A. Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace components of split-system air-conditioning units that fail in materials or workmanship within specified warranty period.

1. Warranty Period:
   a. For Compressor: 7 year(s) from date of Substantial Completion.
   b. For Parts: Five year(s) from date of Substantial Completion.
   c. For Labor: One year(s) from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

1. Carrier Global Corporation.
2. Lennox Industries, Inc.; Lennox International.
3. Mitsubishi Electric & Electronics USA, Inc.
4. Trane.
5. YORK; brand of Johnson Controls International plc, Building Solutions North America.

2.2 INDOOR UNITS, Ductless (5 TONS OR LESS)

A. Wall-Mounted, Evaporator-Fan Components:

1. Cabinet: Enameled steel with removable panels on front and ends in color selected by Architect, and discharge drain pans with drain connection.
2. Refrigerant Coil: Copper tube, with mechanically bonded aluminum fins and thermal-expansion valve. Comply with ARI 206/110.
3. Fan: Direct drive, centrifugal.
4. Fan Motors:
   a. Comply with NEMA designation, temperature rating, service factor, enclosure type, and efficiency requirements specified in Section 230513 "Common Motor Requirements for HVAC Equipment."
   b. Multitapped, multispeed with internal thermal protection and permanent lubrication.
   c. Enclosure Type: Totally enclosed, fan cooled.
   d. NEMA Premium (TM) efficient motors as defined in NEMA MG 1.

e. Controllers, Electrical Devices, and Wiring: Comply with requirements for electrical devices and connections specified in electrical Sections.

5. Airstream Surfaces: Surfaces in contact with the airstream shall comply with requirements in ASHRAE 62.1.
6. Condensate Drain Pans:
   a. Fabricated with one percent slope in at least two planes to collect condensate from cooling coils (including coil piping connections, coil headers, and return bends) and humidifiers, and to direct water toward drain connection.
   b. Single-wall, stainless-steel sheet.
   c. Drain Connection: Located at lowest point of pan and sized to prevent overflow. Terminate with threaded nipple on one end of pan.
7. Air Filtration Section:
   a. General Requirements for Air Filtration Section:
      1) Comply with NFPA 90A.
      2) Minimum MERV according to ASHRAE 52.2.
      3) Filter-Holding Frames: Arranged for flat or angular orientation, with access doors on both sides of unit. Filters shall be removable from one side or lifted out from access plenum.
   b. Disposable Panel Filters:
      1) Factory-fabricated, removable and washable.

2.3 OUTDOOR UNITS (5 TONS OR LESS)

A. Air-Cooled, Compressor-Condenser Components:

1. Casing: Steel, finished with baked enamel in color selected by Architect, with removable panels for access to controls, weep holes for water drainage, and mounting holes in base. Provide brass service valves, fittings, and gage ports on exterior of casing.
2. Compressor: Hermetically sealed with crankcase heater and mounted on vibration isolation device. Compressor motor shall have thermal- and current-sensitive overload devices, start capacitor, relay, and contactor.
   a. Compressor Type: Scroll.
   b. Two-speed compressor motor with manual-reset high-pressure switch and automatic-reset low-pressure switch.
   c. Refrigerant: R-410A .
   d. Refrigerant Coil: Copper tube, with mechanically bonded aluminum fins and liquid subcooler. Comply with ARI 206/110.
3. Fan: Aluminum-propeller type, directly connected to motor.
4. Motor: Permanently lubricated, with integral thermal-overload protection.
5. Low Ambient Kit: Permits operation down to 45 deg F.
6. Mounting Base: Polyethylene.
7. Seacoast Protective Coating: If location is within 5 miles of saltwater, outdoor unit shall be provided with an anti-corrosion treatment to protect all components. Provide with submittals.

2.4 ACCESSORIES

A. Thermostat: Wireless infrared functioning to remotely control compressor and evaporator fan, with the following features:

1. Compressor time delay.
2. 24-hour time control of system stop and start.

3. Liquid-crystal display indicating temperature, set-point temperature, time setting, operating mode, and fan speed.
4. Fan-speed selection including auto setting.
5. Comply with all requirements of the Washington State Energy Code.

B. Refrigerant Line Kits: Soft-annealed copper suction and liquid lines factory cleaned, dried, pressurized, and sealed; factory-insulated suction line with flared fittings at both ends.

C. Drain Hose: For condensate.

D. Condensate Pump: Provide with condensate pump where indoor unit's condensate cannot gravity drain to an approved location.

E. Condensate Piping: All indoor units shall have condensate taken from the drain pan to an approved location. Mechanical contractor to provide piping and routing design. Approved locations shall be lavatory tail pieces, mop sinks, floor drains in mechanical rooms, floor sinks, hub drains, exterior planter boxes, etc. Coordinate with plumbing contractor for necessary locations.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Install units level and plumb.

B. Install evaporator-fan components using manufacturer's standard mounting devices securely fastened to building structure.

C. Install roof-mounted, compressor-condenser components on equipment supports specified in Section 077200 "Roof Accessories." Anchor units to supports with removable, cadmium-plated fasteners.

D. Equipment Mounting:

1. Install ground-mounted, compressor-condenser components on cast-in-place concrete equipment base(s). Comply with requirements for equipment bases and foundations specified in Section 033000 "Cast-in-Place Concrete."
2. Comply with requirements for vibration isolation and seismic control devices specified in Section 230548 "Vibration and Seismic Controls for HVAC."

E. Install and connect precharged refrigerant tubing to component's quick-connect fittings. Install tubing to allow access to unit.

3.2 CONNECTIONS

A. Piping installation requirements are specified in other Sections. Drawings indicate general arrangement of piping, fittings, and specialties.

B. Where piping is installed adjacent to unit, allow space for service and maintenance of unit.

3.3 FIELD QUALITY CONTROL

A. Perform tests and inspections.

B. Tests and Inspections:

1. Leak Test: After installation, charge system and test for leaks. Repair leaks and retest until no leaks exist.
2. Operational Test: After electrical circuitry has been energized, start units to confirm proper motor rotation and unit operation.
3. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment.

C. Remove and replace malfunctioning units and retest as specified above.

D. Prepare test and inspection reports.

3.4 DEMONSTRATION

A. Train Owner's maintenance personnel to adjust, operate, and maintain units.

END OF SECTION 238126

Part 1 - General

1.1 SYSTEM DESCRIPTION R2-SERIES (SIMULTANEOUS HEAT/COOL)

Per the equipment schedule, the variable capacity, heat pump heat recovery air conditioning system basis of design is Mitsubishi Electric CITY MULTI VRF (Variable Refrigerant Flow) zoning system(s).
Acceptable alternative manufacturers, assuming compliance with these equipment specifications, are Daikin, Panasonic, and Hitachi. Contractor bidding an alternate manufacturer does so with full knowledge that that manufactures product may not be acceptable or approved and that contractor is responsible for all specified items and intents of this document without further compensation.
Simultaneous heating/cooling (heat recovery) systems shall consist of an outdoor unit, BC (Branch Circuit) Controller (or comparable branch devices), multiple indoor units, and an integral DDC (Direct Digital Controls) system. 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. To ensure owner comfort, each indoor unit or group of indoor units shall be independently controlled and capable of changing mode automatically when zone temperature strays 1.8 degrees F from set point for ten minutes.
No additional branch circuit controllers (or comparable branch devices) than shown on the drawings/schedule may be connected to any one outdoor unit. Contractors proposing alternate systems requiring more branch devices than those included as the basis of design are responsible for additional piping & electrical costs and are required to identify additional costs & installation time required of other trades with their bid.

1.2 SYSTEM DESCRIPTION LOSSNAY

The basis of design fresh air ventilation system(s) is the Mitsubishi Electric LOSSNAY total heat exchanger with outside air bypass damper and energy recovery ventilation.

The unit shall be equipped with data network control and be directly connectable to the communication control network serving other systems from this manufacturer.

1.3 QUALITY ASSURANCE

1. The units shall be listed by Electrical Testing Laboratories (ETL) and bear the ETL label.
2. All wiring shall be in accordance with the National Electrical Code (N.E.C.).
3. 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).
4. All units must meet or exceed the 2010 Federal minimum efficiency requirements and the ASHRAE 90.1 efficiency requirements for VRF systems. Efficiency shall be published in accordance with the Air-Conditioning, Heating, and Refrigeration Institute (AHRI) Standard 1230.

5. System start-up supervision shall be a required service to be completed by the manufacturer or a duly authorized, competent representative that has been factory trained in system configuration and operation. The representative shall provide proof of manufacturer certification indicating successful completion within no more than two (2) years prior to system installation. This certification shall be included as part of the equipment and/or controls submittals.

1.4 DELIVERY, STORAGE AND HANDLING

1. Unit shall be stored and handled according to the manufacturer's recommendation.

Part 2 - Warranty

The CITY MULTI units shall be covered by the manufacturer's limited warranty for a period of one (1) year parts and seven (7) year compressor to the original owner from date of installation.

Installing contractor shall meet manufacturer requirements to obtain extended manufacturer's limited parts and compressor warranty for a period of ten (10) years to the original owner from date of installation. This warranty shall not include labor.

Manufacturer shall have a minimum of fifteen (15) years continuous experience providing VRF systems in the U.S. market.

All manufacturer technical and service manuals must be readily available for download by any local contractor should emergency service be required. Registering and sign-in requirements which may delay emergency service reference are not allowed.

The CITY MULTI VRF system shall be installed by a contractor with extensive CITY MULTI install and service training. The mandatory contractor service and install training should be performed by the manufacturer.

Part 3 - Outdoor Units

3.1 R2-SERIES STANDARD EFFICIENCY (HEAT RECOVERY), AIR COOLED OUTDOOR UNITS

General:

The outdoor unit modules shall be air-cooled, direct expansion (DX), multi-zone units used specifically with VRF components described in this section and Part 5 (Controls). The outdoor unit modules shall be equipped with a single compressor which is inverter-driven and multiple circuit boards—all of which must be manufactured by the branded VRF manufacturer. Each outdoor unit module shall be completely factory assembled, piped and wired and run tested at the factory.

1. Outdoor unit systems may be comprised of multiple modules with differing capacity if a brand other than basis of design is proposed. 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. Contractor responsible for ensuring alternative brand compatibility in terms of availability, physical dimensions, weight, electrical requirements, etc.

2. Outdoor unit shall have a sound rating no higher than 66.5 dB(A) individually or 69.5 dB(A) twinned. Units shall have a sound rating no higher than 52 dB(A) individually or 55 dB(A) twinned while in night mode operation. Units shall have 5 levels sound adjustment via dip switch selectable fan speed settings. If an alternate manufacturer is selected, any additional material, cost, and labor to meet published sound levels shall be incurred by the contractor.

3. Refrigerant lines from the outdoor unit to the indoor units shall be insulated in accordance with the installation manual.

4. The outdoor unit shall have the capability of installing the main refrigerant piping through the bottom of the unit.

5. The outdoor unit shall have an accumulator with refrigerant level sensors and controls. Units shall actively control liquid level in the accumulator via Linear Expansion Valves (LEV) from the heat exchanger.

6. The outdoor unit shall have a high pressure safety switch, over-current protection, crankcase heater and DC bus protection.

7. VRF system shall meet performance requirements per schedule and be within piping limitations & acceptable ambient temperature ranges as described in respective manufacturers' published product catalogs. Non-published product capabilities or performance data are not acceptable.

8. The outdoor unit shall be capable of operating in heating mode down to -18°F ambient temperatures or cooling mode down to 23°F ambient temperatures, without additional low ambient controls. If an alternate manufacturer is selected, any additional material, cost, and labor to meet low ambient operating condition and performance shall be incurred by the contractor.

9. The outdoor unit shall have a high efficiency oil separator plus additional logic controls to ensure adequate oil volume in the compressor is maintained. Oil return sequences must be enabled only during extended periods of reduced refrigerant flow to ensure no disruption to correct refrigerant flow to individual zones during peak loads. Systems which might engage oil return sequence based on hours of operation risk oil return during inopportune periods are not allowed. Systems which rely on sensors (which may fail) to engage oil return sequence are not allowed.

10. Unit must defrost all circuits simultaneously in order to resume full heating more quickly during extreme low ambient temperatures (below 23F). Partial defrost, also known as hot gas defrost which allows reduced heating output during defrost, is permissible only when ambient temperature is above 23F.

11. While in hot gas defrost the system shall slow the indoor unit fan speed down to maintain a high discharge air temperature. Systems that keep fans running in same state shall not be allowed as they provide an uncomfortable draft to the indoor zone due to lower discharge air temperatures.

12. In reverse defrost all refrigerant shall be bypassed in the main branch controller and shall not be sent out to the indoor units, systems that flow refrigerant through indoor units during reverse defrost shall not be allowed.

Unit Cabinet:

1. The casing(s) shall be fabricated of galvanized steel, bonderized and finished.

2. Outdoor unit components shall be coated with the Seacoast Protection Coating (Brine Spray – BS coating) to protect components from premature corrosion due to a seacoast environment. Coating shall be applied to components before original outdoor unit assembly to ensure manufacturer quality standards are not compromised and shall meet the following minimum requirements:

- ≥85µm thermoset polyester-resin powder coating on External Front Panel
- ≥70µm thermoset polyester-resin powder coating on External Panel Base, Pillar, Compressor Cover, Fan Motor Support, Electrical Box
- ≥1µm cellulose and polyurethane-resin coating on heat exchanger fins
- ≥10µm polyurethane coating on printed circuit boards

3. The outdoor unit shall be tested in compliance with ISO9277 such that no unusual rust shall develop after 960 hours of salt spray testing.

4. Panels on the outdoor unit shall be scratch free at system startup. If a scratch occurs the salt spray protection is compromised and the panel should be replaced immediately.

Fan:

1. Each outdoor unit module shall be furnished with direct drive, variable speed propeller type fan(s) only. Fans shall be factory set for operation at 0 in. WG. external static pressure, but capable of normal operation with a maximum of 0.32 in. WG. external static pressure via dipswitch.

2. All fan motors shall have inherent protection, have permanently lubricated bearings, and be completely variable speed.

3. All fans shall be provided with a raised guard to prevent contact with moving parts.

Refrigerant and Refrigerant Piping:

1. R410A refrigerant shall be required for systems.

2. Polyolester (POE) oil—widely available and used in conventional domestic systems—shall be required. Prior to bidding, manufacturers using alternate oil types shall submit material safety data sheets (MSDS) and comparison of hygroscopic properties for alternate oil with list of local suppliers stocking alternate oil for approval at least two weeks prior to bidding.

3. Refrigerant piping shall be phosphorus deoxidized copper (copper and copper alloy seamless pipes) of sufficient radial thickness as defined by the VRF equipment manufacturer and installed in accordance with manufacturer recommendations.

4. All refrigerant piping must be insulated with ½" closed cell, CFC-free foam insulation with flame-Spread Index of less than 25 and a smoke-development Index of less than 50 as tested by ASTM E 84 and CAN / ULC S-102. R value of insulation must be at least 3.

5. Refrigerant line sizing shall be in accordance with manufacturer specifications. Future changes to indoor unit styles or sizes must be possible without resizing/replacing refrigerant piping to any other branch devices or indoor units.

Coil:

1. Outdoor Coil shall be constructed to provide equal airflow to all coil face surface are by means of a 4-sided coil.

2. Outdoor Coil shall be elevated at least 12" from the base on the unit to protect coil from freezing and snow build up in cold climates. Manufacturer's in which their coil extends to within a few inches from the bottom of their cabinet frame shall provide an additional 12" of height to their stand or support structure to provide equal protection from elements as Mitsubishi Electric basis of design. Any additional support costs, equipment fencing, and tie downs required to meet this additional height shall be responsibility of Mechanical Contractor to provide.

3. The outdoor coil shall be of nonferrous construction with lanced or corrugated plate fins on copper tubing.

4. The coil fins shall have a factory applied corrosion resistant blue-fin finish. Uncoated aluminum coils/fins are not allowed.

5. The coil shall be protected with an integral metal guard.

6. Refrigerant flow from the outdoor unit shall be controlled by means of an inverter driven compressor.

7. Unit shall have prewired plugs for optional panel heaters in order to prevent any residual ice buildup from defrost. Panel heaters are recommended for operating environments where the ambient temperature is expected to stay below -1F for 72 hours.

Condenser coil shall have active hot gas circuit direct from compressor discharge on lowest coil face area to shed defrost condensate away from coil and protect from Ice formation after returning to standard heat pump operation. While in Heat Pump operation this lower section of the Outdoor Evaporator coil shall continually run hot gas from the compressor discharge to protect the coil from ice buildup and coil rupture. Manufacturers who do not have an active

hot gas circuit in the lower section of the Outdoor coil to protect coil from freezing shall not be allowed in markets where the outdoor unit will see temperatures below freezingCompressor:

1. Each outdoor unit module shall be equipped with only inverter driven scroll hermetic compressors. Non inverter-driven compressors, which may cause inrush current (demand charges) and require larger generators for temporary power shall not be allowed.

2. Each compressor shall be equipped with a multi-port discharge mechanism to eliminate over compression at part load. Manufacturer's that rely on a single compressor discharge port and provide no means of eliminating over compression and energy waste at part load shall not be allowed.

3. Crankcase heat shall be provided via induction-type heater utilizing eddy currents from motor windings. Energy-wasting "belly-band" type crankcase heaters are not allowed. Manufacturer's that utilize belly-band crankcase heaters will be considered as alternate only.

4. Compressor shall have an inverter to modulate capacity. The capacity for each compressor shall be variable with a minimum turndown not greater than 15%.

5. The compressor shall be equipped with an internal thermal overload.

6. Field-installed oil equalization lines between modules are not allowed. Prior to bidding, manufacturers requiring equalization must submit oil line sizing calculations specific to each system and module placement for this project.

7. Manufacturers that utilize a compressor sump oil sensor to equalize compressor oil volume within a single module shall not be allowed unless they actively shut down the system to protect from compressor failure.

Controls:

8. The unit shall be an integral part of the system & control network described in Part 5 (Controls) and react to heating/cooling demand as communicated from connected indoor units over the control circuit. Required field-installed control voltage transformers and/or signal boosters shall be provided by the manufacturer.

9. Each outdoor unit module shall have the capability of 4 levels of demand control based on external input.

Electrical:

1. The outdoor unit electrical power shall be 208/230 volts, 3-phase, 60 hertz or 460 volts, 3-phase, 60 hertz per equipment schedule.

2. The outdoor 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 to provide total integration of the system.

3.2 BRANCH CIRCUIT (BC) CONTROLLERS AS REQUIRED FOR SIMULTANEOUS HEAT/COOL SYSTEMS

General

1. BC (Branch Circuit) Controllers (or comparable branch devices) 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 subcooled liquid refrigerant to flow to indoor unit(s) for cooling. Refrigerant used for cooling must always be subcooled for optimal indoor unit LEV performance; alternate branch devices which do not include controlled refrigerant subcooling risk bubbles in liquid supplied to indoor unit LEVs and are not allowed.

2. BC Controllers (or comparable branch devices) shall be equipped with a circuit board that interfaces to the controls system and shall perform all functions necessary for operation. The unit shall have a galvanized steel finish and be completely factory assembled, piped and wired. Each unit shall be run tested at the factory. This unit shall be mounted indoors, with access and service clearance provided for each controller. BC Controllers (or comparable branch devices) shall be suitable for use in plenums in accordance with UL1995 ed 4.

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.

Refrigerant Piping (specifications in addition to those for outdoor unit):

1. All refrigerant pipe connections shall be brazed.

2. Future changes to indoor unit quantities or sizes served by BC Controller or comparable branch device must be possible with no piping changes except between the branch device and indoor unit(s) changing. Systems which might require future piping changes between branch device and outdoor unit—if changes to indoor unit quantities or sizes are made—are not considered equal and are not allowed.

Refrigerant valves:

1. 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.

2. Service shut-off valves shall be pre-installed by the equipment vendor and leak tested to the applicable factory specifications for each branch to allow service to any indoor unit without field interruption to overall system operation.

Condensate Management:

1. BC Controller (or comparable branch device) must have integral resin drain pan or insulate refrigeration components with removable insulation that allows easy access for future service needs. Cabinets filled with solid foam insulation do not allow for future service and are not allowed.

Electrical:

1. The unit electrical power shall be 208/230 volts, 1 phase, 60 Hertz. The unit shall be capable of satisfactory operation within voltage limits of 187-228 (208V/60Hz) or 207-253 (230/60Hz).
2. The BC Controller shall be controlled by integral microprocessors
3. The control circuit between the indoor units and outdoor units shall be 24VDC completed using a 2-conductor, twisted pair shielded cable to provide total integration of the system.

Part 4 - Indoor Units

4.1 WALL MOUNTED INDOOR UNIT

General:

1. The wall-mounted 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.

Unit Cabinet:

2. All casings, regardless of model size, shall have the same white finish
3. Multi directional drain and refrigerant piping offering four (4) directions for refrigerant piping and two (2) directions for draining are required.
4. There shall be a separate back plate which secures the unit firmly to the wall.

Fan:

1. The indoor fan shall be statically and dynamically balanced to run on a single motor with permanently lubricated bearings.
2. A manual adjustable guide vane shall be provided with the ability to change the airflow from side to side (left to right).
3. A motorized air sweep louver shall provide an automatic change in airflow by directing the air up and down to provide uniform air distribution.

Filter:

1. Return air shall be filtered by means of an easily removable, washable filter.

Coil:

1. Basis of design indoor units include factory-installed LEV/EEV. Alternative brands which require field-installed, accessory LEV or EEV kits are permissible only with written Engineer and Architect approval for the location of kits being submitted two weeks prior to bid date. EEV kits mounted in cavities inside fire-rated interior walls shall be mounted inside three hour fire rated enclosures with access panels supplied by the manufacturer. Enclosure type and placement require prior approval.

2. The indoor coil shall be of nonferrous construction with smooth plate fins on copper tubing. The tubing shall have inner grooves for high efficiency heat exchange. All tube joints shall be brazed with phos-copper or silver alloy.

3. The coils shall be pressure tested at the factory.

Electrical:

1. The unit electrical power shall be 208/230 volts, 1-phase, 60 hertz.

2. The system shall be capable of satisfactory operation within voltage limits of 187-228 volts (208V/60Hz) or 207-253 volts (230V/60Hz)

Controls:

1. The unit shall include an IR receiver for wireless remote control flexibility

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 (4) digital inputs capable of being used for customizable control strategies.

5. Indoor unit shall include no less than three (3) digital outputs capable of being used for customizable control strategies.

4.2 4-WAY CEILING-RECESSED CASSETTE WITH GRILLE FOR 2X2 GRID INDOOR UNIT

General:

1. The indoor unit shall be a four-way cassette style indoor unit that recesses into the ceiling with a ceiling grille. 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, an emergency operation function and a test run switch. Indoor unit and refrigerant pipes shall be charged with dehydrated air before shipment from the factory. The unit shall be suitable for use in plenums in accordance with UL1995 ed 4.

Unit Cabinet:

1. The cabinet shall be a compact 22-7/16” wide x 22-7/16” deep so it will fit within a standard 24” square suspended ceiling grid.
2. The cabinet panel shall have provisions for a field installed filtered outside air intake.
3. Four-way grille shall be fixed to bottom of cabinet allowing two, three or four-way blow.

Fan:

1. The indoor fan shall be an assembly with a turbo fan direct driven by a single motor.
2. The indoor fan shall be statically and dynamically balanced to run on a motor with permanently lubricated bearings.
3. The indoor fan shall be capable of three (3) speed settings, Low, Mid, and High.
4. The indoor unit shall have an adjustable air outlet system offering 4-way airflow, 3-way airflow, or 2-way airflow.
5. The indoor unit vanes shall have 5 fixed positions and a swing feature that shall be capable of automatically swinging the vanes up and down for uniform air distribution.
6. Grille shall include an optional “3D i-see” sensor, or equal, to work in conjunction with indoor unit control sequence to prevent unnecessary cooling or heating in unoccupied areas of the zone without decreasing comfort levels. Sensor must detect occupancy (not simply motion) and location of occupants by measuring size & temperature of objects within a 39’ detecting diameter (based on 8.8ft mounting height) with 1,856 or more measuring points.

Filter:

1. Return air shall be filtered by means of a long-life washable filter.

Coil:

1. The indoor coil shall be of nonferrous construction with smooth plate fins on copper tubing. The tubing shall have inner grooves for high efficiency heat exchange. All tube joints shall be brazed with phos-copper or silver alloy.
2. The coils shall be pressure tested at the factory.

3. The unit shall be provided with an integral condensate lift mechanism that will be able to raise drain water 19-3/4” inches above the condensate pan.

Electrical:

1. The unit electrical power shall be 208/230 volts, 1-phase, 60 hertz.

2. The system shall be capable of satisfactory operation within voltage limits of 187-228 volts (208V/60Hz) or 207-253 volts (230V/60Hz).

Controls:

1. 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.

2. 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.

3. Indoor unit shall include no less than four (4) digital inputs capable of being used for customizable control strategies.

4. Indoor unit shall include no less than three (3) digital outputs capable of being used for customizable control strategies.

5. A factory-installed drain pan sensor shall provide protection against drain pan overflow by sensing a high condensate level in the drain pan. Should this occur, the control shuts down the indoor unit before an overflow can occur. A thermistor error code will be produced should the sensor activate indicating a fault which must be resolved before the unit re-starts.

4.3 MEDIUM STATIC CEILING-CONCEALED DUCTED INDOOR UNIT

General:

1. The ceiling-concealed ducted 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. The unit shall be suitable for use in plenums in accordance with UL1995 ed 4.

Unit Cabinet:

1. The unit shall be ceiling-concealed, ducted—with a 2-position, field adjustable return and a fixed horizontal discharge supply.

2. The cabinet panel shall have provisions for a field installed filtered outside air intake.

Fan:

1. Indoor unit shall feature multiple external static pressure settings ranging from 0.14 to 0.60 in. WG.
2. The indoor unit fan shall be an assembly with statically and dynamically balanced Sirocco fan(s) direct driven by a single motor with permanently lubricated bearings.
3. The indoor fan shall consist of three (3) speeds, High, Mid, and Low plus the Auto-Fan function

Filter:

1. Return air shall be filtered by means of a standard factory installed return air filter.
2. Optional return filter box (rear or bottom placement) with high-efficiency filter as noted on equipment schedule.

Coil:

1. The indoor coil shall be of nonferrous construction with smooth plate fins on copper tubing. The tubing shall have inner grooves for high efficiency heat exchange. All tube joints shall be brazed with phos-copper or silver alloy.
2. The coils shall be pressure tested at the factory.
3. Coil shall be provided with a sloped drain pan. Units without sloped drain pans which must be installed cockeyed to ensure proper drainage are not allowed.
4. The unit shall be provided with an integral condensate lift mechanism able to raise drain water 27 inches above the condensate pan.

Electrical:

1. The unit electrical power shall be 208/230 volts, 1-phase, 60 hertz.
2. The system shall be capable of satisfactory operation within voltage limits of 187-228 volts (208V/60Hz) or 207-253 volts (230V/60Hz).

Controls:

1. 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.
2. 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.
3. Indoor unit shall include no less than four (4) digital inputs capable of being used for customizable control strategies.

4. Indoor unit shall include no less than three (3) digital outputs capable of being used for customizable control strategies.

Part 5 - Controls

5.1 OVERVIEW

The control system shall consist of a low voltage communication network and a web-based interface. The controls system shall gather data and generate web pages accessible through 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.
Furnish energy conservation features such as optimal start, request-based logic, and demand level adjustment of overall system capacity as specified in the sequence.

System shall be capable of email generation for remote alarm annunciation.

5.2 ELECTRICAL CHARACTERISTICS

General:

1. Controller power and communications shall be via a common non-polar communications bus and shall operate at 30VDC.

Wiring:

1. 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.

2. 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.

Wiring type:

1. Wiring shall be 2-conductor (16 AWG), twisted, stranded, shielded wire as defined by the Diamond System Builder output.

2. Network wiring shall be CAT-5 with RJ-45 connection.

5.3 CITY MULTI CONTROLS NETWORK

1. 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. The below figure illustrates a sample CMCN System Configuration.

Part 1 - Ventilation Options

1.1 LOSSNAY ENERGY RECOVERY UNITS

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. The unit shall have factory installed inlet air thermistors, control board with functions for local, remote, and optional control modes.

Unit Cabinet:

1. The cabinet shall be fabricated of galvanized steel, and covered with polyurethane foam insulation as necessary with steel mounting points securely attached

Blowers:

1. The unit shall be furnished with 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 a directly connected to the blower wheels and have permanently lubricated bearings.

Heat Exchanger

1. The enthalpic heat exchanger element shall be constructed of specially treated cellulous fiber membrane separated by corrugated layers to allow total heat (sensible and 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. Basis of design heat exchanger does not require condensate drain. Contractor responsible for all additional costs relating to alternate brands which may require condensate drain connection.

Bypass Damper

1. The ERV shall have an automatic supply side by-pass damper to allow inbound ventilation air to by-pass the heat exchanger element when factory-installed thermistors measure outside ambient temperature being at least 7 degrees cooler than air returned from interlocked indoor units running in cooling mode.

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 a mechanical damper flap to allow fresh air to bypass the element.

Filter:

1. The ERV shall be equipped with factory installed, washable air filters located at each intake face (both supply and exhaust sides) of the heat exchanger element to clean the air and prevent clogging.

Electrical:

1. The units will require a 208-230Volt, 1 Phase, 60Hz power supply.

Control:

1. ERV shall be capable of interlocked control with other systems by manufacturer. Communication must include MODE of interlocked indoor unit to allow benefit of proper operation of bypass damper
2. ERV control board shall allow independent control by contact closure from third-party sensor-driven controllers, switches, or timers.

Performance:

1. The ERV units shall have the following nominal capacities:

Model Size (CFM)	Nominal Airflow	External Static Capacity (In. WG) at Nominal Airflow
300	300 CFM	0.46
470	470 CFM	0.60
600	600 CFM	0.66
1200	1200 CFM	0.59

2. The temperature recovery efficiency at extra low fan speed will be as follows:

Model Size (CFM)	Temperature Recovery	Enthalpic Recovery	
		Heating	Cooling
300	83%	81.5%	65%
470	84.5%	83%	72%
600	81%	80%	71%
1200	81%	80%	71%

3. RV performance must be certified to ARI Standard 1060

4. ERV operating sound level shall not exceed 41 dB(A) as measured 59 in. under center of unit at maximum fan speed.

Ductwork:

1. The two outdoor ducts must be covered with heat insulating material in order to prevent condensation from forming.

2. The two outdoor ducts must be tilted at a gradient (1/30 or more) down toward the outdoor area from Lossnay® unit.

PART 1 GENERAL

1.01 SUMMARY OF WORK

A. The extent and location of “Electrical Work” Work is shown in the Contract Documents. This Section includes general requirements for accomplishing electrical Work as specified herein and indicated on the Drawings.

B. Electrical hot Work may be required to be performed on portions of the electrical power distribution and utilization equipment. The Contractor and its subcontractors shall provide personal protection equipment (PPE), training, authority having jurisdiction (AHJ) safety compliance and all necessary tools for the execution of such Work.

1.02 GOVERNING CODES, STANDARDS AND REFERENCES

A. FAA (Federal Aviation Administration)

B. NFPA 70: National Electrical Code (NEC)

C. NFPA 70 E: Standard for Electrical Safety in the Workplace

D. Power Company

E. State of Washington Dept. of Labor & Industries.

F. Underwriters Laboratories, Inc.

G. WAC 296-45

H. State requirements for highway signage, flagging, and re-routing traffic

I. State of Washington safety rules and health standards

1.03 SUBMITTALS

A. Submit materials data in accordance with of Section 01 33 00 - Submittals. Furnish manufacturers’ technical literature, standard details, product specifications, and installation instructions.

B. Submittals shall include the following:

1. Review of Shop Drawings and Brochures shall not relieve the Contractor of responsibility for dimensions and/or errors that may be contained therein, or deviations from Contract Document requirements. It shall be clearly understood that the noting of some errors, but the overlooking of others does not grant the Contractor permission to proceed in error. Regardless of any information contained in the Shop Drawings and Brochures, the requirements of the Contract Documents shall govern and are not waived or superseded in any way by the review of the Shop Drawings and Brochures.

2. Manufacturer Approval Drawings: Equipment that is laid out, configured, or designed by manufacturer based on performance specifications only shall be submitted to the Engineer for approval prior to release of drawings for manufacturing.

C. Ordering Materials: Order materials within two (2) weeks of receiving reviewed submittals from the Engineer. Provide proof of order placement upon request. Failure to comply will be considered non-performance and progress payments will

be suspended until proof of order placement is reviewed and accepted by the Engineer.

D. Provide weekly updated Submittal Log of all penetrations and cuts performed when cutting and patching for installation.

1.04 DRAWINGS

A. The electrical drawings are diagrammatic and are not intended to show all raceway, wiring, exact locations of equipment, terminations, or number or types of fittings required by the electrical system. Provide all related electrical Work which is specified herein, diagrammed or scheduled on the electrical drawings, required by code enforcing agencies and as indicated on other details or elevations for complete and operating electrical systems. Since the drawings of floor, wall, and ceiling installation are made at a small scale, outlets, devices, equipment, etc. are indicated only in their approximate location unless dimensioned or otherwise indicated. Locate outlets and apparatus symmetrically on floors, walls and ceilings where not dimensioned and coordinate such locations with the Work of other trades to prevent interferences. Verify all dimensions on the job. Do not scale the electrical drawings. Refer to Architectural and Mechanical shop drawings and project drawings for dimensions as applicable.

1.05 PRODUCTS

A. General: Products are specified by manufacturer name, description, and/or catalog number to show intended function and quality. Report discrepancies, such as discontinued equipment or catalog numbers, to the Engineer prior to bidding.

B. Manufacturers: Provide only equipment specified in the Contract Documents or approved by addendum. Manufacturers' catalog numbers and descriptions establish the quality of product required.

C. Warranty shall be manufacturer’s standard or a minimum of one year unless noted otherwise in Division 26 Electrical Sections.

1.06 SUBSTITUTIONS

A. Comply with Section 00 26 00 – Substitution Procedures.

1.07 QUALITY ASSURANCE

A. All materials shall be new, unless noted otherwise. Properly store all materials and equipment for protection from physical damage or damage due to corrosion.

B. Review accessibility of equipment for operation, maintenance and repair prior to installation. Proceed with installation only after unsatisfactory conditions have been corrected

C. Equipment Manufacturer Qualifications: Equipment manufacturers shall have at least 10 years experience in manufacturing products and accessories similar to those for this Project, with a record of successful in-service performance.

1.08 COORDINATION AND SCHEDULING

A. Coordinate and schedule electrical Work with the Work of other trades. Every reasonable effort shall be made to prevent conflicts as to space requirements, dimensions, locations, code required working spaces, access openings, drawout and removal spaces or other matters tending to obstruct or delay the Work of other

trades. All changes caused by failure to coordinate shall be made at the Contractor's expense.

1.09 SAFETY AND PROTECTION

A. Safety Measures To Be Taken: The Engineer has not been retained or compensated to provide design and construction review services relating to the Contractor's safety precautions or to the means, methods, techniques, sequences or procedures required for the Contractor to perform his Work. The Contractor will be solely and completely responsible for conditions of the job site, 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 Engineer 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 applicable safety and health regulations for construction. The Contractor shall consult with the state or federal safety inspector for interpretation whenever in doubt as to whether safe conditions do or do not exist or whether they are or are not in compliance with state or federal regulations.

B. Protection: The Contractor shall take whatever measures are required to ensure that electrical safety and protection are maintained, including the proper covering, signage, and securing of “live” circuits.

1.10 ELECTRICAL SERVICE

A. Continuity of Service: Provide temporary service to existing systems as required to maintain continuous operation without reducing equipment efficiency. Coordinate the extent of temporary services with the Engineer.

B. Power Outages: Outages shall be kept to an absolute minimum. Any essential outages required in the course of construction, whether for temporary services, cutovers, or testing, shall be closely coordinated with the Engineer and shall occur at times approved by the customer.

1.11 DEMOLITION

A. General: De-energize circuits in demolition areas to ensure a safe condition.

B. Existing material that is not to be reused or is not requested by the customer to be retained shall be removed from the site and shall become the property of the Contractor for salvage. All materials removed from the site shall be disposed of at facilities licensed for the material.

C. In areas of where alterations are to be done, existing conduits may be reused, with the approval of the Engineer, in their original location, unless noted otherwise.

1. Wiring that is discovered with damaged or deteriorating insulation shall be replaced with new.

2. No existing conduit or wiring once removed may be reused, unless noted otherwise.

D. Remove all unused exposed conduit except where located in or above existing construction, which is not being altered and would require removal and replacement of the existing construction.

1.12 ELECTRICAL EQUIPMENT INSTALLATION

A. Comply with Division 1 General Requirements Sections for environmental regulatory requirements, quality control, construction facilities and temporary controls, traffic control, access control, and signage requirements.

B. Provide electrical connection of all equipment having electrical requirements. Make final connections for all Owner-furnished equipment.

1. Make electrical connections in accordance with manufacturer's written instructions, with recognized industry practices, and complying with requirements of the National Electrical Code.

2. Verify all electrical loads (voltage, phase, full load amperes, number and point of connections, minimum circuit capacity, etc.) for equipment furnished under other divisions of this specification by reviewing respective shop drawings furnished under each division.

3. Meet with each subcontractor furnishing equipment requiring electrical service to review electrical characteristics for each equipment item before rough-in begins. Report any variances from electrical characteristics noted on the electrical drawings to the Engineer before proceeding with rough-in Work.

C. National Electrical Code Compliance: Comply with applicable portions of National Electrical Code as to the type of products used and provisions for electrical power connections.

D. Underwriters Laboratories acceptance: All material and equipment within the scope of the UL Re-examination service shall be approved by Underwriters Laboratories, Inc. for the purpose for which they are used and shall bear their label.

E. Cutting and Patching: Provide and coordinate the locations of all openings required in the building construction for installation of the Work.

1. Drill penetrations required through existing concrete slabs or walls with a diamond core drill. In no case shall any structural member be cut.

2. Provide approved sleeves as required for electrical penetrations through floors and walls. Seal all openings around conduits in sleeves with a material of equal fire rating as the surface penetrated.

3. Obtain written approval from a Structural Engineer licensed in the State of Washington prior to cutting any reinforcing bars.

F. Equipment Accessibility: Comply with applicable codes and install equipment to be accessible for operation, maintenance or repair. Equipment deemed inaccessible shall be reported to the Engineer, and relocated as directed.

G. Electrical Work Exposed to Weather: Provide weatherproof enclosures and corrosion protection for all ferrous metal portions of electrical Work exposed to weather, including conduit, clamps, supports, and hardware.

1. All galvanized electrical equipment exposed to the weather shall be painted to prevent leaching of zinc into the stormwater system. Paint coating shall be a minimum of 3 mils thick, and application as part of the manufacturing process is preferred over painting in the field.

1.13 EARTHWORK

A. Existing Underground Utilities: Verify, before any excavation, the location of all existing utilities in the area of new construction. Exercise extreme care with all Work adjacent to these utilities. A designated representative of the Contractor shall advise the customer and SNOPUD where they can be contacted in case of emergency.

1. Review drawings and notify the Engineer of any deviations in duct runs to avoid conflicts with existing utilities. Any changes in the Work resulting in the same quantities of trenching material shall not entitle the Contractor to any claim for an addition to this Contract.

2. The Contractor is responsible for any damage done to existing utility installations during the course of the Work. All damaged installations shall be replaced to the satisfaction of the utility or agency involved at the expense of the Contractor.

B. Comply with the Division 1 General Requirements and Division 31 Earthwork requirements for site work, including excavation, bracing and shoring, erosion control, requirements for temporary pumping equipment, backfilling, patching and paving, sod replacement, removal of surplus material, and requirements for traffic control during construction.

1.14 PROJECT FINALIZATION

A. Fully test and adjust all equipment installed under this specification and demonstrate its proper operation.

1. Testing that involves use of instruments other than meggers and volt-ohm meters shall be performed by an independent testing agency.

B. Where circuits have been added, removed or relocated on panelboards and switchboards, the Contractor shall provide to the customer as-built panel and switchboard schedules in approved format. Coordinate submittal of schedules with Engineer.

C. Present the customer with Certificate of Inspection from the Authorities Having Jurisdiction upon completion of the Work stating that all Work complies with all applicable Codes and Ordinances.

D. Comply with Division 1 General Requirements for cleaning, closeout procedures, commissioning, training, operations and maintenance manuals, and record drawings.

PART 2 PRODUCTS - NOT USED

PART 3 EXECUTION - NOT USED

PART 4 MEASUREMENT AND PAYMENT

4.01 GENERAL

A. No separate measurement or payment will be made for the Work required by this section. The cost for this portion of the Work will be considered incidental to, and included in the payments made for the applicable bid items.

END OF SECTION

PART 1 - GENERAL

1.1 SUMMARY

A. This Section includes requirements for acceptance testing by an independent testing agency.

B. Related Documents: The provisions and intent of the Contract, the General and Supplementary Conditions, and Division 1 Specification Sections, apply to the Work as if specified in this Section.

1.2 APPLICABLE PUBLICATIONS

A. All inspections and tests shall be in accordance with the following applicable standards and codes. These publications form a part of this specification to the extent referenced.

1. American Society for Testing and Materials (ASTM):

a. D877 -- Dielectric Breakdown Voltage of Insulating Liquids Using Disk Electrodes.

2. Insulated Cable Engineers Association (ICEA):

a. S-68-516 -- Ethylene-Propylene-Rubber Insulated Wire and Cable for the Transmission and Distribution of Electrical Energy.

3. National Electrical Manufacturers Association (NEMA):

a. WC8 -- Ethylene-Propylene-Rubber Insulated Wire and Cable for the Transmission and Distribution of Electrical Energy. (ICEA S-68-516)

4. Institute of Electrical and Electronic Engineers (IEEE):

a. 81 -- Guide for Measuring Earth Resistivity, Ground Impedance, and Earth Surface Potentials of a Ground System.

b. 400 Guide for Making High-Direct-Voltage Tests on Power Cable Systems in the Field.

5. National Electrical Code - NEC

6. American National Standards Institute - ANSI

7. National Fire Protection Association - NFPA

8. Occupational Safety and Health - OSHA 29CFR Part 1910.269

9. International Electrical Testing Association - NETA

10. Nationally Recognized Testing Laboratory Approved - NRTL

11. State of Washington Administrative Code - WAC

12. Tacoma Public Utilities Amendments

1.3 TESTING FIRM QUALITY ASSURANCE

A. The Testing Firm shall be an independent testing organization which can function as an unbiased testing authority, professionally independent of the manufacturers, suppliers and installers of equipment or systems being evaluated, and regularly engaged in the testing of electrical equipment, devices, installations and systems. The Testing Firm shall meet Washington State Department of Labor and Industries and Tacoma Power criteria for accreditation of testing laboratories, for electrical product testing.

B. Testing Firm's Field Supervisor Qualifications: A person, regularly employed by the firm for testing services and currently certified by the International Electrical Testing Association to supervise on-site testing specified.

1.4 GENERAL REQUIREMENTS

A. General Scope: Engage the services of a recognized independent testing firm for the purpose of performing quality control inspections and tests as herein specified.

1. The Testing Firm shall provide all material, equipment, labor and technical supervision to perform all tests and inspections to determine suitability of equipment for energization and continued reliable operation.

2. The purpose of these tests is to assure all tested electrical equipment, both Contractor- and Owner-supplied, is operational within industry and manufacturer's tolerances and equipment is installed and functioning in the system in accordance with design specifications of the Engineer.

3. The Testing Firm shall inspect, test and program the following equipment:

a. 480Y/277V panelboard and circuit breakers.

b. 600V cables.

1.5 SUBMITTALS

A. Submittals by the Testing Firm:

1. Field Test Reports: Maintain a written record of all tests. Assemble and certify a final test report upon completion of the project, showing dates, personnel making tests, equipment used, equipment or material tested, tests performed, and results. The field test forms included in the report shall be the original hand-written test results that were recorded and signed by the individual(s) who performed the testing.

2. Qualification Data: For the Testing Firm.

1.6 DIVISION OF RESPONSIBILITY

A. The Contractor shall perform routine insulation-resistance, continuity, and rotation tests for all distribution and utilization equipment prior to, and in addition to tests performed by the Independent Testing Firm.

B. The Contractor shall supply a suitable and stable source of electrical power to each test site. The Testing Firm shall determine the specific power requirements.

C. The Contractor shall notify the Testing Firm when equipment becomes available for acceptance tests. Coordinate work to expedite project scheduling.

D. Harris Group shall supply a short-circuit and protective device coordination study, a protective device setting form, a complete set of electrical drawings and specifications, and any pertinent change orders to the Testing Firm prior to commencement of testing.

E. The Testing Firm shall notify the Engineer prior to commencement of any testing.

1.7 SAFETY

A. The Contactor shall adhere to safety procedures as required by the following:

1. Occupational Safety and Health Act.

2. Accident Prevention Manual for Industrial Operations, National Safety Council.

3. ANSI/NFPA 70E, Electrical Safety Requirements for Employee Workplaces.
4. American National Standards for Personnel Protection: Lockout/Tagout.
5. Applicable state and local safety operating procedures.

B. Perform all tests with apparatus de-energized, except where specifically required.

C. Designate a Project Safety Representative to supervise operations with respect to safety.

1.8 WORK INCLUDED:

A. The Contractor shall perform tests of the electrical system to assure code compliance and proper system operation according to the intent of the contract documents.

B. Applicable Codes, Standards & References for Tests:

All inspections and tests shall be in accordance with the following applicable codes and standards except as provided otherwise herein.

1. National Electrical Code - NEC
2. National Electrical Manufacturer's Association - NEMA
3. American Society for Testing and Materials - ASTM
4. Institute of Electrical and Electronic Engineers - IEEE
5. National Electrical Testing Association - NETA
6. American National Standards Institute - ANSI
7. State and Local Codes and Ordinances
8. Insulated Cable Engineers Associate - ICEA
9. Association of Edison Illuminating Companies - AEIC

1.9 CIRCUIT TESTS:

A. The Contractor shall perform routine insulation resistance, continuity and grounding tests for all distribution and utilization equipment prior to their connection and energization.

B. A standard megger-type instrument shall be used to demonstrate insulation values are at least 200 megohms, ground system is continuous and neutral system is isolated from grounding system except at the systems' single ground point.

C. System defects, indicated by the circuit tests, shall be corrected. Tests shall be repeated until satisfactory results are obtained.

1.10 GROUNDING TEST:

A. Measure the ohmic value of the Electrical Service Entrance "System Ground" with reference to "Earth Ground" using multiple terminal, fall of potential methods and suitable test instruments.

B. Maximum resistance to ground shall be less than 10 ohms. Notify the Engineer if this resistance value is not obtained for the initially installed system; and then provide corrective measures as required to reduce ground resistance to less than 10 ohms.

1.11 PHASE BALANCE TESTS:

A. Verify the balance of the electrical system's phase currents. Re-assign load connections necessary to obtain a balance that is acceptable to the Port of Tacoma.

PART 2 - PRODUCTS

2.1 TEST EQUIPMENT

A. Utilize test equipment in good mechanical and electrical condition with shape and frequency output waveforms appropriate for the test and the tested equipment.

1. Accuracy shall be appropriate for the test being performed, but not in excess of 2% of the scale being used.

B. Field test meters used to check installed power system instrument calibration must have an accuracy higher than that of the instrument being checked.

2.2 Test Instruments and Calibration

A. The Testing Firm shall have a calibration program which assures that all applicable test instruments are maintained within rated accuracy as dictated by the National Institute of Standards and Technology (NIST).

1. Instruments calibration schedule:

a. Field instruments: Analog, 6 months maximum; Digital, 12 months maximum

b. Laboratory instruments - 12 months.

c. Leased specialty equipment - 12 months (where lessor guarantees accuracy).

2. Provide visible dated calibration labels on all test equipment.

3. Maintain up-to-date instrument calibration instructions and procedures for each test instrument.

B. Provide all testing equipment required including, but not limited to, the following:

1. Wet and dry-bulb thermometer.

2. 500V and 1000V meggers.

3. Battery-powered portable telephone sets

4. DC high-potential adjustable test set for EPR medium-voltage cables.

5. Multimeter (Volts-Ohms-Millimeter) rated 20k ohms per volt or higher.

6. Three-phase rotation meter, 60-Hz.

7. Commercial model three-point earth ground test set that reads directly in ohms.

8. Miscellaneous cable, test leads, jumpers, test lights, buzzers, bells, switches, plugs, receptacles, and other test equipment as required.

9. Insulation Tester (Megger): 2,000 Megohms.

10. Dranetz, BMI Model 355, Fluke 41 or equivalent recording type harmonic analyzer to display individual and total harmonic currents and voltages.

11. Clamp-on Ammeter.

12. Circuit Breaker Current Injections Test Set.

2.3 Test Report

A. Include the following:

1. Summary of Project.

2. Description of equipment tested.
3. Description of test.
4. Test results.
5. Analysis and recommendations.
6. Appendix, including appropriate test forms.
7. List of test equipment used and calibration date.

B. Furnish 3 copies of the completed report to the Engineer no later than thirty days after completion of the tests.

2.4 MATERIALS AND INSTRUMENTATION:

A. Contractor and/or testing agency shall supply all apparatus and materials required for indicated tests.

B. Contractor shall include all costs associated with testing in bid proposal.

2.5 TEST REPORT(S):

A. Furnish minimum three (3) bound copies of test reports, as specified herein, for inclusion into the project operation and maintenance manuals. Each test report shall include the following items:

1. Name, address and telephone number of the testing agency.
2. Name(s) of personnel conducting the tests
3. Type of test
4. Description of test procedure
5. List of items tested
6. List of actual test equipment including make, model(s), serial number(s) and calibration date(s) as applicable.
7. Test results
8. Conclusion and recommendations

PART 3 - EXECUTION

3.1 Testing

A. General requirements: Test all wire, cable, and electrical equipment installed and connected by the Contractor to assure proper installation, setting, connection, and function as indicated or to conform to Contract Documents and manufacturer's instructions. As an exception to requirements stated elsewhere in the Contract, give the Engineer at least 7 calendar days' notice of the dates and times scheduled for tests (except megger tests) so Engineer may witness the tests. After the installation has been completed, the Contractor shall conduct an operating test demonstrating all equipment and devices operate in accordance with the requirements of the plans and specifications.

1. Perform tests recommended by the equipment manufacturer.
2. Perform additional tests issued by the Engineer which are required due to field conditions.
3. Be responsible for all damage to equipment or material due to improper test procedures or

test apparatus handling.

3.2 IDENTIFICATION

A. Upon completion of the tests and inspections noted in these specifications, attach a label to all serviced devices indicating the date serviced and the testing company responsible.

3.3 TESTING PROCEDURE:

A. All tests shall be conducted according to applicable industry standards.

3.4 SCHEDULING:

A. Notify Engineer at least seven (7) calendar days prior to performance of any test.

3.5 TRANSMITTAL OF REPORTS:

A. Transmit test reports to the Engineer per Section 01 77 00 - Closeout Procedures.

END OF SECTION

PART 1 - GENERAL

1.1 GENERAL CONDITIONS:

A. Bidding documents including Division 1 General Conditions, Supplementary General Conditions, Published Addenda and related work in other Divisions form an integral part of these Specifications.

1.2 DEFINITIONS:

A. The term "provide" shall mean furnish, install and connect equipment and materials complete in operating condition.

B. The term "approved" as used herein shall mean the written approval of the Engineer.

C. NEC means National Electrical Code.

D. The term "code" as used herein shall mean all applicable National, State and local codes.

1.3 WORK INCLUDED:

A. The Electrical work consists of furnishing, installing, testing and placing in satisfactory operation all equipment, materials, devices and appurtenances, necessary to provide a complete electrical system according to the intent of the Drawings and Specifications. In general this includes all labor, materials, equipment, tools, etc. to complete the electrical work.

B. There will be multiple contractors working on the site. The Contractor for this project is required to coordinate work for this project with work of the other contractors on site.

C. All metal fabrications are to be steel, as indicated on the Drawings. Provide metal fabrications as 316 stainless steel where identified as such. The work shall consist of furnishing all materials, labor, and equipment for fabricating and/or repairing, PVC coating, painting, and erecting metal fabrications, all in accordance with the Drawings, notes, and this specification.

1.4 INTENT OF DRAWINGS:

A. The Electrical Drawings are intended to serve as working Drawings for general layout. Equipment, switches, panels, disconnects and raceway locations are partially diagrammatic and do not necessarily indicate actual routings or all appurtenances required for a complete installation.

B. Minor changes in the locations of raceways, outlets and the like, from those shown on the Plans, shall be made without extra charge if so directed by the Engineer before installation.

C. Contractor is required to take all working dimensions from civil drawings. Do not scale electrical Drawings.

1.5 MANUFACTURERS' RECOMMENDATIONS:

A. Make all installations in strict accordance with manufacturers' published recommendations and details. All equipment and materials recommended by them shall be considered as part of this contract.

1.6 RELATED WORK:

A. EQUIPMENT FURNISHED BY OTHERS:

1. All equipment furnished for this project shall be coordinated with the Drawings to ensure correctness of Voltage, Phase and Ampacity. Equipment served by single circuit or feeder shall be provided with appropriate internal wiring including fusing of multiple circuits as

required by code.

2. Control Voltages shall not exceed 120 volts. Provide control transformers for higher line voltages. Control transformers shall be connected from phase to neutral.

1.7 SUPERVISION AND COORDINATION:

A. Contractor shall have a responsible person in charge at the site any time work is in progress or when necessary for coordination with other trades.

1.8 CODES AND REGULATIONS:

A. All work shall conform to current applicable National, State and local Codes; these shall be regarded as the minimum standard of quality for material and workmanship. Contractor shall provide all Labor and Material that may be required for compliance with Code Requirements or Code Interpretations, although not specifically detailed on the Drawings or in the Specifications. Contractor shall become familiar with all the following codes prior to bidding.

1. ASTM American Society for Testing and Materials
2. NBFU National Board of Fire Underwriters
3. NEC National Electrical Code
4. WAC Washington State Administrative Code
5. NESC National Electrical Safety Code
6. NEMA National Electric Manufacturers Association
7. NFPA National Fire Protection Association
8. UL Underwriters Laboratories, Inc.
9. ICEA Insulated Cable Engineer's Associations
10. CBM Certified Ballast Manufacturers
11. IBC International Building Code
12. ETL Electrical Testing Laboratories
13. --- Tacoma Public Utilities Standards

B. Nothing in these Drawings and Specifications shall be construed as permitting work not conforming with governing codes.

C. The Contractor shall not be relieved from complying with any requirements of these contract documents which may exceed, but not conflict with requirements of the governing codes.

D. Contractor shall include in bid all costs to have a Department of Labor & Industries approved firm to evaluate the installation safety, and compliance with code as required per WAC 296-40-100 for any equipment specified or furnished that is not UL labeled.

E. For equipment furnished by others that is not UL labeled the contractor shall not connect the equipment to the electrical system until receiving written approval by the electrical authority having jurisdiction.

1.9 PERMITS AND FEES:

A. Obtain and pay all fees for licenses, permits and inspections required by laws, ordinances and rules governing work specified herein. Arrange for inspection of work and provide inspectors with all necessary assistance.

1.10 WORKMANSHIP:

A. All work shall be done by competent craftsmen skilled in the specific work to be done. Equipment shall be installed in a neat and workmanlike manner following the best practice of the trade.

1.11 OPERATING INSTRUCTIONS:

A. Fully instruct the Owner's designated representatives in the operation and maintenance of all components of the electrical system upon completion of the work and after all tests and final inspection(s) by the Authority(s) Having Jurisdiction.

1.12 AS-BUILT RECORD DRAWINGS:

A. See Specification Section 01 77 00.

1.13 ELECTRICAL EQUIPMENT OPERATION AND MAINTENANCE (O & M) MANUALS:

A. See Specification Section 01 78 23.

PART 2 - PRODUCTS

2.1 GENERAL:

A. All materials shall be new, free from defects, of the quality specified herein and on the Drawings. Materials shall be designed to ensure satisfactory operation and manufacturer's rated life in the prevailing environmental conditions where they are being installed. They shall be listed by Underwriter's Laboratories, or a Washington Administration Code (WAC) recognized testing laboratory for use under these conditions.

B. Each type of material shall be of the same make and quality throughout the job. The materials furnished shall be the latest standard design products of manufacturers regularly engaged in their production.

2.2 TECHNICAL DATA:

A. Technical information contained herein relies entirely on tests and ratings provided by manufacturers who are solely responsible for their accuracy. The Engineer using this information in no way implies they have tested or otherwise verified the results of published manufacturer's information.

2.3 AS SPECIFIED EQUIPMENT:

A. This specification generally lists only one make and model number for each item of equipment or material required for the project. This is not intended to be restrictive but is intended to indicate the standard of quality, design and features required.

B. In addition, the listed product is the basis of the design regarding physical size, electrical power requirements and performance. The product so identified is designated "as specified."

2.4 COMPLETE SYSTEMS:

A. All systems specified herein and shown on the Drawings shall be complete and operational in every detail. Mention of certain materials in bidding documents shall not be construed as releasing the Contractor from furnishing additional materials required by the manufacturer, installation methods, codes and performing all labor required to provide a complete and operable system.

2.5 SUBMITTALS:

A. Submittal items: Submittals shall include, but not be limited to the following items:

1. Raceways
2. Wires (600V)
3. Grounding Equipment
4. Wiring Devices
5. Nameplates
6. Items Requested by the Port of Tacoma

PART 3 - EXECUTION

3.1 PROTECTION OF WORK:

A. Protect all work, wire, materials and equipment installed under this Division against damage by other trades, weather conditions or any other causes. Equipment found damaged or in other than new condition will be rejected as defective.

B. Equipment shall be kept covered or enclosed to exclude moisture, dust, dirt, cement, or paint and shall be free of all such contamination before acceptance. Enclosures and trims shall be in new condition, free of rust, scratches or other finish defects. Properly refinish in a manner acceptable to the Engineer if damaged.

C. Keep conduit and raceways closed with suitable plugs or caps during construction to prevent entrance of dirt, moisture, concrete or foreign objects. Pull a properly sized mandrel through each conduit prior to installation of wire or pull string for empty conduits and within 24 hours of concrete placement (duct tape not acceptable). Raceways shall be clean and dry before installation of wire and at the time of acceptance.

D. Make up and insulate wiring promptly after installation of conductors. Wire shall not be pulled-in until raceways are complete, all bushings are installed and raceway terminations are completed nor pulled into conduit embedded in concrete until after the concrete is placed and forms are removed.

3.2 CUTTING AND PATCHING:

A. Obtain permission from the Engineer prior to cutting. Locate cuttings so they will not weaken structural components. Cut carefully and only the minimum amount necessary. Cut concrete with diamond core drills or saws except where space limitations prevent the use of such equipment.

B. All construction materials damaged or cut into during installation must be repaired or replaced with materials of like kind and quality as original materials by skilled labor experienced in that particular building trade.

3.3 PAINTING:

A. Equipment scratched or marred in shipment or installation shall be refinished to the satisfaction of the Engineer.

3.4 LABELING:

A. Clearly and properly label the complete conduit only and electrical system, as specified herein, to indicate the loads served or the function of each item of equipment connected under this contract. All labels shall be stamped Brass/Aluminum type. Seton or equal.

B. Stamped Brass/Aluminum tags shall have source end point, circuit breaker, fused switch, equipment name or equipment ID.

END OF SECTION

PART 1 - GENERAL

1.1 SUMMARY OF WORK:

A. The extent and location of “600 Volt or Less Wire and Cable” Work is shown in the Contract Documents. This section includes requirements for insulated copper stranded conductors and associated connectors, splices, and terminations for general power and control use at voltages below 600 volts, for sizes #14 AWG through 750 kcmil.

1.2 GOVERNING CODES, STANDARDS AND REFERENCES

A. ASTM B3 (American Society for Testing and Materials) – Standard Specification for Soft or Annealed copper Wire

B. ASTM B8 (American Society for Testing and Materials) – Standard Specification for Concentric-Lay-Stranded Copper Conductors, Hard, Medium-Hard, or Soft

C. NECA (National Electrical Contractors Association) - National Electrical Installation Standards

D. ANSI/NEMA WC 70/ICEA S-95-658 – Power Cables Rated 2,000V or Less for the Distribution of Electrical Energy

E. NFPA 70 (National Fire Protection Association) – National Electrical Code

F. NETA (International Electrical Testing Association) – Acceptance Testing Specifications

G. UL 44 (Underwriters Laboratories) – Thermoset-Insulated Wires and Cables

H. UL 62 (Underwriters Laboratories) – Flexible Cords and Cables

I. UL 82 (Underwriters Laboratories) – Electric Gardening Appliances

J. UL 854 (Underwriters Laboratories) – Service-Entrance Cables

1.3 SUBMITTALS

A. Product Data: For each type of product.

B. Qualification Data: For testing agency.

C. Field quality-control reports.

1.4 QUALITY ASSURANCE

A. All wire and cable shall be new and made of copper. No aluminum wire and cable allowed, unless otherwise noted.

B. Listing and Labeling: Provide wire and cable that are Listed and Labeled as defined in NFPA 70, Article 100 and marked for specific types, sizes, and combinations of conductors and connected items.

C. Comply with NFPA 70.

D. Testing Agency Qualifications: Member company of NETA or an NRTL.

1. Testing Agency's Field Supervisor: Certified by NETA to supervise on-site testing.

PART 2 - PRODUCTS

2.2 PACKAGING:

A. Conductors shall be delivered to the job site in approved original cartons, or on reels as recommended by the manufacturer, and shall bear the Underwriter's Label. Reels shall be provided with suitable protection to prevent fork-lift damage to conductors during shipment or storage prior to use.

2.3 CONDUCTORS - 600 VOLTS:

A. Stranded Copper, insulated for 90 degree centigrade and 600 volts.

B. Insulation type XHHW-2. Insulation requirements may vary per the NEC where necessary to suit more stringent installation conditions.

2.4 CONNECTORS - 600 VOLTS:

A. Branch circuit conductor splices:

1. Pre-insulated "twist-on" type or "crimped-on" type as approved (Scotch-lok, Ideal or equal).

B. Terminator lugs of No. 12 wire and smaller:

1. Spade, insulated type to be tool applied.

C. Terminator lugs for No. 10 wire or larger:

1. Two bolt (or approved positive restraint), tool applied compression type (Burndy or equal).

2.5 INSULATING MATERIALS:

A. Insulating tape or heat shrink tubing shall have the equivalent rating of the applicable conductor insulation (Scotch 3M, RAYCHEM or equal).

2.6 PLASTIC CABLE TIES:

A. Nylon, or equivalent, locking type (T&B or equal).

PART 3 - EXECUTION

3.1 GENERAL:

A. Install all wiring in raceway.

3.2 CONDUCTOR TYPES, REFERENCED ON PLAN:

A. Conductors shall be stranded copper.

3.3 CONDUCTOR COLORING CODE:

A. Conductor color coding shall be as follows:

1. 208/120 volt system

a. A Phase - Black
b. B Phase - Red
c. C Phase - Blue
d. Neutral - White
e. Grounding - Green

2. 480/277 volt system
    a. A Phase - Brown
    b. B Phase - Orange
    c. C Phase - Yellow
    d. Neutral -Gray
    e. Grounding - Green with Yellow Trace
    f. Other Colors - Switched Wires

B. Conductors shall have colored insulation except wires larger than #8 may be black with colored tape identification at all terminations and splices.

C. Additional colors may be used where such colors will help in identifying wires and different systems.

3.4 CONDUCTOR INSTALLATION:

A. Raceways shall be complete, clean and free of burrs before pulling conductors.

B. U.L. approved pulling compounds may be used with the residue cleaned from the conductors and raceway entrances after the pull is made.

C. Contractor shall obtain the manufacturer's published recommendations for the handling, pulling and terminating of the cable. Contractor shall perform work in accord with manufacturer's recommendations.

D. Pulleys or blocks shall be used for alignment of the conductors when pulling. Pulling shall be in accordance with manufacturer's specifications regarding pulling tensions, bending radius of the cable and compounds. No mechanical pulling means shall be used for wires No. 8 AWG and smaller. Cables shall be pulled by the conductor, not by the insulation or shielding.

3.5 MOISTURE PROTECTION:

A. Cable ends shall be protected at all times from moisture. Provide approved heat-shrink end caps or equivalent for all unterminated cable ends.

3.6 TERMINATIONS - COPPER CONDUCTORS 600 VOLTS:

A. Control and special systems wires shall be terminated with a crimped on lug when terminating at a screw connection.

B. All screw and bolt type connectors shall be made up tight and retightened after an eight-hour period. Tighten all bolted connections with a ratcheting type torque wrench per manufacturer's standards.

C. All tool applied crimped connectors shall be applied per manufacturer's recommendations and physically checked for tightness.

END OF SECTION

PART 1 GENERAL

1.01 SUMMARY OF WORK

A. The extent and location of “Hangers and Supports for Electrical Systems” Work is shown in the Contract Documents. This Section includes the following:

1. Hangers and supports for electrical equipment and systems.

2. Construction requirements for concrete bases.

B. Definitions

1. EMT: Electrical metallic tubing.

2. IMC: Intermediate metal conduit.

3. RMC: Rigid metal conduit.

1.02 GOVERNING CODES, STANDARDS, AND REFERENCES

A. The publications listed below form a part of this specification to the extent referenced. The publications are referred to within the text by the basic designation only.

1. ASTM (American Society for Testing and Materials)

a. ASTM A325 – Structural Bolts, Steel, Heat Treated, 120/105 ksi Minimum Tensile Strength

b. ASTM A36/A36M – Carbon Structural Steel

c. ASTM A780 – Practice for Repair of Damaged and Uncoated Areas of Hot-Dip Galvanized Coatings

d. ASTM A1011/A1011M – Steel, Sheet and Strip, Hot-Rolled, Carbon, Structural, High-Strength Low-Alloy, High-Strength Low-Alloy with Improved Formability, and Ultra-High Strength

2. AWS (American Welding Society)

a. AWS D1.1/D1.1M – Structural Welding Code – Steel

3. MSS (Manufacturers Standardization Society of the Valve and Fittings Industry)

a. MSS SP-58 Pipe Hangers and Supports – Materials, Design, Manufacture, Selection, Application and Installation

4. MFMA (Metal Framing Manufacturers Association)

a. MFMA-4 Metal Framing Standards Publication

5. NECA (National Electrical Contractors Association)

a. NECA 1 – Standard Practice of Good Workmanship in Electrical Construction

b. NECA 101 – Standard for Installing Steel Conduits (Rigid, IMC, EMT)

6. NFPA (National Fire Protection Association)
    a. NFPA 70 (National Fire Protection Association) – National Electrical Code
7. OSHA (Occupational Safety & Health Administration)
    a. OSHA 29 CFR 1910.7 – Occupational Safety and Health Standards – Definition and requirements for a nationally recognized testing laboratory
8. SSPC (The Society for Protective Coatings)
    a. SSPC-PA 1 – Shop, Field, and Maintenance Painting of Steel

1.03 SUBMITTALS

A. Submit materials data in accordance with Section 01 33 00 – Submittals. Furnish manufacturer's technical literature, standard details, project specifications, and installation instructions for all products.

B. Submittals shall include the following:

1. Product Data: For the following:
    a. Steel slotted support systems.
    b. Nonmetallic slotted support systems.
2. Shop Drawings: Show fabrication and installation details and include calculations for the following:
    a. Trapeze hangers. Include Product Data for components.
    b. Steel slotted channel systems. Include Product Data for components.
    c. Nonmetallic slotted channel systems. Include Product Data for components.
    d. Equipment supports.
3. Field quality-control reports.
    a. Test procedures used.
    b. Test results that comply with requirements.
    c. Results of failed tests and corrective action taken to achieve test results that comply with requirements.

1.04 QUALITY ASSURANCE

A. Testing Agency Qualifications: An independent agency, with the experience and capability to conduct the testing indicated, that is a nationally recognized testing laboratory as defined by OSHA in 29 CFR 1910.7 and that is acceptable to authority having jurisdiction.

B. Welding: Qualify procedures and personnel according to AWS D1.1/D1.1M, "Structural Welding Code - Steel."

C. Comply with NFPA 70.

1.05 COORDINATION

A. Coordinate size and location of concrete bases. Cast anchor-bolt inserts into bases. Concrete, reinforcement, and formwork requirements are specified together in Division 3 Concrete.

1.06 PERFORMANCE REQUIREMENTS

A. Design supports for multiple raceways capable of supporting combined weight of supported systems and its contents.

B. Design equipment supports capable of supporting combined operating weight of supported equipment and connected systems and components.

PART 2 PRODUCTS

2.01 SUPPORT ANCHORAGE, AND ATTACHMENT COMPONENTS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Cooper B-Line, Inc.
2. ERICO International Corporation.
3. Thomas & Betts Corporation.
4. Unistrut; Atkore International.
5. G-Strut; Gregory Industries.
6. Or Approved Equal.

B. Steel Slotted Support Systems: Comply with MFMA-4, factory-fabricated components for field assembly.

1. 1-5/8 inch x 1-5/8 inch cross section.
2. Formed from 0.1046 inch thick steel.
3. Slots at maximum of 2 inches on center in webs, and flange edges turned toward web.
4. Materials: ASTM A1011/A1011M, Grade 33
5. Finish: Baked, rust inhibiting, acrylic enamel paint applied after cleaning and phosphate treatment, unless otherwise indicated.
6. Metallic Coatings: Hot-dip galvanized after fabrication and applied according to MFMA-4.Channel Dimensions: Selected for applicable load criteria.

C. Nonmetallic Slotted Support Systems: Structural grade, factory formed, glass-fiber-resin channels and angels with 9/16-inch diameter holes at a maximum of 8 inches o.c., in at least 1 surface.

1. Fittings and Accessories: Products of channel and angles manufacturer, designed for use with those items and of the same materials.
2. Rated Strength: selected to suit applicable load criteria.

D. Raceway and Cable Supports: As described in NECA 1 and NECA 101. All raceway and cable supports for both interior and exterior applications shall be galvanized.

E. Conduit Support Devices: Galvanized steel hangers, clamps, and associated fittings, designed for types and sizes of raceway or cable to be supported.

F. Support for Conductors in Vertical Conduit: Factory-fabricated assembly consisting of threaded body and insulating wedging plug or plugs for non-armored electrical conductors or cables in riser conduits. Plugs shall have number, size, and shape of conductor gripping pieces as required to suit individual conductors or cables supported. Body shall be malleable iron.

G. Structural Steel for Fabricated Supports and Restraints: ASTM A36/A36M, steel plates, shapes, and bars; black and galvanized.

H. 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.

2. Mechanical-Expansion Anchors: Insert-wedge-type, zinc-coated steel, for use in hardened Portland cement concrete with tension, shear, and pullout capacities appropriate for supported loads and building materials in which used.

   a. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

      (1) Cooper B-Line, Inc.

      (2) Empire Tool and Manufacturing Co., Inc.

      (3) Hilti, Inc.

      (4) ITW Ramset/Red Head; Illinois Tool Works, Inc.

      (5) MKT Fastening, LLC.

      (6) Or Approved Equal

3. Clip type conduit fasteners are NOT allowed. All fasteners and clamps for conduit raceway support shall use mechanical bolted type hardware.

4. Concrete Inserts: Steel or malleable-iron, slotted support system units; complying with MFMA-4 or MSS SP-58.

5. Clamps for Attachment to Steel Structural Elements: MSS SP-58, type suitable for attached structural element.

6. Through Bolts: Structural type, hex head, and high strength. Comply with ASTM A325.

7. Toggle Bolts: All-steel springhead type.

8. Hanger Rods: Threaded galvanized steel.

2.02 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: All raceway, box and cable supports shall be galvanized steel.

PART 3 EXECUTION

3.01 APPLICATION

A. Locations:

1. Indoor Dry Locations: Steel, zinc plated materials.

2. Outdoors and Damp Locations: Galvanized steel products.

3. Corrosive Locations: Stainless Steel.

B. Comply with NECA 1 and NECA 101 for application of hangers and supports for electrical equipment and systems except if requirements in this Section are stricter.

C. Maximum Support Spacing and Minimum Hanger Rod Size for Raceway: Space supports for EMT and RMC as required by NFPA 70. Minimum rod size shall be 3/8 inch in diameter.

D. Multiple Raceways or Cables: Install trapeze-type supports fabricated with 3/8 in rod minimum and 1-5/8 inch square preformed steel slotted channel support system, sized so conduit 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 approved for application by an agency acceptable to the authority having jurisdiction.

E. Strength of Support Assemblies: Where not indicated, select sizes of components so strength will be adequate to carry present and future loads within specified loading limits.

3.02 SUPPORT INSTALLATION

A. Comply with NECA 1 and NECA 101 for installation requirements except as specified in this Article.

B. Coordinate the location of embedded connection hardware with supported equipment attachment and mounting points and with requirements for concrete reinforcement and formwork specified by applicable Engineer of Record.

C. Raceways shall not be supported from ducts, pipes or other systems foreign to the electrical installation. The entire electrical installation shall be kept independent from any other trade.

D. Raceway Support Methods: In addition to methods described in NECA 1, EMT and RMC may be supported by openings through structure members, as permitted in NFPA 70.

1. Raceways shall be supported with heavy-duty on-hole pressed steel straps on interior surfaces.

2. Support pendent mounted raceways on 3/8 inch rod with pear shaped hanger or trapeze type hanger with 3/8 inch rod minimum and 1-5/8 inch square pre-formed channel and pipe clamps.

3. Parallel surface mounted raceways shall be supported from 1-5/8 inch pre-formed channel and pipe clamps.

4. Multiple conduit runs shall be grouped and neatly racked on trapeze hangers with spare room for minimum (2) ¾ inch future conduits.

E. 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. Determination shall be weight of supported components plus 200 lb.

F. Equipment and Hanger Restraints:

1. Install resilient, bolt-isolation washers on equipment anchor bolts where clearance between anchor and adjacent surface exceeds 0.125 inch.

G. Install cables so they do not bend across edges of adjacent equipment or building structure.

H. 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. Install bushing assemblies for mounting bolts for wall-mounted equipment, arranged to provide resilient media where equipment or equipment-mounting channels are attached to wall.

2. Attachment to Structure: If specific attachment is not indicated, anchor bracing to structure at flanges of beams, at upper truss chords of bar joists, or at concrete members.

3. Attachment to New Concrete: Bolt to channel type concrete inserts or use expansion anchors.

4. Attachments to Existing Concrete: Use expansion anchors.

5. Holes for Expansion Anchors in Concrete: Drill at locations and to depths that avoid reinforcing bars.

6. To Metal Stud Structures: Fasten with sheet metal screw or bolted fasteners.

7. To Structural Walls or Slabs: Fasten with steel expansion shells and bolts. Provide flush concrete insert for multiple raceway support system.

8. Structural Steel: Bolt to heavy duty beam clamps on flanges of beams and columns, or on upper truss chords or bar joists.

9. Architectural Walls or Masonry Walls: Fasten with toggle bolts or molly screws.

10. Provide flush concrete insert for multiple raceway support system.

11. Attachments to Wood Structural Members: Install bolts through members.

12. Attachments to Hollow Walls: Bolt to slotted steel channels fastened to wall with expansion anchors.

I. Drilled-in Anchors:

1. Identify position of reinforcing steel and other embedded items prior to drilling holes for anchors. Do not damage existing reinforcing or embedded items during coring or drilling. Notify the Structural Engineer if reinforcing steel or other embedded items are encountered during drilling. Locate and avoid prestressed tendons, electrical and telecommunications conduit, and gas lines.

2. Do not drill holes in concrete or masonry until concrete, mortar, or grout has achieved full design strength.

3. Wedge Anchors: Protect threads from damage during anchor installation. Heavy-duty sleeve anchors shall be installed with sleeve fully engaged in the structural element to which anchor is to be fastened.

4. Adhesive Anchors: Clean holes to remove loose material and drilling dust prior to installation of adhesive. Place adhesive in holes proceeding from the bottom of the hole and progressing toward the surface in such a manner as to avoid introduction of air pockets in the adhesive.

5. Set anchors to manufacturer's recommended torque using a torque wrench.

6. Install zinc-coated steel anchors for interior and stainless-steel anchors for exterior applications.

3.03 INSTALLATION OF FABRICATED METAL SUPPORTS

A. Cut, fit, and place miscellaneous metal supports accurately in location, alignment, and elevation to support and anchor electrical materials and equipment.

B. Field Welding: Comply with AWS D1.1/D1.1M.

3.04 CONCRETE BASES

A. Construct concrete bases of dimensions indicated. Concrete bases must not be less than 4” larger in both directions than supported unit to ensure anchors will be a minimum of 10 bolt diameters from edge of the base.

B. Use 3,000psi, 28-day compressive-strength concrete. Concrete strength, see Section 03 31 00 – Structural Portland Cement Concrete (FAA).

C. Anchor equipment to concrete base. Refer to Section 03 30 00 - Cast-in-Place Concrete.

3.05 ADJUSTING

A. Adjust restraints to permit free movement of equipment within normal mode of operation.

3.06 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. Galvanized Surfaces: Clean welds, bolted connections, and abraded areas and apply galvanizing-repair paint to comply with ASTM A780.

PART 4 MEASUREMENT AND PAYMENT

4.01 GENERAL

A. No separate measurement or payment will be made for the Work required by this section. The cost for this portion of the Work will be considered incidental to, and included in the payments made for the applicable bid items.

End of Section

PART 1 - GENERAL

1.1 WORK INCLUDED:

A. Provide all raceways for a complete electrical system. Include all fittings, hangers and appurtenances required for a complete installation.

B. All metal fabrications are to be steel, as indicated on the Drawings. Provide metal fabrications as 316 stainless steel where identified as such. The work shall consist of furnishing all materials, labor, and equipment for fabricating and/or repairing, galvanizing, and erecting metal fabrications, all in accordance with the Drawings, notes, and this specification.

PART 2 - PRODUCTS

2.1 CONDUITS:

A. Polyvinyl Chloride (PVC) Coated Rigid Steel Conduit, Thick Wall (PVRSC).

B. Non-metallic, polyvinyl chloride (PVC), schedule 80.

C. Flexible Metal Conduit with polyvinyl chloride jacket.

2.2 FITTINGS:

A. PVRSC fittings shall have threaded connections.

B. Flexible Metal Conduit: Thomas & Betts "Super Liquid-Tight" with external ground lug or equal.

C. PVC Schedule 80 fittings shall be solvent welded type.

D. Expansion Couplings: O.Z. type EX with ground jumper.

E. Seismic deflection coupling: Appleton or equal.

F. All conduit elbows 30 degrees or greater shall be factory made, galvanized rigid steel or PVRSC on wharf. All 90-degree elbows shall be a minimum radius of 24” or greater.

2.3 EXPOSED RACEWAY IDENTIFICATION:

A. Provide sign or stencil on all raceway(s) that are intended to contain conductors above 208 volts. The stencil or sign by “Seton” shall have minimum ½” high red letters indicating voltage.

B. All exposed raceway on the wharf or where subject to damage shall be PVRSC. Exposed raceway not on the wharf and where installed not subject to damage such as in protected substation areas may be PVC Schedule 80.

PART 3 - EXECUTION

3.1 GENERAL:

A. Install raceways concealed in construction or below grade.

B. Cut conduit ends square, ream smooth and extend maximum distance into all couplings and connectors.

C. Provide and install manufactured end caps on all conduit ends during construction to prevent the entrance of water or dirt. Tape, as a cover, is unacceptable.

D. Pull a properly sized mandrel through each conduit prior to installation of conductors or pull-lines to remove any materials trapped within the conduit run. Conduits embedded in concrete shall have a mandrel pulled within 24 hours of concrete pour.

E. All PVC elbows shall be factory made.

F. Field made elbows are not acceptable for PVRSC conduits.

G. Conduits shall maintain a minimum 12" clearance from any high temperature surface.

H. The conduit layout shall be carefully planned by the contractor to ensure neat and workmanlike installation.

I. Any work showing inadequate planning may be ordered removed by the Engineer and shall be replaced in a neat and proper manner at no additional cost to the Engineer.

3.2 CONDUIT SIZING:

A. Conduits shall be sized per code for conductors with type XHHW-2 insulation, although thinner insulation types are permitted in some cases. Conduit size shall not be reduced if larger size is specified on the drawing. Minimum conduit size shall be 3/4" trade diameter for above grade and 1” trade diameter for below grade.

3.3 PVRSC:

A. Install PVRSC for all conduits where conduit is exposed above grade where subject to damage.

3.4 FLEXIBLE CONDUIT:

A. Provide liquid tight flexible metal conduit connection to equipment. Provide flexible conduit connection(s) at each light pole base to allow for a maximum of 6” settlement. Provide bonding jumper when required by N.E.C.

3.5 PVC CONDUIT SCHEDULE 80:

A. PVC conduit Schedule 80 shall be used underground. Field bends, when necessary, shall be formed with factory recommended bending equipment. Offsets and bends shall not exceed 22 degrees without engineer’s field review and approval. All bends greater than 30 degrees shall be galvanized rigid steel. Contractor shall field stake bends for engineer’s review.

3.6 CONTINUITY OF CONDUIT SYSTEM:

A. Conduits shall be assembled continuous and secured to boxes, panels, etc., with appropriate fittings to maintain electric continuity.

3.7 PULL-LINES:

A. Provide 150-pound plastic pull-lines, with numbered distance marks at one-foot increments in all conduit-only systems and spare conduits to facilitate future conductor installation. Unless not required as indicated on conduit and conductor schedule, Sheets E3.0. Provide labels on source and end point of all pull lines.

END OF SECTION

PART 1 – GENERAL

1.1 SCOPE

The work under this section includes furnishing of all labor, material, supports and services to install a complete cable tray system as shown and or indicated on the drawings. The cable tray system is defined to include, but not limited to, straight sections of cable tray, bends, tees, elbows, drop-outs, supports and all other related accessories necessary for a complete installation. Included are the following topics:

1.2 RELATED WORK

Applicable provisions of Division 1 govern work under this Section.

Section 01 91 01 or 01 91 02 – Commissioning Process

Section 26 05 29 – Hangers and Supports for Electrical Systems

Section 26 08 00 – Commissioning of Electrical

1.3 REFERENCES

A. ASTM A1011/A1011M - Standard Specification for Steel, Sheet and Strip, Hot-Rolled, Carbon, Structural, High-Strength Low-Alloy, High-Strength Low-Alloy with Improved Formability, and Ultra-High Strength

B. ASTM A123 Specification for Zinc (Hot Galvanized) Coatings on Products Fabricated from Rolled, Pressed, and Forged Steel Shapes, Plates, Bars, and Strip

C. ASTM A510 - General Requirements for Wire Rods and Coarse Round Wire, Carbon Steel

D. ASTM A513 - Standard Specification for Electric-Resistance-Welded Carbon and Alloy Steel Mechanical Tubing

E. ASTM A580 - Standard Specification for Stainless Steel Wire

F. ASTM B 633 - Specification for Electro-deposited Coatings of Zinc on Iron and Steel

G. ASTM A641/A641M - Standard Specification for Zinc-Coated (Galvanized) Carbon Steel Wire

H. ASTM A653/A653M-00 Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by Hot-Dip Process

I. ASTM D769 - Standard Specification for Black Synthetic Iron Oxide

J. NEMA VE 1 Metal Cable Tray Systems

K. NEMA VE 2 - Metal Cable Tray Installation Guidelines

1.4 SUBMITTALS

A. Shop Drawings: Indicate tray type, dimensions, support points, and finishes.

B. Product Data: Provide data for tray sections, connector assemblies, clamp assemblies, brackets, splice plates, splice bars, grounding clamps, hold-down plates, support hardware, and accessories.

C. Detailed sketch of proposed method(s) of installation.

D. Manufacturer's Instructions: Indicate application conditions and limitations of use stipulated by Product testing agency specified under Regulatory Requirements. Include instructions for

storage, handling, protection, examination, preparation, and installation of Product.

PART 2– PRODUCTS

2.1 WIRE BASKET CABLE TRAY and COMPONENTS

A. Description: Continuous, rigid, welded steel wire mesh cable support system.

B. Material: Carbon steel wire, ASTM A510, Grade 1008. Wire shall be welded, bent and surface treated after manufacture.

C. Finish: Electro-Plated Zinc Galvanizing per ASTM B633, Type III, SC-1, or Electro-plated yellow zinc dichromate in accordance with ASTM B633 SC2.

D. Wire diameter shall be 0.195” (5mm) minimum on all mesh sections or as required to meet application load requirements.

E. All straight section longitudinal wires shall be constructed with a continuous top wire safety edge. Safety edge must be T-welded on all tray sizes.

F. Confirm tray size is indicated on drawings. Otherwise, specify required width(s).

G. Inside Width: [As indicated on Project Drawings] [_-inches].

H. Bends/Reducers/Tees/Horizontal and Vertical Offsets: These may be factory manufactured or field fabricated in accordance with manufacturer's instructions.

I. Provide manufactured “Radius shield” for a smooth inside radius surface.

J. Support System: A cable tray support system incorporating mechanisms for wall installation, trapeze, center support, or under-floor mounting. Supports shall comply with product requirements defined in specification section 26 05 29.

K. Hardware: Hardware, including splice connectors and support components, shall be furnished by cable tray manufacturer.

L. Grounding: Assembled tray shall be UL classified as an equipment grounding conductor.

M. WARNING LABELS: Engraved or printed nameplates shall include the following or similar language:

N. WARNING! DO NOT USE CABLE TRAY AS WALKWAY, LADDER, OR SUPPORT FOR LADDERS OR PERSONNEL.

PART 3 – EXECUTION

3.1 INSTALLATION

A. Install in accordance with manufacturer's instructions.

B. Install metallic cable tray in accordance with NEMA VE-1 and VE-2.

C. Provide manufacturer's standard clamps, hangers, brackets, splice plates, reducer plates, blind ends, barrier strips, connectors, and grounding straps as required.

D. Conduit connections to the tray shall be made with an UL approved clamp, manufactured specifically for the purpose.

3.2 SUPPORT

A. No conduit shall be attached to the cable tray except for the conduits that terminate at the cable tray. Cable tray supports can be used to support conduit. Do not use more than 1/2 of the cable tray support for conduit support.

B. Support trays in accordance with Section 26 05 29. Provide supports at each connection point, at the end of each run, and at other points to maintain spacing between supports of 8 ft (2.5 m) maximum.

C. All of the threaded rod used for the tray support shall be 3/8" diameter for 12" wide tray and 1/2" minimum for tray larger than 12" wide.

D. Where a single Center Support is used for 12” wide tray, threaded rod shall be 1/2".

E. Bolts and nuts shall be installed in all holes of the cable tray splice plates per the manufacturer’s instructions for installation.

F. Provide cable tray support details on the drawings.

G. Tray support shall be installed in a trapeze, wall angle, or center support configuration as shown on the plans, outlined in the spec, and approved by the engineer. Center support is allowed on 12” wide and less cable tray.

H. Supports shall be formed shape channel trapeze members per section 26 05 29, or formed mounting assemblies that are part of the manufacturer’s integrated cable tray system, complete with nuts, bolts, washers, lock washers and tray clamps as required for a complete and finished installation.

I. Submit complete detailed sketch(es) for approval of the actual proposed method(s) of installation.

J. The maximum allowable deviation of the tray, from the level horizontal plane measured across the width of the tray, is one half of one inch (1/2"), with the tray loaded to capacity, as allowed by the NEC.

K. The approval of the installation method does not relieve this contractor from meeting the above deviation requirement. If additional support is needed, as determined by the engineer, this contractor shall furnish and install the additional support at no additional cost to the customer.

3.3 FITTINGS AND HARDWARE

A. Use manufactured expansion fittings where required at the building expansion joints and as required by the manufacturer.

B. Nuts, bolts, washers, rod, etc. shall be plated.

C. Provide End-of Run Drop-out (4-inch radius; minimum) at terminus of cable tray at equipment room(s) and wherever tray is discontinuous and there is a change in height.

D. Provide threaded rod protector sleeves over all threaded rod supporting the tray. Protectors shall extend above the tray a minimum of eight (8) inches.

3.3 GROUNDING AND BONDING

A. Ground and bond cable tray under provisions of Section 26 05 26.

B. Provide electric continuity between tray components. Provide manufacturer's grounding clamps as required. Use anti-oxidant compound to prepare aluminum contact surfaces before assembly if required by the manufacturer. Assembled tray shall be UL classified as an equipment grounding conductor.

C. Provide #4 AWG bare stranded copper equipment grounding conductor through entire length of tray. Bond equipment ground conductor to each component, each tray section, and connect to the main building equipment grounding conductor.
   a. *Exception:* Equipment grounding conductor is not required in telecommunications applications provided that the tray is UL-Listed for grounding and is installed as specified to maintain electrical continuity along the entire length of the cable tray.

D. Bond cable tray to the telecommunication grounding bar or conductor in each equipment room (#6 AWG minimum).

E. Equipment grounding conductor connections to the tray shall be made using a UL listed mechanical connection. Sheet metal or TEK screws shall not be used for grounding. Split bolts may be used for connection to wire-basket type trays.

3.5 PENETRATIONS

Rated Penetrations

A. Where cable tray is to penetrate a fire rated wall or floor, the following installation method shall be used by this contractor:

B. Stop the tray at the penetration and fasten the tray end to the wall/floor.

C. Provide a manufactured re-enterable system that features a built-in fire and smoke sealing system that allows cables to be added or removed without the need to remove or reinstall fire stopping materials. Capacity (for cabling) of the system shall match that of the cable tray. Refer to specification Section 07 84 00 - FIRE STOPPING.

D. Install re-enterable system per manufacturer's instructions.

E. Bond each re-enterable system to the equipment grounding conductor (or cable tray, if it is listed by a Nationally Recognized Testing Laboratory (NRTL) as an equipment grounding conductor) with a minimum #6 stranded copper wire using a NRTL listed connector.

Non-rated Penetrations

F. In non-rated penetrations where the contractor is able to create an opening of sufficient size, cable tray may simply pass through such an opening without providing conduit sleeves.

G. Where cable tray is to penetrate a non-rated wall or floor, and the cable tray cannot be made continuous for reasons other than rating, the following installation method shall be used by this contractor:

H. Stop the tray at the penetration and fasten the tray end to the wall/floor.

I. For every 6" of tray width, furnish and install a 4" PVC sleeve or rigid galvanized nipple (threaded at both ends) through the penetration extending 4" beyond both sides and supported per section 26 05 29.

J. Provide a fiber or plastic bushing on both ends of the PVC sleeve, or for a rigid galvanized nipple, provide a fiber or plastic bushing on one end and a ground bushing on the other end.

K. Bond each grounding bushing to the equipment grounding conductor (or cable tray, if it is listed by a Nationally Recognized Testing Laboratory (NRTL) as an equipment grounding conductor) with a minimum #6 stranded copper wire using a NRTL listed connector.

L. Completely seal the annular space between the wall and conduit sleeve with urethane caulk.

M. Plug the conduits with material to prevent sound or odor transmission.

3.6 WARNING SIGNS

Provide warning signs at 15-foot intervals along cable tray. Adjust labeling interval to ensure that signs are visible.

END OF SECTION

PART 1 GENERAL

1.01 SUMMARY OF WORK

A. The extent and location of “Underground Ducts and Manholes” Work is shown in the Contract Documents. This section includes the requirements for trenching, backfilling and installation of underground conduits, ducts and ductbanks, and the design, fabrication, delivery and installation of pull boxes.

B. Definitions

1. Duct: Electrical conduit and other raceway, either metallic or nonmetallic, used underground, embedded in earth or concrete.

2. Ductbank: 2 or more conduits or other raceway installed underground in the same trench or concrete envelope.

1.02 GOVERNING CODES, STANDARDS AND REFERENCES

A. ASTM (American Society for Testing and Materials)

B. NFPA 70 (National Fire Protection Association) - National Electrical Code

C. WSDOT/APWA Specifications, Section 6-02.3

1.03 QUALITY ASSURANCE

A. Listing and Labeling: Provide products that are Listed and Labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to the Authority Having Jurisdiction, and marked for intended use for the location and environment in which they are installed.

B. Comply with NFPA 70, as adopted and administered by the Authority Having Jurisdiction.

C. Comply with ANSI C2 “National Electrical Safety Code” for components and installation.

1.04 SUBMITTALS

A. General: Submit the following in accordance with Conditions of the Contract and Division 1 Specification Sections:

1. Product data for metal accessories for conduit and duct, duct bank materials, and miscellaneous components.

2. Inspection report for factory inspections, according to ASTM C 1037.

3. Record Documents: Show dimensioned locations of underground ducts from nearest building or permanent structure.

1.05 COORDINATION

A. Coordinate layout and installation of ducts with final arrangement of other utilities as determined by field verification. Revise locations and elevations from those indicated as required to suit field conditions. Contractor shall coordinate all modifications with the Engineer prior to final installation.

1.06 SAFETY REQUIREMENTS

A. Comply with safety and protection requirements of Section 26 00 00 - Electrical Work - General.

B. Perform Work in accordance with the safety requirements of the Department of Labor Occupational Safety and Health Administration, Volume 36, Number 75, Part II, Subpart P, “Excavations, Trenching, and Shoring,” and with Section 7 of the Manual of Accident Prevention in Construction as published by the Association General Contractors of America, Inc.

C. Educate supervisors and employees on safety requirements and practices to be followed during the course of the Work.

1.07 DELIVERY, STORAGE, AND HANDLING

A. Deliver ducts to site with ends capped. Store nonmetallic ducts with supports to prevent bending, warping, and deforming.

PART 2 PRODUCTS

2.01 CONDUIT AND DUCTS

A. Metallic Conduit:

1. Galvanized Rigid Steel Conduit (GRC): ANSI C80.1

2. PVC-Coated Rigid Steel Conduit: ANSI RN 1. Coating thickness shall be 0.040 inch, minimum.

B. Nonmetallic conduit: Use underground only for medium-voltage and low-voltage applications

1. Rigid Plastic Conduit: NEMA TC 2, UL 651A, Schedule 40 and Schedule 80 PVC, rated for use with 90°C conductors under all installation conditions and labeled for underground use.

2. Rigid Plastic Underground Conduit: High-density polyethylene, Schedule 40 and Schedule 80.

3. LFNC: UL 1660.

2.02 CONDUIT FITTINGS

A. Steel Fittings: Zinc-coated, cast malleable, ferrous metal, threaded fittings, with neoprene cover gasket on each fitting installed outdoors.

B. PVC Conduit and Tubing Fittings: NEMA TC 3. Provide PVC fittings for PVC conduit and suitable watertight connections where PVC conduit connects to galvanized steel conduit.

C. “Mogul Fittings”: Provide “Mogul” size fittings for all conduit.

D. Seal Bushings: O.Z. compound bushing on each conduit entering a building from outside underground and on each conduit passing from one space into another, which is normally at a lower temperature.

E. Hubs: Appleton “Hub” or “Hub-U” series, Thomas & Betts “370” series, Or Approved Equal hub on each conduit terminating in a box where a hub was not previously provided.

F. Unions: Appleton Type “EC”, Thomas & Betts “Erickson Coupling” conduit unions, Or Approved Equal where necessary.

2.03 DUCT SUPPORTS/SPACERS

A. Rigid PVC spacers selected to provide 3 1/2” minimum duct spacings and concrete cover depths indicated, while supporting ducts during concrete pour. Refer to drawing details for additional duct spacing requirements.

2.04 PULL BOXES

A. Cast Metal Boxes: Cast aluminum, sized as indicated on Drawings, with outside flanges and recessed, gasketed cover for flush mounting. Non-skid finish on cover with legend reading “ELECTRIC” or “SIGNAL” as appropriate.

2.05 BACKFILL MATERIAL

A. Designer shall coordinate trenching and backfill with Civil trenching and backfill sections.

1. Lower Trench Portion (surrounding ductbank): Sandy silt, clay silt, sand clay or other material free of stones and conglomerates larger than 2”

2. Upper Trench Portion (one foot above ductbank up to grade): On-site backfill material consisting of rock, soil or soil-rock mixture containing no rocks or lumps over 6”

B. Direct-Burial Conduit

1. Initial Bedding: 3” of sand below conduits.

2. Secondary Bedding: Unsaturated excavated earth free of rocks, broken concrete and debris 2” and larger, and compacted to 6” minimum above conduits.

3. Upper Trench:

a. Areas Under Pavement:

(1) See Civil requirements in Section 31 00 00 - Earthwork and Section 31 23 33 - Trenching and Backfilling.

(2) Provide plastic warning tape, 4-mil thickness reading "Caution - Buried Electrical Line Below" in trench at 12" below base course ACP.

b. Areas Not Under Pavement:

(1) Unsaturated excavated earth free of rocks, broken concrete and debris 6” and larger, and compacted in 12” lifts to prevent settlement

PART 3 EXECUTION

3.01 EXAMINATION

A. Existing Utilities: Locate all existing utilities in the area prior to performing any excavation.

3.02 EARTHWORK

A. Trenching:

1. Comply with OSHA/WISHA safety standards for trenching, including stable slope and shoring requirements.

2. Depth: Refer to Electrical Details Sheet E4.0 for trench depth requirements. Correct points of over-excavation using mechanically-compacted backfill to form a smooth trench bottom. 24 inch minimum cover for direct burial conduit.

3. Width: Excavate to minimum width consistent with stability of sides.

4. Rock Excavation: Where rock pad is used for conduit trench, overexcavate 6” below the ductbanks and refill and compact with selected backfill material of same composition.

5. Muck Excavation: Where muck or unstable material is encountered, over-excavate and backfill to attain proper grade with coarse sand, gravel, or Controlled Density Fill.

6. Stockpile backfill material in an orderly manner; a sufficient distance from the trench to avoid overloading trench banks.

7. Bedding: The entire bottom of the excavation is to be firm, stable, and at uniform density.

3.03 RACEWAY APPLICATIONS

A. Refer to Specifications and Drawings for raceway materials. Where not specified otherwise, use metallic conduit above and underground.

B. Metallic Conduit: Only use as specified in Section 26 05 33 - Raceways and Boxes.

C. Nonmetallic conduit: Use underground only.

1. Underground Direct-Burial: For low-voltage applications only. Provide rigid plastic conduit, NEMA TC 2, Schedule 40 PVC with NEMA TC3 PVC conduit and tubing fittings.

D. All underground conduit shall be a minimum of one-inch standard trade size.

E. Use PVC fittings for PVC conduit and suitable water-tight connections where PVC conduit connects to galvanized steel conduit.

3.04 CONDUIT AND DUCT INSTALLATION

A. Install conduit and ducts as indicated on Drawings and according to manufacturer’s written instructions.

B. Curves and Bends: Use manufactured galvanized rigid steel elbows for stub-ups at equipment and at building entrances with a minimum radius of 36 inches. Use manufactured long sweep bends with a minimum radius of 25 feet both horizontally and vertically at other locations. Do not exceed 20 degrees for field bends.

C. Make joints in ducts and fittings watertight according to manufacturer’s instructions. Stagger couplings so those of adjacent ducts do not lie in the same plane.

D. Separation Between Direct-Buried, Non-Encased Ducts: Provide 3 inches minimum separation for like services, and 12 inches minimum between power and signal ducts.

E. Stub-Ups: Use rigid steel conduit for stub-ups through concrete to equipment. Install insulated grounding bushings at the conduit terminations. For equipment mounted on outdoor concrete pads, extend steel conduit a minimum of 2 feet beyond the edge of the pad. Couple steel conduits to the ducts with adapters designed for the purpose and then encase the coupling with 3 inches of concrete.

F. Pulling Cord: Install 100-pound- test nylon cord in installed ducts, including spares.

G. Warning Tape: Bury warning tape approximately 12 inches above all concrete-encased ducts and duct banks. Align tape parallel to and within 3 inches of centerline of duct bank. Provide an additional warning tape for each 12-inch increment of ductbank width over a nominal 18 inches. Space additional tapes 12 inches apart, horizontally.

3.05 BACKFILLING

A. Backfill only after all necessary inspections and tests have been performed.

B. Remove all debris, rocks, broken concrete, and formwork before backfilling trenches.

C. Deposit backfill in layers with materials described in Article 2.11, “Backfill Material.” Uniformly spread and compact backfill with suitable power tampers to the density of the adjacent soil and in such a manner so as not to disturb the alignment of the conduit. If settlement occurs, refill, compact and smooth off to conform to the surface of the ground.

D. Restore surface features at areas disturbed by excavation, and reestablish original grades.

1. Replace removed sod as soon as possible after backfilling is completed.

2. Restore all areas disturbed by trenching, storing of dirt, cable laying, and other Work.

3. Replace disturbed paving.

3.06 IDENTIFICATION

A. Identify raceways, cables and equipment as specified in Section 26 05 53 - Electrical Identification.

B. Label raceways entering concealed locations from exposed locations as to the destination via the concealed area.

3.07 TESTING AND CLEANING

A. Duct Integrity: Swab out ducts with a mandrel 1/4 inch smaller in diameter than internal diameter of ducts.

PART 4 MEASUREMENT AND PAYMENT

4.01 GENERAL

A. No separate measurement or payment will be made for the Work required by this section. The cost for this portion of the Work will be considered incidental to, and included in the payments made for the applicable bid items.

End of Section

PART 1 - GENERAL

1.1 SUMMARY

A. This Section includes identification of electrical materials, equipment, and installations.

B. Related Documents: The provisions and intent of the Contract, the General and Supplementary Conditions, and Division 1 Specification Sections, apply to the Work as if specified in this Section.

1.2 REFERENCES

A. ANSI/IEEE C2 - National Electrical Safety Code.

B. NFPA 70 (National Fire Protection Association) - National Electrical Code.

1.3 QUALITY ASSURANCE

A. Comply with NFPA 70, as adopted and administered by the Authority Having Jurisdiction.

B. Comply with ANSI C2.

1.4 SUBMITTALS

A. Product Data for each type of product specified.

B. Provide sample label with identification nomenclature for one of each label type to be used for identification and equipment labels.

PART 2 - PRODUCTS

2.1 LABEL TYPES

A. Manufacturer's standard products with colors prescribed by ANSI A13.1, NFPA 70, and these Specifications. Refer to drawings for label schedule and types:

Section	Title	Label Types																
		B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	
26 05 19	600-Volt or Less Wire and Cable		X	X			X	X										
26 24 16	Panelboards					1/2							X					
26 27 26	Wiring Devices	X																
26 79 00	Site Grounding						X											

B. Black felt-tip permanent marker on backside of plate in all locations.

C. Flexible, preprinted pre-tensioned wraparound plastic sleeves sized to suit the diameter of the wire it identifies and arranged to stay in place by pre-tensioned gripping action when placed in position.

D. Preprinted self-adhesive vinyl labels with clear chemical-resistant coating.

E. Engraved melamine plastic laminate flat stock, 1/16-inch minimum thickness for sizes up to 15 square inches. Use 1/8-inch minimum for sizes larger than 20 square inches. Black with white letters for normal power systems and red with white letters for emergency power systems, with height as shown in table above unless specified otherwise. UV-inhibited when used outdoors. Secure with stainless steel drive screws, stainless steel self-tapping screws or stainless steel oval-head 6-32 screws tapped into enclosure, or with stainless steel bolts with elastic stopnut. Do not attach labels with screws or bolts if it voids manufacturer warranty UL listing of equipment. Provide alternate adhesive type label.

F. Exterior use adhesive-backed plastic machine-printed labels, white with black letters.

G. Plain-colored vinyl adhesive tape, 3-mil minimum by 1-inch wide minimum. Apply 1/2-inch minimum over-wrap through 2-inch minimum length.

H. Stainless-steel machine or hand-stamped wire marker plates, 0.010-inch minimum thickness, with 2 holes at each end for attachment with nylon Ty-wraps. (Reference Panduit MMP350-C series.) Wire tags shall have source point, circuit breaker, fused switch, equipment name or equipment ID.

I. Provide field stamped label on exposed metal frame and lid. Label shall match vault ID on electrical site plans.

J. Underground line warning tape with pre-printed warning message identifying type of system. Material shall be compounded for unlimited life when direct buried. 6-inch minimum width by 4-mils thick. (Reference Seton Style 210.)

K. Underground metallic line-warning tape with pre-printed warning message identifying type of system. Material shall be compounded for unlimited life when direct buried. Use when metal-detection of line is required on Medium Voltage Systems. 6-inch minimum width by 4-mils thick. (Reference Seton style 6ELE.)

L. Warning signs: Baked Enamel on aluminum plate, 0.040-inch minimum thickness. OSHA standard wording where approved. Custom wording if required. Secure with non-corrosive fasteners.

M. Stencils: Machine-punched patterns, paint with color and formulation appropriate for material and location.

N. Adhesive-backed metal labels manufactured with testing agency logo. Punched or engraved with actual settings and date.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Install identification labels according to manufacturer's written instructions.

B. Install labels where indicated and as required by the Authority Having Jurisdiction. Locate for optimum viewing and without interference with the operation and maintenance of equipment.

C. Coordinate names, abbreviations, colors, graphics and other designations used for electrical identification with corresponding designations used in the Contract Documents or as required

by codes and standards.

Use consistent designations throughout the Project. Labeling abbreviations are not allowed.

D. Sequence of Work: Where identification is to be applied to surfaces that require finish, install identification after completion of finish work.

1. Coordinate installing electrical identifying labels prior to installing finishes that conceal such items.

E. Clean surfaces of dust, loose material, and oily films before applying painted or self-adhesive identification products.

F. Painted Identification Products:

1. Prime surfaces according to manufacturer's instructions prior to applying painted labels:

a. For galvanized metal, use single-component, acrylic vehicle coating formulated for galvanized surfaces.

b. For concrete masonry units, use heavy-duty, acrylic-resin block filler.

c. For concrete surfaces, use clear, alkali-resistant, alkyd binder-type sealer.

2. Apply one intermediate and one finish coat of paint.

G. Conductor Identification:

1. Conductors to be Extended in the Future: Indicate source and circuit numbers.

2. Multiple Power or Lighting Circuits in the Same Enclosure: Identify each conductor with source, voltage, circuit number, and phase. Use color coding for voltage and phase indication of secondary circuit.

3. Multiple Control and Communications Circuits in the Same Enclosure: Identify each conductor by its system and circuit designation. Use a consistent system of tags, color coding, or cable marking tape.

H. Warning, Caution, and Instruction Signs:

1. Install warning, caution, and instruction signs where indicated or required to ensure safe operation and maintenance of electrical systems and of items to which they connect.

2. Emergency-Operating Signs: Install engraved laminate signs with white legend on red background with minimum 3/8-inch high lettering for emergency instructions on power transfer, load shedding, and other emergency operations.

I. Apply equipment identification labels of engraved plastic laminate on each major unit of equipment, including central or master unit of each system. This includes communication, signal, and alarm systems, unless units are specified with their own self-explanatory identification. Except as otherwise indicated, provide a single line of text with 1/4-inch high lettering on 1-inch high label. Use white lettering on black field. Apply labels parallel to equipment lines.

END OF SECTION

PART 1 GENERAL

1.01 SUMMARY OF WORK

A. The extent and location of “Panelboards” work is shown in the Contract Documents. This section includes 600 ampere Distribution Panelboards, rated 600 volts or less. The following is a summary of the work on panelboards identified on the project drawings:

1. The following panels are new:

a. PP-C

1.02 GOVERNING CODES, STANDARDS AND REFERENCES

A. NEMA AB 1 (National Electrical Manufacturers Association) - Molded Case Circuit Breakers,

B. NEMA FU 1 (National Electrical Manufacturers Association) - Fuses,

C. NEMA KS 1 (National Electrical Manufacturers Association) - Enclosed and Miscellaneous Distribution Equipment Switches (600 Volts Maximum),

D. NEMA PB 1 (National Electrical Manufacturers Association) - Panelboards,

E. NEMA 250 (National Electrical Manufacturers Association) - Enclosures for Electrical Equipment (1000 Volts Maximum).

F. NETA ATS (International Electrical Testing Association) - Acceptance Testing Specifications for Electrical Power Distribution Equipment and Systems,

G. NFPA 70 (National Fire Protection Association) - National Electrical Code,

H. UL 50 (Underwriters Laboratory) - Enclosures for Electrical Equipment,

I. UL 67 (Underwriters Laboratory) - Panelboards,

1.03 SUBMITTALS

A. Submit materials data in accordance with of Section 01 33 00 - Submittals. Furnish manufacturers’ technical literature, standard details, product specifications, and installation instructions for all products.

B. Submittals shall include the following:

1. Product Data: For each type of panelboard, accessory, and component indicated. Include dimensions and manufacturers’ technical data on features, performance, electrical characteristics, ratings, and finishes.

2. Shop Drawings: For each panelboard and related equipment.

a. Dimensioned plans, elevations, sections, and details. Show tabulations of installed devices, equipment features, and ratings. Include the following:

(1) Enclosure types and details for types other than NEMA 250, Type 1.

(2) Bus configuration, current, and voltage ratings.

(3) Short-circuit current rating of panelboards and overcurrent protective devices.

(4) UL listing for series rating of installed devices.

(5) Features, characteristics, ratings, and factory settings of individual overcurrent protective devices and auxiliary components.

(6) Wiring diagrams for power, signal and control wiring.

(7) Time-current coordination curves for each type and rating of overcurrent protective device included in panelboards. Include selectable ranges for each type of overcurrent protective device.

3. Field Test Reports: Written reports specified in Part 3.

4. Maintenance Data: Include maintenance data for panelboards and components in maintenance manuals specified in Division 1 General Requirements. In addition to requirements specified in Section 01 78 23 - Operations and Maintenance Data include the following:

a. Manufacturer’s written instructions for testing and adjusting overcurrent protective devices.

b. Time-current curves, including selectable ranges for adjustable overcurrent protective devices.

5. Panelboard Schedules:

a. Panelboard schedules shall have provisions for totaling all loads and performing demand calculations by load category.

b. This schedule shall be updated with as built information upon the completion of the Project. The contractor shall post a hard copy of the revised panel schedule in any panel modified and submit an electronic copy of the panel schedule in Port standard Excel format showing accurate as-built information.

1.04 QUALITY ASSURANCE

A. Testing Agency Qualifications: Member company of NETA or an NRTL.

1. Testing Agency's Field Supervisor: Currently certified by NETA to supervise on-site testing.

B. Source Limitations: Obtain panelboards, overcurrent protective devices, components, and accessories from single source from single manufacturer.

C. Product Selection for Restricted Space: Verify that product submitted will fit in space shown on drawings and meet NEC working clearance requirements.

D. Listing and Labeling: Provide components, devices and accessories that are Listed and Labeled as defined in NFPA 70, Article 100 and marked for intended use for the location and environment in which they are installed.

E. Comply with UL 67, UL50 and NEMA PB 1.

F. Comply with NFPA 70, as adopted and administered by the Authority Having Jurisdiction.

1.05 COORDINATION

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, and encumbrances to workspace clearance requirements.

B. Pipes and ducts shall not pass over panelboards.

1.06 WARRANTY

A. Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace transient voltage suppression devices that fail in materials or workmanship within specified warranty period.

1. Warranty Period: Five years from date of Substantial Completion.

1.07 EXTRA MATERIALS

A. Spare and extra parts shall be identified for all products. Include spare parts information in Operation and Maintenance Manuals.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Panelboards and Accessories:

a. Eaton.

b. GE.

c. Square D.

d. Or Approved Equal.

2.02 SERVICE CONDITIONS

A. Environmental Limitations: Rate equipment for continuous operation under the following conditions, unless otherwise indicated:

1. Ambient Temperature: Not exceeding 40°C.

2. Altitude: Not exceeding 1000 feet Main.

3. Breakers: Main breakers are required for all panelboards.

2.03 FABRICATION AND FEATURES

A. Enclosures: Surface-mounted cabinets.

1. NEMA PB 1, Type to meet environmental conditions at installed location:

a. Indoor Dry, and Clean Locations: NEMA 250, Type 1.

b. Indoor Locations Subject to dust, falling dirt, and dripping noncorrosive liquids: NEMA 250, Type 12.

B. Hinged Front Cover: Entire front trim cover piano-hinged to box for 110-degree opening minimum. Standard door hinged within trim cover. Hinged Door-in-Door panel fronts for all panelboards, except NEMA 3R. Two locks required.

1. Full size front cover shall have maintenance master keyed lock.

2. Standard door within front trim cover shall allow access to circuit breakers and shall also have maintenance master keyed lock. Depending on the user group and area, this door may remain unlocked for user group access to the circuit breakers or maintenance may optionally keep this door locked. Special locks from Maintenance shall be added to the panel.

C. Panel doors shall have a continuous piano hinge for 110 degree opening minimum.

D. Skirt for surface mounted panelboards shall be same gage and finish as panelboard front with flanges for attachment to panelboard, wall, and ceiling or floor.

E. Surface-mounted panelboard front cover with same dimensions as enclosure.

F. Finish:

1. 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.

2. Back Boxes: Same finish as panels and trim.

G. Directory Card: With transparent protective cover, mounted inside metal frame, inside panelboard standard door.

H. Phase, Neutral, and Ground Buses:

1. Material: Hard-drawn copper, 98 percent conductivity, silver plated copper.

2. Equipment Ground Bus: Adequate for feeder and branch-circuit equipment ground conductors; bonded to box.

3. Neutral Bus: 100% rated.

I. Conductor Connectors: Suitable for use with conductor material and sizes.

1. Material: Hard-drawn copper, 98 percent conductivity.

2. Main and Neutral Lugs: Mechanical type.

3. Ground Lugs and Bus-Configured Terminators: Mechanical type.

4. Feed-through Lugs: Mechanical type. Locate at opposite end of bus from incoming lugs or main device.

J. Service Equipment Label: UL labeled for use as service equipment for panelboards or load centers with one or more main service disconnecting and overcurrent protective devices.

1. Main circuit breaker is required for panelboards serving a metered tenant or user group.

K. Panelboard shall have a minimum of 25% spare breaker capacity and 30% spare load capacity. 50% spare breaker and load capacity is preferred.

2.04 PANELBOARD SHORT-CIRCUIT RATING

A. Fully rated to interrupt symmetrical short-circuit current available at terminals.

B. UL label indicating series-connected rating with integral or remote upstream devices. Include size and type of upstream device allowable, branch devices allowable, and UL series-connected short-circuit rating.

2.05 DISTRIBUTION PANELBOARDS

A. Doors: Front mounted, except omit in fused-switch panelboards; secured with vault-type latch with tumbler lock; maintenance master keyed.

1. For doors more than 36 inches high, provide two latches, keyed alike.

B. Main Overcurrent Protective Devices: Circuit breaker

C. Branch Overcurrent Protective Devices for Circuit-Breaker Frame Sizes 125 A and Smaller: Bolt-on circuit breakers.

1. Branch Overcurrent Protective Devices for Circuit-Breaker Frame Sizes Larger Than 125 A: Bolt-on circuit breakers; plug-in circuit breakers where individual positive-locking device requires mechanical release for removal.

2.06 DISCONNECTING AND OVERCURRENT PROTECTIVE DEVICES

A. Molded-Case Circuit Breaker: NEMA AB 1, with interrupting capacity to meet available fault currents.

1. Thermal-Magnetic Circuit Breakers: Inverse time-current element for low-level overloads, and instantaneous magnetic trip element for short circuits. Adjustable magnetic trip setting for circuit-breaker frame sizes 250A and larger.

2. Adjustable Instantaneous-Trip Circuit Breakers: Magnetic trip element with front-mounted, field-adjustable trip setting.

3. Electronic Trip Unit Circuit Breakers: RMS sensing; field-replaceable rating plug; with the following field-adjustable settings:

a. Instantaneous trip.

b. Long- and short-time pickup levels.

c. Long- and short-time time adjustments.

d. Ground-fault pickup level, time delay, and I^2t response.

4. Current-Limiting Circuit Breakers: Frame sizes 400A 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 two-pole configurations with Class A 6 mA trip sensitivity.

7. Ground-Fault Equipment Protection (GFEP) Circuit Breakers: Class B ground-fault protection, 30mA trip where required.

B. Molded-Case Circuit-Breaker Features and Accessories. Standard frame sizes, trip ratings, and number of poles.

1. Lugs: Mechanical style, suitable for number, size, trip ratings, and material of conductors.

2. Application Listing: Appropriate for application; Type SWD for switching fluorescent lighting loads; Type HACR for heating, air-conditioning, and refrigerating equipment.

3. Ground-Fault Protection: Integrally mounted or remote-mounted relay and trip unit with adjustable pickup and time-delay settings, push-to-test feature, and ground-fault indicator.

4. Communication Capability: Circuit-breaker-mounted communication module with functions and features compatible with power monitoring and control system.

5. Shunt Trip: 120V trip coil energized from separate circuit, set to trip at 75 percent of rated voltage.

6. Undervoltage Trip: Set to operate at 35 to 75 percent of rated voltage without intentional time delay as required by the engineer of record.

7. Auxiliary Switch: Two SPDT switches with “a” and “b” contacts; “a” contacts mimic circuit-breaker contacts, “b” contacts operate in reverse of circuit-breaker contacts.

8. Key Interlock Kit: Externally mounted to prohibit circuit-breaker operation; key shall be removable only when circuit breaker is in off position.

9. Zone-Selective Interlocking: Integral with electronic trip unit; for interlocking ground-fault protection function.

2.07 ACCEPTABLE OPTIONS

A. Shunt trip breakers for load management purposes. 120-V trip coil energized from separate circuit

B. Adjustable trips where engineered coordination settings are provided.

PART 3 EXECUTION

3.01 INSTALLATION

A. Install panelboards and accessories according to NEMA PB 1.1.

B. Receive, inspect, handle, and store panelboards according to NEMA PB 1.1.

C. Examine panelboards before installation. Reject panelboards that are damaged or 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.

F. Surface mounted panelboard fronts shall have same dimensions as enclosure.

G. Standard Mounting Heights: Top of trim 72-inches above finished floor, unless otherwise indicated.

1. Maximum height of highest operating handle on distribution panelboards shall be 78”.

H. Mounting: Plumb and rigid without distortion of box. Mount recessed panelboards with fronts uniformly flush with wall finish.

I. Install filler plates in unused spaces.

J. Provision for Future Circuits at Flush Panelboards: Stub six 1-inch empty conduits from panelboard into accessible ceiling space or space designated to be ceiling space in the future. Identify each as SPARE.

K. Wiring in Panelboard Gutters: Arrange conductors into groups and bundle and wrap with wire ties after completing load balancing.

L. Current Transformers: Securely support CTs so that transformer leads are not bearing weight and are not under pressure.

M. Comply with NECA 1.

3.02 CONNECTIONS

A. Install equipment grounding connections for panelboards with ground continuity to main electrical ground bus.

B. Tighten electrical connectors and terminals according to manufacturer’s published torque-tightening values. If manufacturer’s torque values are not indicated, use those specified in UL 486A and UL 486B.

1. Mark lugs after torquing with black, red or yellow paint such that paint will be visibly disturbed if lugs are disturbed.

3.03 IDENTIFICATION

A. Identify field-installed conductors, interconnecting wiring, and components as specified in Section 26 05 53 - Electrical Identification.

B. Panelboard Nameplates: Label each panelboard with engraved laminated-plastic nameplate with panel designation, power source, source location and voltage.

C. Provide framed, typed panelboard circuit directory with accurate descriptions of the connected load. Hand-written directories are not acceptable. Complete directory only after all modifications have been made to correct load imbalance.

1. Number circuit breakers with odd numbers on the left and even numbers on the right when facing the panel. Number consecutively, with multiple-pole breakers assigned multiple numbers.

2. Describe branch circuit loads and identify locations using room numbers or column lines.

3. Include date of last changes made and the name and company of the individual making changes.

D. Equipment used in emergency systems shall be labeled “Suitable for use on emergency systems” per NEC 700-3.

3.04 FIELD QUALITY CONTROL

A. Prepare for acceptance tests as follows:

1. Test insulation resistance for each panelboard bus, component, connecting supply, feeder, and control circuit. Use 1000-volt megger for 480 volts and 500-volt megger for 208 volts.

2. Test continuity of each circuit and all ground connections. Megger with all circuit breakers open and then with all circuit breakers closed.

3. Check for proper phase rotation: Phase A, B, C from left to right and front to back.

4. After energizing, check load balance under normal operation. If load unbalance exceeds 10 percent, initiate corrective measures.

B. Testing: After installing panelboards and after electrical circuitry has been energized, demonstrate product capability and compliance with requirements.

1. Procedures: Perform each visual and mechanical inspection and electrical test indicated in NETA ATS, Section 7.5 for switches and Section 7.6 for molded-case circuit breakers. Certify compliance with test parameters.

2. Correct malfunctioning units on-site, where possible, and retest to demonstrate compliance; otherwise, replace with new units and retest.

3. Perform the following infrared scan tests and inspections and prepare reports:

a. Initial Infrared Scanning: Prior to Substantial Completion, perform an infrared scan of each panelboard. Remove front panels so joints and connections are accessible to portable scanner.

b. Follow-up Infrared Scanning: The Port shall have the option of performing its own infrared inspection.

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.

C. Panelboards will be considered defective if they do not pass tests and inspections.

D. Prepare test and inspection reports, including a certified report that identifies panelboards included and that describes scanning results. Include notation of deficiencies detected, remedial action taken, and observations after remedial action. Submit test and inspection reports

3.05 ADJUSTING

A. Adjust moving parts and operable component to function smoothly, and lubricate as recommended by manufacturer.

B. Set field-adjustable switches and circuit breaker trip ranges.

C. Load Balancing: Prior to Substantial Completion, measure load balancing and make circuit changes.

1. Measure as directed during period of normal system loading.

2. Perform load-balancing circuit changes outside normal occupancy/working schedule of the facility and at time directed. Avoid disrupting critical 24-hour services such as fax machines and on-line data processing, computing, transmitting, and receiving equipment.

3. After circuit changes, recheck loads during normal load period. Record all load readings before and after changes and submit test records.

4. Tolerance: Difference exceeding 10 percent between phase loads, within a panelboard, is not acceptable. Rebalance and recheck as necessary to meet this minimum requirement.

3.06 CLEANING

A. On completion of installation, inspect interior and exterior of panelboards. Remove paint splatters and other spots. Vacuum dirt and debris; do not use compressed air to assist in cleaning. Repair exposed surfaces to match original finish.

3.07 OPERATION AND MAINTENANCE MANUALS

A. Comply with Section 01 78 23 - Operations and Maintenance Data and Part 1 of this specification.

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.

PART 4 MEASUREMENT AND PAYMENT

4.01 GENERAL

A. No separate measurement or payment will be made for the Work required by this section. The cost for this portion of the Work will be considered incidental to, and included in the payments made for the applicable bid items.

End of Section

PART 1 GENERAL

1.01 SUMMARY OF WORK

A. The extent and location of “Cabinets and Enclosures” Work is shown in the Contract Documents. This section includes hinged cover enclosures, cabinets, terminal blocks, and accessories.

1.02 GOVERNING CODES, STANDARDS AND REFERENCES

A. NECA (National Electrical Contractors Association) - National Electrical Installation Standards

B. NEMA 250 (National Electrical Manufacturers Association) - Enclosures for Electrical Equipment (1000 Volts Maximum)

C. NEMA ICS 4 (National Electrical Manufacturers Association) – Application Guideline for Terminal Blocks.

D. NFPA 70 (National Fire Protection Association) - National Electrical Code

1.03 SUBMITTALS

A. Submit materials data in accordance with of Section 01 33 00 - Submittals. Furnish manufacturers’ technical literature, standard details, product specifications, and installation instructions for all products.

B. Submittals shall include the following:

1. Product Data: For enclosures, cabinets, and terminal blocks.

2. Manufacturer’s Installation Instructions, including storage, handling, protection, examination, preparation, and installation of product.

3. Shop Drawings: Include layout drawings showing components and wiring for nonstandard enclosures, and cabinets.

1.04 QUALITY ASSURANCE

A. Listing and Labeling: Provide products that are Listed and Labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to the Authority Having Jurisdiction, and marked for intended use for the location and environment in which they are installed.

B. Comply with NECA’s “National Electrical Installation Standards.”

C. Comply with NFPA 70, as adopted and administered by the Authority Having Jurisdiction.

1.05 EXTRA MATERIALS

A. Spare and extra parts shall be identified for all products. Include spare parts information in Operation and Maintenance Manual

PART 2 PRODUCTS

2.01 HINGED COVER ENCLOSURES

A. Construction: NEMA 250, Type 1, except as noted below, with continuous hinge cover and flush latch. Key latch to match panelboards.

1. Metal Enclosures: Steel, finished inside and out with manufacturer’s standard enamel.

2. Nonmetallic Enclosures: PVC or fiberglass, finished inside with radio-frequency-resistant paint.

3. Application in other than NEMA 250, Type 1 environments:

a. Indoor Dusty Locations: NEMA 12.

b. Damp or Wet Locations: NEMA 3R.

c. Outdoor dirty/oily and washdown locations such as Aircraft Operations Areas: NEMA 4, stainless steel.

d. Damp or Wet and Corrosive Locations: NEMA 250, Type 4X, stainless steel.

e. Hazardous Locations: NEMA 250, Type 7, 8, or 9 depending on hazardous area classification and location (unhinged).

2.02 CABINETS

A. Cabinets: NEMA 250, Type 1, except as noted below, galvanized steel box with removable interior panel and removable front, finished inside and out with manufacturer's standard enamel.

1. Hinged door in front cover with flush latch and concealed hinge. Key latch to match panelboards.

2. Include metal barriers to separate wiring of different systems and voltage.

3. Include accessory feet where required for freestanding equipment.

4. Application in other than NEMA 250, Type 1 environments:

a. Indoor Dusty Locations: NEMA 12.

b. Damp or Wet Locations: NEMA 3R.

c. Outdoor dirty/oily and washdown locations such as Aircraft Operations Areas: NEMA 4, stainless steel.

d. Damp or Wet and Corrosive Locations: NEMA 250, Type 4X, stainless steel.

e. Hazardous Locations: NEMA 250, Type 7, 8, or 9 depending on hazardous area classification and location (unhinged).

2.03 TERMINAL BLOCKS

A. Minimum 600-volt rating for 480-volt circuits.

B. Clamp or screw terminals sized for maximum conductor size.

C. Separate connection point for each conductor.

D. Ten percent spare terminal points.

E. Individual identification for each terminal block.

F. Phenolic block separators or barriers to isolate low-voltage and control terminations from analog and DC circuits.

G. Terminal Blocks: NEMA ICS 4.

H. Power Terminals: Unit construction type with closed back and tubular pressure screw connectors, rated 600 volts.

I. Signal and Control Terminals: Modular construction type, suitable for channel mounting, with tubular pressure screw connectors, rated 300 volts.

J. Provide ground bus terminal block, with each connector bonded to enclosure.

2.04 PLASTIC RACEWAY

A. Plastic channel with hinged or snap-on cover.

PART 3 EXECUTION

3.01 EXAMINATION

A. Examine surfaces to receive enclosures, and cabinets for compliance with installation tolerances, access and working clearances. Do not proceed with installation until unsatisfactory conditions have been corrected.

3.02 INSTALLATION

A. Install enclosures and cabinets as indicated, according to manufacturer's written instructions and in accordance with NECA "National Electrical Installation Standards."

B. Install enclosures and cabinets plumb and level and anchor securely.

3.03 IDENTIFICATION

A. Provide labels for enclosures and components as specified in Section 26 05 53 - Electrical Identification.

B. Equipment used in emergency systems shall be labeled "Suitable for use on emergency systems" per NEC 700-3.

3.04 PROTECTION

A. Provide final protection and maintain conditions, in a manner acceptable to manufacturer and Installer that ensure coatings, finishes, and cabinets are without damage or deterioration at the time of Substantial Completion.

1. Repair damage to finishes with matching touchup coating recommended by manufacturer.

3.05 CLEANING

A. On completion of installation, clean electrical parts and remove conductive and harmful materials

B. Remove dirt and debris from enclosure.

C. Clean finishes and touch up damage.

PART 4 MEASUREMENT AND PAYMENT

4.01 GENERAL

A. No separate measurement or payment will be made for the Work required by this section. The cost for this portion of the Work will be considered incidental to, and included in the payments made for the applicable bid items.

End of Section

PART 1 - GENERAL

1.1 WORK INCLUDED:

A. Provide all wiring devices and plates for a complete installation.

PART 2 - PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS:

A. Hubbell

B. G.E. Wiring Devices

C. Leviton

D. Pass & Seymour

2.2 MATERIALS:

A. Wiring devices shall be specification grade, and the product of a nationally recognized manufacturer regularly engaged in their production.

B. All wiring devices specified in this section shall be the product of one manufacturer. Each type shall have identical appearance and characteristics.

2.3 SWITCHES AND RECEPTACLES:

A. Ivory, toggle type, 20A, 277V.

B. Ivory duplex 20A, 125V, specification grade with GFCI with trip indicator light.

C. All switch and receptacle covers shall be NEMA 3R “In Use”.

PART 3 - EXECUTION

3.1 MOUNTING:

A. Rigidly fasten each device to auxiliary pole or non-metallic strut.

3.2 RECEPTACLE GROUNDING:

A. Provide bare bonding wire between receptacle grounding terminal and box.

END OF SECTION

PART 1 GENERAL

1.01 SUMMARY OF WORK

A. The extent and location of “Enclosed Switches and Circuit Breakers” Work is shown in the Contract Documents. This section includes individually mounted enclosed switches and circuit breakers used for the following:

1. Service disconnecting means.

2. Feeder and branch-circuit protection.

B. Definitions

1. GFCI: Ground-fault circuit interrupter.

2. RMS: Root mean square.

3. SPDT: Single pole, double throw.

1.02 GOVERNING CODES, STANDARDS AND REFERENCES

A. NEMA AB 1 (National Electrical Manufacturers Association) - Molded Case Circuit Breakers.

B. NEMA FU1 (National Electrical Contractors Association) - Low Voltage Cartridge Fuses.

C. NEMA KS 1 (National Electrical Contractors Association) - Enclosed and Miscellaneous Distribution Equipment Switches (600 Volts Maximum).

D. NETA ATS (International Electrical Testing Association) - Acceptance Testing Specifications for Electrical Power Distribution Equipment and Systems (International Electrical Testing Association).

E. NFPA 70 (National Fire Protection Association) - National Electrical Code.

1.03 SUBMITTALS

A. Submit materials data in accordance with Section 01 33 00 - Submittals. Furnish manufacturers’ technical literature, standard details, product specifications, and installation instructions for all products.

B. Submittals shall include the following:

1. Product Data: For each type of switch, circuit breaker, accessory, and component indicated. Include dimensions and manufacturers’ technical data on features, performance, electrical characteristics, ratings, and finishes.

2. Shop Drawings: For each switch and circuit breaker.

a. Dimensioned plans, elevations, sections, and details, including required clearances and service space around equipment. Show tabulations of installed devices, equipment features, and ratings. Include the following:

(1) Enclosure types and details for types other than NEMA 250, Type 3R, 4X.

(2) Current and voltage ratings.

(3) Short-circuit current rating.

(4) UL listing for series rating of installed devices.

(5) Features, characteristics, ratings, and factory settings of individual overcurrent protective devices and auxiliary components.

(6) Include time-current coordination curves for each type and rating of overcurrent protective device; include selectable ranges for each type of overcurrent protective device.

3. Field Test Reports: Submit written test reports and include the following:

a. Test procedures used.

b. Test results that comply with requirements.

c. Results of failed tests and corrective action taken to achieve test results that comply with requirements.

4. Manufacturer's field service report.

5. Maintenance Data: For enclosed switches and circuit breakers and for components to include in maintenance manuals specified in Division 1 General Requirements. In addition to requirements specified in Section 01 77 00 - Project Closeout include the following:

a. Routine maintenance requirements for components.

b. Manufacturer's written instructions for testing and adjusting switches and circuit breakers.

c. Time-current curves, including selectable ranges for each type of circuit breaker.

1.04 QUALITY ASSURANCE

A. Listing and Labeling: Provide components, devices and accessories that are Listed and Labeled as defined in NFPA 70, Article 100 and marked for intended use for the location and environment in which they are installed.

1. Service Entrance: Switches and circuit breakers identified for use as service equipment shall be labeled for this application.

B. Comply with NEMA AB 1 and NEMA KS 1.

C. Comply with NFPA 70, as adopted and administered by the Authority Having Jurisdiction.

1.05 PROJECT CONDITIONS

A. Environmental Limitations: Rate equipment for continuous operation under the following conditions, unless otherwise indicated:

1. Ambient Temperature: Not less than minus 22°F (minus 30°C) and not exceeding 104°F (40°C).

2. Altitude: Not exceeding 1000 feet.

1.06 COORDINATION

A. Coordinate layout and installation of switches, circuit breakers, and components with other construction, including conduit, piping, equipment, and adjacent surfaces. Maintain required workspace clearances and required clearances for equipment access doors and panels.

1.07 EXTRA MATERIALS

A. Spare and extra parts shall be identified for all products. Include spare parts information in Operation and Maintenance Manuals.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Eaton.
2. GE.
3. Square D.
4. Or Approved Equal.

2.02 ENCLOSED CIRCUIT BREAKERS

A. Enclosed Circuit Breakers

1. Ground Fault protection type:

a. Required for solidly grounded wye service entrance switches over 150 Volts to ground, not exceeding 600 Volts and rated 1000 Amps and above.

2. Switch Duty (SWD) rated type for switching lighting fixtures. Note that energy code restricts use of circuit breakers as sole means of switching lighting circuits. (See State of Washington Nonresidential Energy Code 1513.2)

3. Auxiliary contacts: Provide as required by engineering considerations.

B. Molded-Case Circuit Breaker: NEMA AB 1, with interrupting capacity to meet available fault currents.

1. Thermal-Magnetic Circuit Breakers: Inverse time-current element for low-level overloads, and instantaneous magnetic trip element for short circuits. Adjustable magnetic trip setting for circuit-breaker frame sizes 250A and larger.

2. Current-Limiting Circuit Breakers: Frame sizes 400A and smaller; let-through ratings less than NEMA FU 1, RK-5.

3. 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.

4. Molded-Case Switch: Molded-case circuit breaker without trip units.

C. Molded-Case Circuit-Breaker Features and Accessories: Standard frame sizes, trip ratings, and number of poles.

1. Lugs: Mechanical style suitable for number, size, trip ratings, and material of conductors.
2. Ground-Fault Protection: Integrally mounted relay and trip unit with adjustable pickup and time-delay settings, push-to-test feature, and ground-fault indicator.
3. Communication Capability: Integral Din-rail-mounted communication module with functions and features compatible with power monitoring and control system.
4. Shunt Trip: 120V 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 Switch: one NO/NC reversible contact that operates only when circuit breaker has tripped.
7. Key Interlock Kit: Externally mounted to prohibit circuit-breaker operation; key shall be removable only when circuit breaker is in off position.
8. Zone-Selective Interlocking: Integral with electronic trip unit; for interlocking ground-fault protection function.

D. Service Entrance: For enclosed circuit breakers identified for use as service equipment, provide solid neutral assembly and equipment ground bus.

2.03 ENCLOSURES

A. NEMA AB 1, NEMA KS 1 and UL 50 to meet environmental conditions of installed location.

1. Indoor Wet or Damp Locations and Outdoor Dirty/Oily or Washdown Locations: NEMA 250, Type 4.
2. Outdoor Locations: NEMA 250, Type 3R.
3. Corrosive Locations: NEMA 250, Type 4X, stainless steel.

2.04 FACTORY FINISHES

A. Manufacturer’s standard prime-coat finish ready for field painting.

B. Finish: Manufacturer’s standard paint applied to factory-assembled and tested enclosures before shipping.

PART 3 EXECUTION

3.01 EXAMINATION

A. Examine elements and surfaces to receive enclosed switches and circuit breakers for compliance with installation tolerances and other conditions affecting performance.

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

3.02 EQUIPMENT INSTALLATION

A. Comply with NFPA 70 working space requirements and NECA 1.

B. Standard Mounting Height: Install individual wall-mounted switches and circuit breakers with tops at uniform height unless otherwise indicated. Operating handle typically at 5’-0” above grade or finished floor.

C. Mount on substantial structure and secure to meet seismic zone 3 requirements.

D. Temporary Lifting Provisions: Remove temporary lifting eyes, channels, and brackets and temporary blocking of moving parts from enclosures and components.

E. Set adjustable parameters and provide testing and calibration as required by engineering considerations.

3.03 IDENTIFICATION

A. Identify field-installed conductors, interconnecting wiring, and components; provide warning signs as specified in Section 26 05 53 - Electrical Identification.

B. Install enclosure nameplate with switch or circuit breaker designation, power source, source location, voltage, load served and load location.

1. Identify special conditions for shutting down load served.

C. Apply label inside door cover identifying NEMA fuse class and size of fuses installed.

3.04 CONNECTIONS

A. Install equipment grounding connections for switches and circuit breakers with ground continuity to main electrical ground bus.

B. Install power wiring. Install wiring between switches and circuit breakers, and control and indication devices.

C. Tighten electrical connectors and terminals according to manufacturer’s published torque-tightening values. If manufacturer’s torque values are not indicated, use those specified in UL 486A and UL 486B.

1. Mark lugs after torquing with red paint such that paint will be visibly disturbed if lugs are disturbed.

3.05 FIELD QUALITY CONTROL

A. Manufacturer's Field Service: Engage a factory-authorized service representative to initially inspect, test, and adjust components, assemblies, and equipment installations, including connections. Verification will be by third party testing agency.

B. Prepare for acceptance tests as follows:

1. Test insulation resistance for each enclosed switch, circuit breaker, component, and control circuit.

2. Test continuity of each line- and load-side circuit.

C. Testing: After installing enclosed switches and circuit breakers and after electrical circuitry has been energized, demonstrate product capability and compliance with requirements.

1. Procedures: Perform each visual and mechanical inspection and electrical test indicated in NETA ATS, Section 7.5 for switches and Section 7.6 for molded-case circuit breakers. Certify compliance with test parameters.

2. Correct malfunctioning units on-site, where possible, and retest to demonstrate compliance; otherwise, replace with new units and retest.

3.06 ADJUSTING

A. Adjust moving parts and operable components to function smoothly, and lubricate as recommended by manufacturer.

B. Set field-adjustable switches and circuit-breaker trip ranges.

3.07 CLEANING

A. On completion of installation, inspect interior and exterior of enclosures. Remove paint splatters and other spots. Vacuum dirt and debris; do not use compressed air to assist in cleaning. Repair exposed surfaces to match original finish.

3.08 OPERATION AND MAINTENANCE MANUALS

A. Comply with Section 01 78 23 - Operations and Maintenance Data and Part 1 of this specification.

PART 4 MEASUREMENT AND PAYMENT

4.01 GENERAL

A. No separate measurement or payment will be made for the Work required by this section. The cost for this portion of the Work will be considered incidental to, and included in the payments made for the applicable bid items.

End of Section

PART 1 – GENERAL

1.1 SUMMARY

A. This Section includes grounding of electrical systems and equipment. Grounding requirements specified in this Section may be supplemented by special requirements of systems described in other Sections.

B. Related Documents: The provisions and intent of the Contract, the General and Supplementary Conditions, and Division 1 Specification Sections, apply to the Work as if specified in this Section.

1.2 REFERENCES

A. ASTM B8.

B. NFPA 70 (National Fire Protection Association) - National Electrical Code.

C. ANSI/UL 467 - (Underwriter's Laboratory) - Grounding and Bonding Equipment.

1.3 QUALITY ASSURANCE

A. Listing and Labeling: Provide electrical components, devices, and accessories that are Listed and Labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to the Authority Having Jurisdiction, and marked for specific types, sizes, and combinations of conductors and connected items.

B. Comply with IEEE 837 and UL 467.

C. Comply with IEEE Std. 142 (Green Book).

D. Comply with NFPA 70.

E. Comply with IEEE C2 for overhead-line construction and medium-voltage underground construction.

1.4 SUBMITTALS

A. Submit product data for the following:

1. Grounding conductors and cables.
2. Grounding connectors.
3. Grounding electrodes.
4. Ground bus.

B. Field Test Reports: Submit written test reports to include the following:

1. Test procedures used.
2. Test results that comply with requirements.
3. Results of failed tests and corrective action taken to achieve test results that comply with requirements.

PART 2 – PRODUCTS

2.1 MANUFACTURERS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the

following:

1. Grounding Conductor Fittings:
    a. Erico Inc.
    b. Chance/Hubbell.
    c. Copperweld Corp.
    d. Erico Inc.; Electrical Products Group.
    e. Framatome Connectors/Burndy Electrical.
    f. Ideal Industries, Inc.
    g. ILSCO.
    h. Kearney/Cooper Power Systems.
    i. Lyncole XIT Grounding.
    j. O-Z/Gedney Co.
    k. Raco, Inc.; Division of Hubbell.
    l. Thomas & Betts, Electrical.
2. Grounding Connectors:
    a. Erico.
    b. ILSCO.
    c. Lyncole XIT Grounding.
    d. O-Z/Gedney.
    e. Raco, Inc.; Division of Hubbell.
    f. Thomas & Betts

2.2 GROUNDING CONDUCTORS

A. For insulated conductors, comply with Specification Section 26 05 19, Low Voltage Electrical Power Conductors and Cables.

B. Material: Copper.

C. Equipment Grounding Conductors: Insulated with green-colored insulation.

D. Grounding Electrode Conductors: Stranded cable.

E. Underground Conductors: Bare, tinned, stranded.

F. Bare Copper Conductors: Assembly of stranded conductors, ASTM B 8.

G. Copper Bonding Conductors:
    1. Bonding Conductor: #4 or #6 AWG, stranded copper conductor.
    2. Bonding Jumper: Bare copper tape, braided bare copper conductors, terminated with copper ferrules; 1-5/8 inches wide and 1/16 inch thick.

H. Bonding Straps: Soft copper.

I. Grounding Bus: Bare, annealed copper bars of rectangular cross section, with insulators.

2.3 CONNECTORS

A. Pressure Connectors: High-conductivity-plated units.

B. Bolted Connectors: Heavy-duty, bolted-pressure-type.

C. Welded Connectors: Exothermic-welded type, in kit form, and selected per manufacturer's written instructions.

2.4 GROUND BUS

A. Ground bus: 1/4 inch x 2 inch copper mounted on stand-off insulators. Size and location as shown on drawings.

PART 3 – EXECUTION

3.1 APPLICATION

A. Copper conductors for both insulated and bare grounding conductors in direct contact with earth, concrete, masonry, crushed stone, and similar materials.

B. In raceways, use insulated equipment grounding conductors.

C. Exothermic-Welded Connections: Use for connections to structural steel, rail, rebar and for underground connections.

D. Equipment Grounding Conductor Terminations: Use bolted pressure clamps.

E. Grounding Bus: Install in electrical and communications equipment rooms, in rooms housing service equipment, and elsewhere as indicated.

1. Use insulated spacer; space 1 inch from wall and support from wall 18 inches above finished floor, unless otherwise indicated.

3.2 EQUIPMENT GROUNDING CONDUCTORS

A. Comply with NFPA 70, Article 250, for types, sizes, and quantities of equipment grounding conductors, unless specific types, larger sizes, or more conductors than required by NFPA 70 are indicated.

B. Install equipment grounding conductors in all feeders and branch circuits unless otherwise noted.

C. Busway Supply Circuits: Install insulated equipment grounding conductor from the grounding bus in the switchgear, switchboard, or distribution panel to equipment grounding bar terminal on busway.

D. Nonmetallic Raceways: Install an equipment grounding conductor in all nonmetallic raceways unless they are designated for telephone or data cables.

3.3 INSTALLATION

A. Grounding Conductors: Route along shortest and straightest paths possible. Avoid obstructing access or placing conductors where they may be subjected to strain, impact, or damage.

B. Bonding Straps and Jumpers: Install so vibration by equipment mounted on vibration isolation hangers and supports is not transmitted to rigidly mounted equipment.

1. Use exothermic-welded connectors for outdoor locations, unless a disconnect-type connection is required; then, use a bolted clamp.

2. Bond straps directly to the basic structure taking care not to penetrate any adjacent parts.

3. Install straps only in locations accessible for maintenance.

C. Water Meter Piping: Use braided-type bonding jumpers to electrically bypass water meters. Connect to pipe with grounding clamp connectors.

D. Gas Piping: Bond each aboveground portion of gas piping system upstream from equipment shutoff valve.

3.4 CONNECTIONS

A. General: Make connections so galvanic action or electrolysis possibility is minimized. Select connectors, connection hardware, conductors, and connection methods so metals in direct contact will be galvanically compatible.

1. Use electroplated or hot-tin-coated materials to ensure high conductivity and to make contact points closer to 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.

B. Exothermic-Welded Connections: Comply with manufacturer's written instructions. Welds that are puffed up or that show convex surfaces indicating improper cleaning are not acceptable.

C. Equipment Grounding Conductor Terminations: For #8 AWG and larger, use pressure-type grounding lugs. #10 AWG and smaller grounding conductors may be terminated with winged pressure-type connectors.

D. Noncontact Metal Raceway Terminations: If metallic raceways terminate at metal housings without mechanical and electrical connection to housing, terminate each conduit with a grounding bushing.

1. Connect grounding bushings with a bare grounding conductor to grounding bus or terminal in housing.

2. Bond electrically noncontinuous conduits at entrances and exits with grounding bushings and bare grounding conductors, unless otherwise indicated.

E. Tighten screws and bolts for grounding and bonding connectors and terminals according to manufacturer's published torque-tightening values.

F. Compression-Type Connections: Use hydraulic compression tools to provide correct circumferential pressure for compression connectors. Use tools and dies recommended by connector manufacturer. Provide embossing die code or other standard method to make a visible indication that a connector has been adequately compressed on the grounding conductor.

G. Moisture Protection: If insulated grounding conductors are connected to grounding buses, insulate entire area of connection and seal against moisture penetration of insulation and cable.

3.5 UNDERGROUND DISTRIBUTION SYSTEM GROUNDING

A. Ductbanks: Provide a ground conductor with each medium-voltage and low voltage feeder circuit sized per NEC.

B. Connections to Vault/Manhole Components: Connect all exposed-metal parts, such as inserts, cable racks, pulling irons, cover frame, cover, sump ladders, and cable shields within each manhole to ground loop conductor.

1. Make connections with #2 AWG minimum, stranded, hard-drawn copper conductor.
2. Train conductors level or plumb around corners and fasten to manhole walls.
3. Make connection to cable shield as recommended by manufacturer of splicing and termination kits.
4. Connect equipment grounding conductor in each conduit to ground loop.

3.6 IDENTIFICATION

A. Identify grounding system components as required by the Authority Having Jurisdiction and as specified in Division 26, Section “Identification for Electrical Systems.”

3.7 FIELD QUALITY CONTROL

A. Testing: Perform the following field quality-control testing:

1. After installing grounding system but before permanent electrical circuitry has been energized, test for compliance with requirements.
   a. Measure ground resistance without the 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. Test by one of the following methods for resistance measurement:
      1) Perform fall of potential test per IEEE Standard No. 81, Section 9.04 on the main grounding electrode or system for each substation and building.
      2) Perform the two-point method test per IEEE No.81 Section 9.03 to determine the ground resistance between the main grounding system and all major electrical equipment frames, system neutral and/or derived neutral points.
      3) Alternate Method: Perform ground continuity test between main ground system and equipment frame, system neutral and/or derived neutral point. Conduct test by passing a minimum of ten amperes dc current between ground reference system and the ground point to be tested. Measure voltage drop and calculate resistance by voltage drop method.
   c. Test Requirements:
      1) Equipment Rated and manhole/handhole grounds: 10 ohms.
   d. Excessive Ground Resistance: If resistance to ground exceeds specified values, notify Engineer promptly and include recommendations to reduce ground resistance.
2. Record test results on a Ground Resistance Test Report form for inclusion with O & M Manuals.

END OF SECTION

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:
   1. Subsoil materials.
   2. Topsoil materials.

B. Related Sections:
   1. Section 310516 - Aggregates for Earthwork.
   2. Section 312000 - Earth Moving.
   3. Section 312317 - Trenching.
   4. Section 312513 - Erosion Controls
   5. Document: *Report of Geotechnical Investigation and Engineering: Proposed Tulalip Utilities Building Development, Tulalip, Washington*, Prepared by Materials Testing& Consulting, dated June 15, 2022. – Geotechnical report; findings of subsurface materials.

1.2 REFERENCES

A. American Association of State Highway and Transportation Officials:
   1. AASHTO T180 - Standard Specification for Moisture-Density Relations of Soils Using a 4.54-kg (10-lb) Rammer and a 457-mm (18-in.) Drop.

B. ASTM International:
   1. ASTM D698 - Standard Test Method for Laboratory Compaction Characteristics of Soil Using Standard Effort (12,400 ft-lbf/ft3 (600 kN-m/m3)).
   2. ASTM D1557 - Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Modified Effort (56,000 ft-lbf/ft3 (2,700 kN-m/m3)).
   3. ASTM D2487 - Standard Classification of Soils for Engineering Purposes (Unified Soil Classification System).

1.3 SUBMITTALS

A. Section 013300 - Submittal Procedures: Requirements for submittals.

B. Materials Source: Submit imported materials source name and product information.

1.4 QUALITY ASSURANCE

A. Furnish each material from single source throughout the Work.

PART 2 - PRODUCTS

2.1 SUBSOIL MATERIALS

A. Select Fill:
   1. Excavated and re-used material, on-site soils located above the water table.
   2. Graded.
   3. Free of lumps larger than 3 inches, rocks larger than 2 inches, highly plastic materials (materials having plasticity index >30 and a liquid limit >50), organics, deleterious materials, and debris.

B. Imported Fill:
   1. Soil and/or Soil/Aggregate Mixtures meeting the following gradation:

Sieve Size	Percent Passing
3 inches	100
3/4 inch	70 to 100
No. 200	0 to 30

   2. Liquid Limit < 30

3. Plasticity Index < 12
4. Organic Content < 3%

C. Excavated materials consisting of broken rock exceeding 3-inch sieve size are to be further processed by crushing in accordance with Instructions to Bidders for use as Select Fill wherever possible.

D. Suitable materials may be selected for use for riprap and rockery walls, subject to approval by General Contractor, Engineer and Owner.

E. Unsuitable Materials:
1. All materials not meeting Select Fill or Imported Fill requirements shall be considered unsuitable. Separate unsuitable materials for disposal as directed by Owner/Engineer.

2.2 TOPSOIL MATERIALS

A. Topsoil:
1. Excavated material, approximately 6 inches deep.
2. Separate from other materials.
3. Dispose of as directed by Owner/Engineer.

2.3 SOURCE QUALITY CONTROL

A. Section 014500 - Quality Control: Testing and Inspection Services.

B. Testing and Analysis of Subsoil Material: Perform in accordance with ASTM D1557.

C. When tests indicate materials do not meet specified requirements, change material and retest.

D. Furnish materials of each type from same source throughout the Work.

PART 3 - EXECUTION

3.1 STOCKPILING

A. Stockpile materials at locations designated by Owner/Engineer.

B. Stockpile in sufficient quantities to meet Project schedule and requirements.

C. Separate differing materials with dividers or stockpile apart to prevent mixing.

D. Stockpile topsoil 6 feet high maximum.

E. Prevent intermixing of soil types or contamination.

F. Direct surface water away from stockpile site to prevent erosion or deterioration of materials.

3.2 STOCKPILE CLEANUP

A. Dispose of stockpiled materials as directed by Owner/Engineer.

B. Leave area in clean and neat condition. Grade site surface to prevent free standing surface water.

END OF SECTION

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:
   1. Coarse aggregate materials.
   2. Fine aggregate materials.

B. Related Sections:
   1. Section 310513 - Soils for Earthwork.
   2. Section 312000 - Earth Moving.
   3. Section 312317 - Trenching.
   4. Document: *Report of Geotechnical Investigation and Engineering: Proposed Tulalip Utilities Building Development, Tulalip, Washington*, Prepared by Materials Testing& Consulting, dated June 15, 2022. – Geotechnical report; findings of subsurface materials.

1.2 UNIT PRICE - MEASUREMENT AND PAYMENT

A. Pipe and Trench Zone Backfill (Plastic Sewer/Storm Pipe):
   1. Basis of Measurement: By cubic yard.
   2. Basis of Payment: Includes supplying aggregate materials, placing, and stockpiling.

B. Pipe Zone Backfill (Plastic Water Pipe):
   1. Basis of Measurement: By cubic yard.
   2. Basis of Payment: Includes supplying aggregate materials, placing, and stockpiling.

C. Drain Rock:
   1. Basis of Measurement: By cubic yard.
   2. Basis of Payment: Includes supplying aggregate materials, placing, and stockpiling.

1.3 SUBMITTALS

A. Section 013300 - Submittal Procedures: Requirements for submittals.

B. Product Data: Submit gradation analysis for aggregate materials.

PART 2 - PRODUCTS

2.1 AGGREGATE MATERIALS

A. Granular Fill Produced Onsite/Imported Granular Fill:
   1. Aggregate Mixtures meeting the following gradation:

Sieve Size	Percent Passing
3 inches	100
3/4 inch	70 to 100
No. 200	<5

   2. Nonplastic
   3. Organic Content < 3%

B. Pipe and Trench Zone Backfill (Plastic Sewer/Storm Pipe):
   1. ¾” Crushed Rock: ASTM D2940; graded type.

Sieve Size	Percent Passing
1 inch	100
3/4 inches	90 to 100

1/2 inches	-
3/8 inches	55 to 75
1/4 inches	40 to 60
No. 10	40 to 60% of fraction passing 1/4 inch sieve

C. Pipe Zone Backfill (Plastic Water Pipe):
   1. Sand, free from clay or organic material, meeting the following gradation:

Sieve Size	Percent Passing
1/2 inches	100
No. 4	75 to 100
No. 50	0 to 70
No. 100	0 to 30
No. 200	0 to 15

   2. Sand equivalent per ASTM D-2419 shall be equal to or greater than 20.
   3. Relative compaction of 95% or greater per ASTM D1557.

D. Drain Rock:
   1. Clean, coarse grained material with no more than 5% passing the No. 200 sieve.
      a. Permeable Material (Class 2) as specified in Section 9-03.12(4) of the Washington State Department of Transportation Standard Specifications; or
      b. Peagravel with nominal diameter of ¼"; or
      c. Crushed stone sized between ¼" and ½"

2.2 SOURCE QUALITY CONTROL

A. Section 014500 - Quality Control: Testing and inspection services.

B. Coarse Aggregate Material - Testing and Analysis: Perform in accordance with ASTM D1557.

C. Fine Aggregate Material - Testing and Analysis: Perform in accordance with ASTM D1557.

D. When tests indicate materials do not meet specified requirements, change material and retest.

PART 3 - EXECUTION

3.1 EXCAVATION

A. Remove excavated materials not meeting requirements for coarse aggregate materials and fine aggregate materials from site.

3.2 STOCKPILING

A. Stockpile materials on site at locations designated by Engineer.

B. Stockpile in sufficient quantities to meet Project schedule and requirements.

C. Separate different aggregate materials with dividers or stockpile individually to prevent mixing.

D. Direct surface water away from stockpile site to prevent erosion or deterioration of materials.

3.3 STOCKPILE CLEANUP

A. Remove stockpile, leave area in clean and neat condition. Grade site surface to prevent free standing surface water.

END OF SECTION

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:
   1. Removing surface debris.
   2. Removing designated trees, shrubs, and other plant life.
   3. Excavating topsoil.
   4. Existing underground utilities, wells and/or foundations.

B. Related Sections:
   1. Section 312000 – Earth Moving.
   2. Document – *Report of Geotechnical Investigation and Engineering: Proposed Tulalip Utilities Building Development, Tulalip, Washington*, Prepared by Materials Testing& Consulting, dated June 15, 2022. – Geotechnical report; findings of subsurface materials.

1.2 UNIT PRICE - MEASUREMENT AND PAYMENT

A. Site Clearing:
   1. Basis of Measurement: per acre.
   2. Basis of Payment: all work necessary to clear site and remove material as directed by the Drawings and within this specification. Removed materials shall be disposed of offsite at no additional cost to the Owner.

1.3 SUBMITTALS

A. Section 013300 - Submittal Procedures: Requirements for submittals.

1.4 QUALITY ASSURANCE

A. Conform to applicable code for environmental requirements and disposal of debris.

PART 2 - PRODUCTS

Not Used.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Field verify existing conditions before starting work including all utility locations and depths.

B. Verify existing plant life designated to remain is tagged or identified.

3.2 PREPARATION

A. Call Local Utility Line Information service at 1-800-424-5555 not less than 48 hours before performing Work.
   1. Request underground utilities to be located and marked within and surrounding construction areas.

3.3 PROTECTION

A. Locate, identify, and protect utilities indicated to remain, from damage.

B. Protect trees, plant growth, and features designated to remain, as final landscaping as specified in Section 015000 - Temporary Facilities and Controls.

C. Protect any benchmarks, survey control points, and existing structures from damage or displacement.

3.4 CLEARING

A. Clear areas required for access to site and execution of Work to minimum depth of 6 inches.

B. Remove trees and shrubs indicated. Remove stumps, main root ball, root system to depth of 18 inches.

C. Clear undergrowth and deadwood, without disturbing subsoil.

3.5 REMOVAL

A. Remove debris, rock, and extracted plant life from site.

B. Existing underground utilities, wells, and/or foundations, if encountered shall be removed and/or rerouted per recommendations of the project Geotechnical report.

C. Partially remove paving as indicated on Drawings. Neatly saw cut edges at right angle to surface.

D. Continuously clean-up and remove waste materials from site. Do not allow materials to accumulate on site. Dispose of waste materials in accordance with local regulations.

E. Do not burn or bury materials on site. Leave site in clean condition.

END OF SECTION

PART 1 - GENERAL

1.1 SUMMARY

A. Section includes
   1. Site grading, including cutting, grading, scarifying, filling, rough contouring.
   2. Removal of topsoil and subsoil.
   3. Excavating for site structures and utilities.
   4. Over-excavation.
   5. Backfilling site structures to subgrade elevations.
   6. Fill under slabs-on-grade and paving.
   7. Fill for over-excavation.

B. Related Sections:
   1. Section 310513 - Soils for Earthwork: Soils for fill.
   2. Section 310516 - Aggregates for Earthwork: Aggregates for fill.
   3. Section 311000 - Site Clearing: Excavating topsoil.
   4. Section 312317 - Trenching: Trenching and backfilling for utilities.
   5. Section 321123 - Aggregate Base Courses: Aggregate Base for Asphalt and Concrete Paving.
   6. Document: *Report of Geotechnical Investigation and Engineering: Proposed Tulalip Utilities Building Development, Tulalip, Washington*, Prepared by Materials Testing& Consulting, dated June 15, 2022. – Geotechnical report; findings of subsurface materials.

1.2 UNIT PRICE - MEASUREMENT AND PAYMENT

A. Measurement - The quantities of earthwork will be measured as follows:
   1. Volume basis, based on the Engineer's digital terrain model (DTM) calculated by Grid Volume, or by other methods of equivalent accuracy.
   2. Watering of materials shall be considered incidental and no measurement shall be made.

B. Embankment Basis Measurement – Measurement of earthwork is on the embankment basis; the materials will be measured in their final embankment position. Measurement will be limited to the lines, grades, and slopes of the original ground contours before embankment construction begins.
   1. The quantities of embankment measured for payment will not include the volumes of:
      a. Any additional quantities required due to subsidence, settlement of the ground or base, settlement within embankments, or to shrinkage, settlement, washout, slippage, or loss regardless of cause.
      b. Slide materials paid for as Extra Work.
      c. Any materials for which payment is made for completed embankments or backfills under other Contract provisions.
      d. Keying and benching required beneath fills placed on existing ground slopes in excess of 20%.
      e. Temporary stockpiles.
      f. Overexcavation of artificial fill.

C. Payment – The accepted quantities of earthwork performed under this Section will be paid for at the Contract unit price, per unit of measurement, for each item that appears in the Contract Schedule of Items.
   1. Payment will be payment in full for furnishing and placing all materials, and for furnishing all equipment, labor, and incidentals necessary to complete the work as specified.
   2. Watering of materials required for work will be considered incidental and no separate payment shall be made for this item.
   3. No separate or additional payment will be made for work that is required to be done under these Specifications that does not appear as a separately listed item in the Contract Schedule of Items.
   4. Rock removal, either by mechanical or explosive means, shall be made under the provisions of those sections.

D. Embankment Basis Payment - When listed in the Contract Schedule of Items, the following items will be paid for on the embankment basis:

Pay Item	Unit of Measurement
Embankment In Place:	Cubic Yard

1. Item includes excavating, selecting, handling, hauling, placing, and compacting of the materials as specified and all other costs incurred in furnishing required embankment materials.
2. No separate or additional payment will be made for preserving, sorting, and handling selected materials. However, earthwork materials obtained from excavations and incorporated into specified embankments will be paid for at the applicable item, if listed in the Contract Schedule of Items.

1.3 DEFINITIONS

A. General (over-burden) excavated materials shall be those materials that meet the requirements for subsoil fill as specified in Section 310513.

PART 2 - PRODUCTS

2.1 FILL MATERIALS

A. Select Fill: As specified in Section 310513.

B. Imported Fill: As specified in Section 310513.

C. Granular Fill: As specified in Section 310516.

PART 3 - EXECUTION

3.1 EXAMINATION AND PREPARATION

A. Section 311000 - Site Clearing: Verification of existing conditions before starting work.

B. Call Local Utility Line Information service at 1-800-424-5555 not less than three working days before performing Work.
   1. Request underground utilities to be located and marked within and surrounding construction areas.

C. Identify required lines, levels, contours, and datum.

D. Notify Architect/Engineer of unexpected subsurface conditions and discontinue affected work in area until notified to resume work.

E. Maintain and protect existing utilities to remain.

F. Protect bench marks, survey control points, existing structures, fences, sidewalks, paving, and curbs from excavating equipment and vehicular traffic.

G. Comply with the recommendations of the Project Geotechnical Report.

3.2 PROTECTION OF ADJACENT WORK

A. Underpin adjacent structures which may be damaged by excavation work, including service utilities and pipe chases.

B. Grade excavation top perimeter to prevent surface water run-off into excavation or to adjacent properties.

3.3 EXCAVATION

A. Excavate topsoil from areas to be further excavated, relandscaped, or regraded without mixing with foreign materials for use in finish grading. Topsoil shall be disposed of as directed by Owner/Engineer. Do not excavate wet subsoil.

B. Excavate subsoil to required elevations to accommodate slabs-on-grade, site structures, and construction operations.

C. Grade top perimeter of excavation to prevent surface water from draining into excavation.

D. Trim excavation. Remove loose matter.

E. Remove lumped subsoil, boulders, and rock up to 1/3 cu yd measured by volume. Stockpile excavated material in area designated on site in accordance with Section 310513.

F. Remove material and stockpile in location designated by Owner/Engineer for processing into aggregates as specified in Section 310516.

G. Notify Engineer of unexpected subsurface conditions.

H. Repair or replace items indicated to remain damaged by excavation.

I. Benching Slopes: refer to project Geotechnical Report for slope benching and stability.

J. Stability: Replace damaged or displaced subsoil as specified for fill.

3.4 SCARIFYING SUBSOILS

A. Under locations of interior concrete floor slabs, scarify subgrade to minimum of 8 inches.

B. Under locations of pavement, scarify subgrade to minimum depth of 1 foot; condition as necessary.

3.5 FILL

A. Fill areas to contours and elevations with unfrozen materials.

B. Systematically fill to allow maximum time for natural settlement. Do not fill over porous, wet, frozen or spongy subgrade surfaces.

C. Place material in continuous layers as follows:
   1. Loose lifts not exceeding 12 inches in thickness if using heavy compactors
   2. Loose lifts not exceeding 6 inches in thickness if using hand operated compaction equipment.

D. Employ placement method that does not disturb or damage other work.

E. Maintain optimum moisture content of fill materials to attain required compaction density.

F. Backfill against supported foundation walls. Do not backfill against unsupported foundation walls.

G. Backfill simultaneously on each side of unsupported foundation walls until supports are in place.

H. Slope grade away from building minimum 2 percent slope for minimum distance of 10 ft, unless noted otherwise.

I. Make gradual grade changes. Blend slope into level areas.

J. Remove surplus fill materials from site.

K. Leave fill material stockpile areas free of excess fill materials.

3.6 PLACING TOPSOIL

A. Place topsoil in areas where seeding is scheduled.

B. Fine grade topsoil eliminating rough or low areas. Maintain levels, profiles, and contours of subgrade.

C. Remove large stone, roots, grass, weeds, debris, and foreign material while spreading.

D. Lightly compact placed topsoil.

E. Leave stockpile area and site clean and raked, ready to receive landscaping.

3.7 FIELD QUALITY CONTROL

A. Section 014500 - Quality Control: Field inspecting, testing, adjusting, and balancing.

B. Perform laboratory material tests in accordance with ASTM D1557.

C. Perform in place compaction tests in accordance with the following:
   1. Density Tests: ASTM D1556.

2. Moisture Tests: ASTM D3017.

D. Compaction shall be as identified in the project Geotechnical Report.

E. When tests indicate Work does not meet specified requirements, remove Work, replace and retest.

F. Frequency of Tests: every 50 cubic yards.

G. Proof roll compacted fill surfaces under slabs-on-grade, and paving.

3.8 TOLERANCES

A. Top Surface of Exposed Subgrade: Plus or minus one inch.

B. Top of Topsoil: Plus or minus 1/2 inch.

END OF SECTION

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:
   1. Excavating trenches for utilities.
   2. Compacted fill from top of utility bedding to subgrade elevations.
   3. Backfilling and compaction.

B. Related Sections:
   1. Section 310513 - Soils for Earthwork: Soils for fill.
   2. Section 310516 - Aggregates for Earthwork: Aggregates for fill.
   3. Section 331116 - Site Water Utility Distribution Piping: Water and Reclaimed Water piping and bedding.
   4. Section 333100 - Sanitary Utility Sewerage Piping: Sanitary sewer piping and bedding.
   5. Section 333400 - Sanitary Force Main: Sewage force main piping and bedding.
   6. Section 334100 - Storm Utility Drainage Piping: Storm drainage piping and bedding.

1.2 UNIT PRICE - MEASUREMENT AND PAYMENT

A. Trenching:
   1. Basis of Measurement: no separate measurement will be made for this item.
   2. Basis of Payment: considered incidental to utility pipe.

B. Subsoil Fill:
   1. Basis of Measurement: no separate measurement will be made for this item.
   2. Basis of Payment: considered incidental to utility pipe.

C. Trench Bedding:
   1. Basis of Measurement: no separate measurement will be made for this item.
   2. Basis of Payment: considered incidental to utility pipe.

1.3 REFERENCES

A. American Association of State Highway and Transportation Officials:
   1. AASHTO T180 - Standard Specification for Moisture-Density Relations of Soils Using a 4.54-kg (10-lb) Rammer and a 457-mm (18-in.) Drop.

B. ASTM International:
   1. ASTM D698 - Standard Test Method for Laboratory Compaction Characteristics of Soil Using Standard Effort (12,400 ft-lbf/ft3 (600 kN-m/m3)).
   2. ASTM D1556 - Standard Test Method for Density and Unit Weight of Soil in Place by the Sand-Cone Method.
   3. ASTM D1557 - Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Modified Effort (56,000 ft-lbf/ft3 (2,700 kN-m/m3)).
   4. ASTM D2167 - Standard Test Method for Density and Unit Weight of Soil in Place by the Rubber Balloon Method.
   5. ASTM D2922 - Standard Test Method for Density of Soil and Soil-Aggregate in Place by Nuclear Methods (Shallow Depth).
   6. ASTM D3017 - Standard Test Method for Water Content of Soil and Rock in Place by Nuclear Methods (Shallow Depth).

1.4 DEFINITIONS

A. Utility: Any buried pipe, duct, conduit, or cable.

1.5 SUBMITTALS

A. Section 013300 - Submittal Procedures: Requirements for submittals.

B. Product Data: Submit data for geotextile fabric indicating fabric and construction.

1.6 QUALITY ASSURANCE

A. Perform Work in accordance with Washington Standard Specifications for Construction.

1.7 FIELD MEASUREMENTS

A. Verify field measurements prior to fabrication.

1.8 COORDINATION

A. Section 013113 – Project Coordination: Coordination and project conditions.

B. Verify Work associated with lower elevation utilities is complete before placing higher elevation utilities.

PART 2 - PRODUCTS

2.1 FILL MATERIALS

A. Subsoil Fill: as specified in Section 310513.

B. Pipe Zone Backfill: as specified in Section 310516.

C. Trench Zone Backfill: as specified in Section 310516.

PART 3 - EXECUTION

3.1 LINES AND GRADES

A. Lay pipes to lines and grades indicated on Drawings.
   1. Engineer reserves right to make changes in lines, grades, and depths of utilities when changes are required for Project conditions.

B. Use laser-beam instrument with qualified operator to establish lines and grades.

C. Maintain grade alignment of pipe using string line parallel with grade line and vertically above centerline of pipe.
   1. Establish string line on level batter boards at intervals of not more than 25 feet.
   2. Install batter boards spanning trench, rigidly anchored to posts driven into ground on both sides of trench.
   3. Set three adjacent batter boards before laying pipe to verify grades and line.
   4. Determine elevation and position of string line from elevation and position of offset points or stakes located along pipe route.
   5. Do not locate pipe using side lines for line or grade.

3.2 PREPARATION

A. Call Local Utility Line Information service at 1-800-424-5555 not less than 48 hours before performing Work.
   1. Request underground utilities to be located and marked within and surrounding construction areas.

B. Identify required lines, levels, contours, and datum locations.

C. Protect plant life, lawns, and other features remaining as portion of final landscaping.

D. Protect benchmarks, existing structures, fences, sidewalks, paving, and curbs from excavating equipment and vehicular traffic.

E. Maintain and protect above and below grade utilities indicated to remain.

F. Establish temporary traffic control and detours when trenching is performed in public right-of-way. Coordinate with Owner.

3.3 TRENCHING

A. Excavate subsoil required for utilities.

B. Remove lumped subsoil, boulders, and rock up of 1/6 cubic yard, measured by volume.

C. Perform excavation within 24 inches of existing utility service in accordance with utility's requirements.

D. Do not advance open trench more than 200 feet ahead of installed pipe.

E. Cut trenches sufficiently wide to enable installation and allow inspection. Remove water or materials that interfere with Work.

F. Excavate bottom of trenches maximum 2 feet wider than outside diameter of pipe.

G. Excavate trenches to depth indicated on Drawings. Provide uniform and continuous bearing and support for bedding material and pipe.

H. When Project conditions permit, slope side walls of excavation starting 2 feet above top of pipe. When side walls cannot be sloped, provide sheeting and shoring to protect excavation as specified in this section.

I. When subsurface materials at bottom of trench are loose or soft, consult project geotechnical report for trench subgrade stabilization. Inform Engineer immediately.

J. If groundwater is encountered during excavation of trenches, consult project geotechnical report for trench subgrade stabilization. Inform Engineer immediately.

K. Trim excavation. Hand trim for bell and spigot pipe joints. Remove loose matter.

L. Correct areas over excavated areas with compacted backfill as specified for authorized excavation or replace with fill concrete as directed by Engineer.

M. Stockpile excavated material in area designated on site in accordance with Section 310513.

3.4 SHEETING AND SHORING

A. Sheet, shore, and brace excavations to prevent danger to persons, structures and adjacent properties and to prevent caving, erosion, and loss of surrounding subsoil.

B. Support trenches more than 5 feet deep excavated through unstable, loose, or soft material. Provide sheeting, shoring, bracing, or other protection to maintain stability of excavation.

C. Design sheeting and shoring to be removed at completion of excavation work.

D. Repair damage caused by failure of the sheeting, shoring, or bracing and for settlement of filled excavations or adjacent soil.

E. Repair damage to new and existing Work from settlement, water or earth pressure or other causes resulting from inadequate sheeting, shoring, or bracing.

3.5 BACKFILLING

A. Backfill trenches to contours and elevations with unfrozen fill materials.

B. Systematically backfill to allow maximum time for natural settlement. Do not backfill over porous, wet, frozen, or spongy subgrade surfaces.

C. Place material in continuous layers as follows:
   1. Pipe Zone Backfill: Maximum 4 inches compacted depth.
   2. Trench Zone Backfill: Maximum 8 inches compacted depth.

D. Employ placement method that does not disturb or damage utilities in trench.

E. Maintain optimum moisture content of fill materials to attain required compaction density.

F. Do not leave more than 50 feet of trench open at end of working day.

G. Protect open trench to prevent danger to Owner and the public.

3.6 TOLERANCES

A. Section 014500 - Quality Control: Tolerances.

B. Top Surface of Backfilling Under Paved Areas: Plus or minus 0.08 feet from required elevations.

C. Top Surface of General Backfilling: Plus or minus 1 inch from required elevations.

3.7 FIELD QUALITY CONTROL

A. Section 014500 - Quality Control: Field inspecting, testing, adjusting, and balancing.

B. Perform laboratory material tests in accordance with ASTM D1557.

C. Perform in place compaction tests in accordance with the following:
   1. Density Tests: ASTM D1556.
   2. Moisture Tests: ASTM D3017.

D. When tests indicate Work does not meet specified requirements, remove Work, replace, compact, and retest.

E. Frequency of Tests: every 200 feet.

3.8 PROTECTION OF FINISHED WORK

A. Section 017700 - Closeout Procedures: Protecting finished work.

B. Reshape and re-compact fills subjected to vehicular traffic during construction.

END OF SECTION

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:
   1. Sediment Fencing
   2. Construction Entrance
   3. Fiber Roll Check Dams
   4. Seeding
   5. Mulching

B. Related Sections:
   1. Section 310513 - Soils for Earthwork.
   2. Section 310516 - Aggregates for Earthwork.
   3. Section 311000 - Site Clearing.
   4. Section 312000 - Earth Moving.

1.2 REFERENCES

A. American Association of State Highway and Transportation Officials:
   1. AASHTO T88 - Standard Specification for Particle Size Analysis of Soils.
   2. AASHTO T180 - Standard Specification for Moisture-Density Relations of Soils Using a 4.54-kg (10-lb) Rammer and a 457-mm (18-in.) Drop.

B. ASTM International:
   1. ASTM C127 - Standard Test Method for Density, Relative Density (Specific Gravity), and Absorption of Coarse Aggregate.
   2. ASTM D698 - Standard Test Method for Laboratory Compaction Characteristics of Soil Using Standard Effort (12,400 ft-lbf/ft3 (600 kN-m/m3)).
   3. ASTM D1557 - Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Modified Effort (56,000 ft-lbf/ft3 (2,700 kN-m/m3)).
   4. ASTM D2922 - Standard Test Method for Density of Soil and Soil-Aggregate in Place by Nuclear Methods (Shallow Depth).

1.3 UNIT PRICE - MEASUREMENT AND PAYMENT

A. Erosion Control:
   1. Basis of Measurement: Lump Sum
   2. Basis of Payment: Includes providing erosion controls as identified on Drawings.

1.4 QUALITY ASSURANCE

A. Perform Work in accordance with Washington State Department of Transportation Standard Specifications (Standard Specifications).

PART 2 - PRODUCTS

2.1 AGGREGATE AND SOIL MATERIALS

A. Granular Fill per Section 310516.

B. Subsoil as per Section 310513.

C. Topsoil as per Section 310513.

2.2 SEDIMENT FENCE

A. As specified in Section 8-01.3(9) of the Standard Specifications.

2.3 FIBER ROLL CHECK DAMS

A. As specified in Section 8-01.3(6) of the Standard Specifications.

2.4 PLANTING MATERIALS

A. Seeding, fertilizing and mulching shall meet the requirements of Section 8-01.3(2) of the Standard Specifications.

2.5 SOURCE QUALITY CONTROL

A. Section 014500 - Quality Control: Testing, inspection and analysis requirements.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Verify compacted subgrade is acceptable and ready to support devices and imposed loads.

B. Verify gradients and elevations of base or foundation for other work are correct.

3.2 SEDIMENT FENCES

A. Provide sediment fences, as required and as shown on Drawings, for temporary control of erosion and to stop silt and sediment from reaching surface waters, adjacent properties, or entering catch basins, or damaging the Work.

B. Erect sediment fences and bury bottom edge in accordance with Manufacturer's recommended installation instructions. Provide sufficient length of fence to accommodate runoff without causing flooding and to adequately store any silt, sediment, and debris reaching it.

3.3 GRAVEL CONSTRUCTION ENTRANCE

A. Remove topsoil and loose, unsuitable material below bottom of Aggregate Base layer, then replace with suitable material. Thoroughly compact and finish entire foundation area to firm, even surface.

B. Lay and overlay geotextile fabric over substrate. Overlap edges upstream over downstream and upslope over downslope. Provide a minimum overlap of 3 feet. Offset adjacent roll ends a minimum of 5 feet when lapped. Cover fabric as soon as possible and in no case leave fabric exposed more than 4 weeks.

C. Carefully place Aggregate Base on geotextile fabric to produce an even distribution, with minimum of voids and without tearing geotextile.

3.4 SITE STABILIZATION

A. Incorporate erosion control devices indicated on the Drawings into the Project at the earliest practicable time.

B. Construct, stabilize and activate erosion controls before site disturbance within tributary areas of those controls.

C. Stockpile and waste pile heights shall not exceed 8 feet. Slope stockpile sides at 2: 1 or flatter.

D. Stabilize any disturbed area of affected erosion control devices on which activity has ceased and which will remain exposed for more than 20 days.
   1. During non-germinating periods, apply mulch at recommended rates.
   2. Stabilize disturbed areas which are not at finished grade and which will be disturbed within one year at 50 percent of permanent application rate with no topsoil.
   3. Stabilize disturbed areas which are either at finished grade or will not be disturbed within one year permanent seeding specifications.

E. Stabilize diversion channels, sediment traps, and stockpiles immediately.

3.5 FIELD QUALITY CONTROL

A. Section 014500 - Quality Control: Field inspecting, testing, adjusting, and balancing.

B. Inspect erosion control devices on a weekly basis and after each runoff event. Make necessary repairs to ensure erosion and sediment controls are in good working order

C. Compaction Testing: In accordance with ASTM D698.

D. When tests indicate Work does not meet specified requirements, remove Work, replace and retest.

E. Frequency of Compaction Testing: One for each lift.

3.6 CLEANING

A. When sediment accumulation in sedimentation structures has reached a point one-third depth of sediment structure or device, remove and dispose of sediment.

B. Do not damage structure or device during cleaning operations.

C. Do not permit sediment to erode into construction or site areas or natural waterways.

D. Clean channels when depth of sediment reaches approximately one half channel depth.

3.7 PROTECTION

A. Immediately after placement, protect seeding and mulching from premature drying, excessive hot or cold temperatures, and mechanical injury.

B. Do not permit construction traffic over seeding and mulching for 7 days minimum after finishing.

END OF SECTION

SECTION 321123 – AGGREGATE BASE COURSES

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:
   1. Aggregate base.

B. Related Sections:
   1. Section 312000 - Earth Moving.
   2. Section 321216 - Asphalt Paving.
   3. Section 321313 - Concrete Paving.
   4. Document: *Report of Geotechnical Investigation and Engineering: Proposed Tulalip Utilities Building Development, Tulalip, Washington*, Prepared by Materials Testing & Consulting, dated June 15, 2022. – Geotechnical report; findings of subsurface materials

1.2 REFERENCES

A. American Association of State Highway and Transportation Officials:
   1. AASHTO M288 - Standard Specification for Geotextile Specification for Highway Applications.

B. ASTM International:
   1. ASTM D1556 - Standard Test Method for Density and Unit Weight of Soil in Place by the Sand-Cone Method.
   2. ASTM D2167 - Standard Test Method for Density and Unit Weight of Soil in Place by the Rubber Balloon Method.
   3. ASTM D2922 - Standard Test Method for Density of Soil and Soil-Aggregate in Place by Nuclear Methods (Shallow Depth).
   4. ASTM D2940 - Standard Specification for Graded Aggregate Material for Bases or Subbases for Highways or Airports.
   5. ASTM D3017 - Standard Test Method for Water Content of Soil and Rock in Place by Nuclear Methods (Shallow Depth).

1.3 UNIT PRICE MEASUREMENT AND PAYMENT

A. Crushed Surfacing:
   1. Basis of Measurement: By cubic yard.
   2. Basis of Payment: Includes supplying aggregate materials, placing, and stockpiling.

1.4 SUBMITTALS

A. Product Data: submit product data and gradation.

B. Materials Source: Submit name of aggregate materials suppliers.

C. Manufacturer's Certificate: Certify Products meet or exceed specified requirements.

1.5 QUALITY ASSURANCE

A. Furnish each aggregate material from single source throughout the Work.

PART 2 - PRODUCTS

2.1 AGGREGATE MATERIALS

A. Crushed Surfacing as specified in Section 9-03.9(3) of the Washington State Department of Transportation Standard Specifications.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Verify compacted substrate is dry and ready to support paving and imposed loads.
   1. Proof roll substrate in minimum two perpendicular passes to identify soft spots.

2. Remove soft substrate and replace with compacted fill as specified in Document: *Report of Geotechnical Investigation and Engineering: Proposed Tulalip Utilities Building Development*, Prepared by Materials Testing & Consulting, dated June 15, 2022

B. Verify substrate has been inspected, gradients and elevations are correct.

C. Verify subgrade has been scarified as specified in Section 312000 - Earth Moving.

3.2 PREPARATION

A. Correct irregularities in substrate gradient and elevation by scarifying, reshaping, and re-compacting.

B. Do not place fill on soft, muddy, or frozen surfaces.

3.3 AGGREGATE PLACEMENT

A. Place aggregate equal thickness layers to total compacted thickness indicated on Drawings.
1. Maximum Layer Compacted Thickness: 8 inches.
2. Minimum Layer Compacted Thickness: 4 inches.

B. Roller compact aggregate to 95 percent maximum density.

C. Level and contour surfaces to elevations, profiles, and gradients indicated.

D. Add small quantities of fine aggregate to coarse aggregate when required to assist compaction.

E. Maintain optimum moisture content of fill materials to attain specified compaction density.

F. Use mechanical tamping equipment in areas inaccessible to compaction equipment.

3.4 TOLERANCES

A. Maximum Variation From Flat Surface: ¼ inch measured with 10 foot straight edge.

B. Maximum Variation From Thickness: ¼ inch.

C. Maximum Variation From Elevation: ½ inch.

3.5 FIELD QUALITY CONTROL

A. Compaction testing will be performed in accordance with AASHTO T-180.

B. When tests indicate Work does not meet specified requirements, remove Work, replace and retest.

C. Frequency of Tests: every 100 cubic yards.

END OF SECTION

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:
   1. Asphalt paving as required to restore utility trenches cut in existing pavement, and as otherwise indicated on Drawings.
   2. Perform Asphalt Paving in conformance with Washington State Department of Transportation Standard Specifications Section 5-04, unless otherwise noted herein.

B. Related Sections:
   1. Section 312000 - Earth Moving.
   2. Section 321123 – Aggregate Base Courses.
   3. Document: *Report of Geotechnical Investigation and Engineering: Proposed Tulalip Utilities Building Development, Tulalip, Washington*, Prepared by Materials Testing& Consulting, dated June 15, 2022. – Geotechnical report; findings of subsurface materials

1.2 PRICE AND PAYMENT PROCEDURES

A. Hot Mix Asphalt:
   1. Basis of Measurement: By square foot, to limits as shown on drawings.
   2. Basis of Payment: Includes all work necessary to place asphaltic concrete as shown on drawings.

1.3 SUBMITTALS

A. Section 013300 - Submittal Procedures: Requirements for submittals.

B. Product Data:
   1. Submit product information for asphalt and aggregate materials.
   2. Submit mix design with laboratory test results supporting design.

C. Manufacturer's Certificate: Certify Products meet or exceed specified requirements.

1.4 QUALITY ASSURANCE

A. Obtain materials from same source throughout.

1.5 AMBIENT CONDITIONS

A. Section 015000 - Temporary Facilities and Controls: Ambient conditions control facilities for product storage and installation.

B. Do not place asphalt mixture when ambient air or base surface temperature is less than 45 degrees F, or surface is wet or frozen.

PART 2 - PRODUCTS

2.1 ASPHALT PAVING

A. Performance / Design Criteria:
   1. Asphalt Paving to be Hot Mix Asphalt, MHA Class -1/2 Inch, PG 64-22 per Washington State Department of Transportation Standard Specifications Section 9-02.1 and Section 9-03.8.

2.2 SOURCE QUALITY CONTROL

A. Section 014500 - Quality Control: Testing, inspection and analysis requirements.

B. Submit proposed mix design of each class of mix for review prior to beginning of Work.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Section 017700 - Closeout Procedures: Requirements for installation examination.

B. Verify utilities indicated under paving are installed with excavations and trenches backfilled and compacted.

C. Verify compacted granular subbase is dry and ready to support paving and imposed loads.
   1. Proof roll subbase in minimum two perpendicular passes to identify soft spots.
   2. Remove soft subbase and replace with compacted fill as specified in Section 312323.

D. Verify gradients and elevations of base are correct.

E. Verify manhole frames are installed in correct position and elevation.

3.2 PREPARATION

A. Prepare subbase in accordance with Washington State Department of Transportation Standard Specifications.

3.3 DEMOLITION

A. Saw cut and notch existing paving as indicted on Drawings.

B. Clean existing paving to remove foreign material, excess joint sealant and crack filler from paving surface.

C. Repair surface defects in existing paving to provide uniform surface to receive new paving.

3.4 INSTALLATION

A. Subbase:
   1. Subbase: Compact in accordance with the recommendations of the project geotechnical report.

B. Base:
   1. Aggregate base: Install as specified in Section 321123.

C. Asphaltic Pavement:
   1. Compact to 91% (Rice) density (AASHTO T209)
   2. Place asphalt in one lift.

3.5 TOLERANCES

A. Section 014500 - Quality Control: Tolerances.

B. Flatness: Maximum variation of ¼ inch measured with 10 foot straight edge.

C. Scheduled Compacted Thickness: Within ¼ inch.

D. Variation from Indicated Elevation: Within ½ inch.

3.6 FIELD QUALITY CONTROL

A. Section 014500 - Quality Control: Requirements for inspecting, testing.

B. Take samples and perform tests in accordance with Washington State Department of Transportation Standard Specifications.

C. Asphalt Paving Mix Temperature: Measure temperature at discharge from the hauling equipment into the hopper of the paving machine and behind the paver. The allowable production temperatures may be adjusted based on the asphalt cement supplier's recommendation if approved by Engineer. The maximum mixing temperature of the HMA and the minimum placement temperature shall be as follows:
   1. Maximum at discharge from hauling equipment: 350˚F
   2. Minimum behind paver: 240˚F

D. Asphalt Paving Thickness: ASTM D3549; test one core sample from every 1000 square yards compacted paving.

3.7 PROTECTION

A. Section 017700 - Closeout Procedures: Requirements for protecting finished Work.

B. Immediately after placement, protect paving from mechanical injury until surface temperature is less than 140 degrees F.

END OF SECTION

PART 1 - GENERAL

1.1 SUMMARY

A. Section includes:
   1. Concrete paving.
      a. Concrete curbs.
      b. Concrete Sidewalks.
   2. Construct Concrete Curbs in conformance with Washington State Department of Transportation Standard Specifications Section 8-04, unless otherwise noted herein.
   3. Construct Concrete Sidewalks in conformance with Washington State Department of Transportation Standard Specifications Section 8-14, unless otherwise noted herein.

B. Related Sections:
   1. Section 312000 - Earth Moving.
   2. Section 321123 – Aggregate Base Courses.
   3. Document: *Report of Geotechnical Investigation and Engineering: Proposed Tulalip Utilities Building Development, Tulalip, Washington*, Prepared by Materials Testing& Consulting, dated June 15, 2022. – Geotechnical report; findings of subsurface materials

1.2 PRICE AND PAYMENT PROCEDURES

A. Concrete Curbs:
   1. Basis of Measurement: By linear foot, to limits as shown on drawings.
   2. Basis of Payment: Includes all work necessary to place concrete as shown on drawings.

B. Concrete Sidewalks:
   1. Basis of Measurement: By square foot, to limits as shown on drawings.
   2. Basis of Payment: Includes all work necessary to place concrete as shown on drawings.

1.3 SUBMITTALS

A. Section 013300 - Submittal Procedures: Requirements for submittals.

B. Product Data:
   1. Submit product information for concrete and curing materials.
   2. Submit mix design with laboratory test results supporting design.

C. Manufacturer's Certificate: Certify Products meet or exceed specified requirements.

1.4 QUALITY ASSURANCE

A. Obtain materials from same source throughout.

B. Perform Work in accordance with Washington State Department of Transportation Standard Specifications (Standard Specifications).

1.5 AMBIENT CONDITIONS

A. Section 015000 - Temporary Facilities and Controls: Ambient conditions control facilities for product storage and installation.

PART 2 - PRODUCTS

2.1 CONCRETE CURBS

Materials to conform to Washington State Department of Transportation Standard Specifications Section 8-04.2.

2.2 CONCRETE SIDEWALKS

A. Materials to conform to Washington State Department of Transportation Standard Specifications Section 8-14.2

PART 3 - EXECUTION

3.1 EXAMINATION

A. Section 017700 - Closeout Procedures: Requirements for installation examination.

B. Verify utilities indicated under paving are installed with excavations and trenches backfilled and compacted.

C. Verify compacted granular subbase is dry and ready to support paving and imposed loads.

D. Verify gradients and elevations of base are correct.

3.2 PREPARATION

A. Remove loose material from compacted subbase surface immediately before placing concrete.

3.3 EDGE FORMS AND SCREED CONSTRUCTION

A. Set, brace, and secure edge forms, bulkheads, and intermediate screed guides to required lines, grades, and elevations. Install forms to allow continuous progress of work and so forms can remain in place at least 24 hours after concrete placement.

B. Clean forms after each use and coat with form-release agent to ensure separation from concrete without damage.

3.4 JOINTS

A. General: Form construction, isolation, and contraction joints and tool edges true to line, with faces perpendicular to surface plane of concrete. Construct transverse joints at right angles to centerline unless otherwise indicated.

B. Construction Joints: Set construction joints at side and end terminations of paving and at locations where paving operations are stopped for more than one-half hour unless paving terminates at isolation joints.

C. Isolation Joints: Form isolation joints of preformed joint-filler strips abutting concrete curbs, catch basins, manholes, inlets, structures, other fixed objects, and where indicated.

D. Contraction Joints: Form weakened-plane contraction joints, sectioning concrete into areas as indicated. Construct contraction joints for a depth equal to at least one-fourth of the concrete thickness**,** to match jointing of existing adjacent concrete paving:

E. Edging: After initial floating, tool edges of paving, gutters, curbs, and joints in concrete with an edging tool to a **3/8-inch** radius. Repeat tooling of edges after applying surface finishes. Eliminate edging-tool marks on concrete surfaces.

3.5 CONCRETE PLACEMENT

A. Moisten subbase to provide a uniform dampened condition at time concrete is placed. Do not place concrete around manholes or other structures until they are at required finish elevation and alignment.

B. Comply with ACI 301 requirements for measuring, mixing, transporting, and placing concrete.

C. Deposit and spread concrete in a continuous operation between transverse joints. Do not push or drag concrete into place or use vibrators to move concrete into place.

D. Screed paving surface with a straightedge and strike off.

E. Commence initial floating using bull floats or darbies to impart an open-textured and uniform surface plane before excess moisture or bleedwater appears on the surface. Do not further disturb concrete surfaces before beginning finishing operations or spreading surface treatments.

3.6 FLOAT FINISHING

A. General: Do not add water to concrete surfaces during finishing operations.

B. Float Finish: Begin the second floating operation when bleedwater sheen has disappeared and concrete surface has stiffened sufficiently to permit operations. Float surface with power-driven floats

or by hand floating if area is small or inaccessible to power units. Finish surfaces to true planes. Cut down high spots and fill low spots. Refloat surface immediately to uniform granular texture.

1. Burlap Finish: Drag a seamless strip of damp burlap across float-finished concrete, perpendicular to line of traffic, to provide a uniform, gritty texture.
2. Medium-to-Fine-Textured Broom Finish: Draw a soft-bristle broom across float-finished concrete surface, perpendicular to line of traffic, to provide a uniform, fine-line texture.
3. Medium-to-Coarse-Textured Broom Finish: Provide a coarse finish by striating float-finished concrete surface 1/16 to 1/8 inch deep with a stiff-bristled broom, perpendicular to line of traffic.

C. Slip-Resistive Aggregate Finish: Before final floating, spread slip-resistive aggregate finish on paving surface according to manufacturer's written instructions.

1. Cure concrete with curing compound recommended by slip-resistive aggregate manufacturer. Apply curing compound immediately after final finishing.
2. After curing, lightly work surface with a steel-wire brush or abrasive stone and water to expose nonslip aggregate.

3.7 CONCRETE PROTECTION AND CURING

A. General: Protect freshly placed concrete from premature drying and excessive cold or hot temperatures.

B. Comply with ACI 306.1 for cold-weather protection.

C. Begin curing after finishing concrete but not before free water has disappeared from concrete surface.

Curing Methods: Cure concrete by [moisture curing] [moisture-retaining-cover curing] [curing compound] [or] [a combination of these].

3.8 PAVING TOLERANCES

A. Section 014500 - Quality Control: Tolerances.

B. Comply with tolerances in ACI 117 and as follows:

1. Elevation: 3/4 inch.
2. Thickness: Plus 3/8 inch, minus 1/4 inch.
3. Surface: Gap below 10-feet- long; unleveled straightedge not to exceed 1/2 inch.
4. Joint Spacing: 3 inches.
5. Contraction Joint Depth: Plus 1/4 inch, no minus.
6. Joint Width: Plus 1/8 inch, no minus.

3.9 REPAIR AND PROTECTION

A. Section 017700 - Closeout Procedures: Requirements for protecting finished Work.

B. Remove and replace concrete paving that is broken, damaged, or defective or that does not comply with requirements in this Section. Remove work in complete sections from joint to joint unless otherwise approved by Architect.

C. Protect concrete paving from damage. Exclude traffic from paving for at least 14 days after placement. When construction traffic is permitted, maintain paving as clean as possible by removing surface stains and spillage of materials as they occur.

D. Maintain concrete paving free of stains, discoloration, dirt, and other foreign material. Sweep paving not more than two days before date scheduled for Substantial Completion inspections.

3.10 FIELD QUALITY CONTROL

A. Section 014500 - Quality Control: Requirements for inspecting, testing.

END OF SECTION

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:
   1. Cold-applied joint sealants.
   2. Hot-applied joint sealants.
   3. Joint-sealant backer materials.
   4. Primers.

B. Related Sections:
   1. Section 312000 - Earth Moving.
   2. Section 321123 – Aggregate Base Courses.
   3. Section 321313 – Concrete Paving

1.2 SUBMITTALS

A. Make submittals in accordance with Section 013300.

B. Product data.

C. Samples: Manufacturer's standard color sheets, showing full range of available colors for each type of joint sealant.

1.3 QUALITY ASSURANCE

A. Obtain materials from same source throughout.

B. Perform Work in accordance with Washington State Department of Transportation Standard Specifications (Standard Specifications).

1.4 AMBIENT CONDITIONS

A. Section 015000 - Temporary Facilities and Controls: Ambient conditions control facilities for product storage and installation.

PART 2 - PRODUCTS

2.1 JOINT SEALANTS, GENERAL

A. Compatibility: Provide joint sealants, backer materials, and other related materials that are compatible with one another and with joint substrates under conditions of service and application, as demonstrated by joint-sealant manufacturer, based on testing and field experience.

2.2 COLD-APPLIED JOINT SEALANTS

A. Single-Component, Nonsag, Silicone Joint Sealant: ASTM D5893/D5893M, Type NS.

B. Single-Component, Self-Leveling, Silicone Joint Sealant: ASTM D5893/D5893M, Type SL.

C. Multicomponent, Nonsag, Urethane, Elastomeric Joint Sealant: ASTM C920, Type M, Grade NS, Class 25, for Use T.

D. Single Component, Pourable, Urethane, Elastomeric Joint Sealant: ASTM C920, Type S, Grade P, Class 25, for Use T.

E. Multicomponent, Pourable, Urethane, Elastomeric Joint Sealant: ASTM C920, Type M, Grade P, Class 25, for Use T.

2.3 HOT-APPLIED JOINT SEALANTS

A. Hot-Applied, Single-Component Joint Sealant, Type I: ASTM D6690.

B. Hot-Applied, Single-Component Joint Sealant, Type I or Type II: ASTM D6690.

C. Hot-Applied, Single-Component Joint Sealant, Type I, II, or III: ASTM D6690.

D. Hot-Applied, Single-Component Joint Sealant, Type IV: ASTM D6690.

2.4 JOINT-SEALANT BACKER MATERIALS

A. Joint-Sealant Backer Materials: Nonstaining; compatible with joint substrates, sealants, primers, and other joint fillers; and approved for applications indicated by joint-sealant manufacturer, based on field experience and laboratory testing.

B. Round Backer Rods for Cold- and Hot-Applied Joint Sealants: ASTM D5249, Type 1, of diameter and density required to control sealant depth and prevent bottom-side adhesion of sealant.

C. Round Backer Rods for Cold-Applied Joint Sealants: ASTM D5249, Type 3, of diameter and density required to control joint-sealant depth and prevent bottom-side adhesion of sealant.

D. Backer Strips for Cold- and Hot-Applied Joint Sealants: ASTM D5249; Type 2; of thickness and width required to control joint-sealant depth, prevent bottom-side adhesion of sealant, and fill remainder of joint opening under sealant.

2.5 PRIMERS

A. Primers: Product recommended by joint-sealant manufacturer where required for adhesion of sealant to joint substrates indicated.

PART 3 - EXECUTION

3.1 PREPARATION

A. Surface Cleaning of Joints: Before installing joint sealants, clean out joints immediately to comply with joint-sealant manufacturer's written instructions.

B. Joint Priming: Prime joint substrates where indicated or where recommended in writing by joint-sealant manufacturer.

3.2 INSTALLATION OF JOINT SEALANTS

A. Comply with joint-sealant manufacturer's written installation instructions for products and applications indicated unless more stringent requirements apply.

B. Joint-Sealant Installation Standard: Comply with recommendations in ASTM C1193 for use of joint sealants as applicable to materials, applications, and conditions.

C. Install joint-sealant backers to support joint sealants during application and at position required to produce cross-sectional shapes and depths of installed sealants relative to joint widths that allow optimum sealant movement capability.
   1. Do not leave gaps between ends of joint-sealant backer materials.
   2. Do not stretch, twist, puncture, or tear joint-sealant backer materials.
   3. Remove absorbent joint-sealant backer materials that have become wet before sealant application and replace them with dry materials.

D. Install joint sealants immediately following backer material installation, using proven techniques that comply with the following:
   1. Place joint sealants so they fully contact joint substrates.
   2. Completely fill recesses in each joint configuration.
   3. Produce uniform, cross-sectional shapes and depths relative to joint widths that allow optimum sealant movement capability.

E. Tooling of Nonsag Joint Sealants: Immediately after joint-sealant application and before skinning or curing begins, tool sealants in accordance with the following requirements to form smooth, uniform beads of configuration indicated; to eliminate air pockets; and to ensure contact and adhesion of sealant with sides of joint:
   1. Remove excess joint sealant from surfaces adjacent to joints.
   2. Use tooling agents that are approved in writing by joint-sealant manufacturer and that do not discolor sealants or adjacent surfaces.

F. Provide joint configuration to comply with joint-sealant manufacturer's written instructions unless otherwise indicated.

G. Clean off excess joint sealant as the Work progresses, by methods and with cleaning materials approved in writing by joint-sealant manufacturers.

END OF SECTION

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:
   1. Precast concrete parking bumpers.
   2. Parking bumper anchors.

B. Related Requirements:
   1. Section 321216 - Asphalt Paving.

1.2 REFERENCES

A. ASTM International:
   1. ASTM A615/A615M - Standard Specification for Deformed and Plain Billet-Steel Bars for Concrete Reinforcement.
   2. ASTM C33 - Standard Specification for Concrete Aggregates.
   3. ASTM C150 - Standard Specification for Portland Cement.
   4. ASTM C260 - Standard Specification for Air-Entraining Admixtures for Concrete.

1.3 COORDINATION

A. Section 013113 – Project Coordination: Requirements for coordination.

B. Coordinate the Work with pavement placement and parking striping.

1.4 SUBMITTALS

A. Section 013300 - Submittal Procedures: Requirements for submittals.

B. Product Data: Submit unit configuration, dimensions.

1.5 QUALITY ASSURANCE

A. Perform Work in accordance with Washington State Department of Transportation, Standard Specifications for Road, Bridge, and Municipal Construction.

PART 2 - PRODUCTS

2.1 MANUFACTURERS AND PRODUCTS

A. Manufacturer and Product List:
   1. Oldcastle Precast, Auburn, Washington – Bumper Curb, 6 feet Long, or approved alternate.
   2. Section 016000 - Product Requirements: Requirements for substitutions for other manufacturers and products.

2.2 CONCRETE BUMPERS

A. Concrete Mix: Minimum 5000 psi, 28-day strength.

B. Use rigid molds, constructed to maintain precast units uniform in shape, size and finish. Maintain consistent quality during manufacture.

C. Embed reinforcing steel, and drill or sleeve for two dowels.

D. Cure units to develop concrete quality, and to minimize appearance blemishes including non-uniformity, staining, or surface cracking.

2.3 CONFIGURATION

A. Nominal Size: 7 inches high, 10 inches wide, 6 feet long.

B. Profile: Manufacturer's standard.

2.4 ACCESSORIES

A. Dowels: Cut reinforcing steel bar, 1/2-inch diameter, 18-inch-long, pointed tip.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Install units without damage to shape or finish. Replace or repair damaged units.

B. Install units in alignment with adjacent work.

C. Fasten units in place with 2 dowels for each bumper.

END OF SECTION

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:
   1. Parking Space Lines
   2. Striping for No Parking Areas
   3. Pavement Markings for Directional Arrows and Handicap Parking Space Legends

B. Related Requirements:
   1. Section 321216 - Asphalt Paving.

1.2 PRICE AND PAYMENT PROCEDURES

A. Pavement Markings:
   1. Basis of Measurement: no separate measurement needed.
   2. Basis of Payment: considered incidental to asphalt paving.

1.3 REFERENCE STANDARDS

A. American Association of State Highway and Transportation Officials:
   1. AASHTO M247 - Standard Specification for Glass Beads Used in Traffic Paint.

B. ASTM International:
   1. ASTM D34 - Standard Guide for Chemical Analysis of White Pigments.
   2. ASTM D126 - Standard Test Methods for Analysis of Yellow, Orange, and Green Pigments Containing Lead Chromate and Chromium Oxide Green.
   3. ASTM D562 - Standard Test Method for Consistency of Paints Measuring Krebs Unit (KU) Viscosity Using a Stormer-Type Viscometer.
   4. ASTM D711 - Standard Test Method for No-Pick-Up Time of Traffic Paint.
   5. ASTM D713 - Standard Practice for Conducting Road Service Tests on Fluid Traffic Marking Materials.
   6. ASTM D969 - Standard Test Method for Laboratory Determination of Degree of Bleeding of Traffic Paint.
   7. ASTM D1301 - Standard Test Methods for Chemical Analysis of White Lead Pigments.
   8. ASTM D1394 - Standard Test Methods for Chemical Analysis of White Titanium Pigments.
   9. ASTM D1475 - Standard test Method for Density of Liquid Coatings, Inks, and Related Products.
   10. ASTM D1640 - Standard Test Methods for Drying, Curing, or Film Formation of Organic Coatings at Room Temperature.
   11. ASTM D2202 - Standard Test Method for Slump of Sealants.
   12. ASTM D2371 - Standard Test Method for Pigment Content of Solvent-Reducible Paints.
   13. ASTM D2621 - Standard Test Method for Infrared Identification of Vehicle Solids From Solvent-Reducible Paints.
   14. ASTM D2743 - Standard Practices for Uniformity of Traffic Paint Vehicle Solids by Spectroscopy and Gas Chromatography.

1.4 SUBMITTALS

A. Section 013300 - Submittal Procedures: Requirements for submittals.

B. Product Data: Submit for each type of marking.

C. Test and Evaluation Reports: Submit source and acceptance test results in accordance with AASHTO M247.

D. Manufacturer's Instructions: Submit instructions for application temperatures, eradication requirements, application rate, line thickness, type of glass beads, bead embedment and bead application rate, and any other data on proper installation.

1.5 QUALITY ASSURANCE

A. Perform Work in accordance with Section 8-22 of the Washington State Department of Transportation Standard Specifications.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Section 016000 - Product Requirements: Requirements for transporting, handling, storing, and protecting products.

B. Invert containers several days prior to use when paint has been stored more than 2 months. Minimize exposure to air when transferring paint. Seal drums and tanks when not in use.

C. Glass Beads. Store glass beads in cool, dry place. Protect from contamination by foreign substances.

1.7 AMBIENT CONDITIONS

A. Do not apply materials when surface and ambient temperatures are outside temperature ranges required by paint product manufacturer.

B. 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.

C. Do not apply when temperatures are expected to fall below 50 degrees F for 24 hours after application.

D. Volatile Organic Content (VOC). Do not exceed State or Environmental Protection Agency maximum VOC on traffic paint.

1.8 WARRANTY

A. Section 017700 - Closeout Procedures: Requirements for warranties.

B. Furnish three year manufacturer’s warranty for traffic paints.

PART 2 - PRODUCTS

2.1 PAINTED PAVEMENT MARKINGS

A. Furnish materials in accordance with Washington State Department of Transportation, Standard Specifications for Road, Bridge, and Municipal Construction.

B. Performance / Design Criteria:
   1. Paint Adhesion: Adhere to road surface forming smooth continuous film one minute after application.
   2. Paint Drying: Tack free by touch so as not to require coning or other traffic control devices to prevent transfer by vehicle tires within two minutes after application.

C. Paint: Ready mixed, conventional, and fast dry waterborne traffic paints, lead-free, non-toxic, ASSHTO Test Deck, minimum retro reflectance of 100 mcds, durability rating of 6 or more after in place for 9 months.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Section 017700 - Closeout Procedures: Requirements for installation examination.

B. Do not apply paint to concrete surfaces until concrete has cured for 28 days.

3.2 PREPARATION

A. Section 017700 - Closeout Procedures: Requirements for installation preparation.

B. Maintenance and Protection of Traffic:
   1. Provide short term traffic control in accordance with Section 015000 - Temporary Facilities and Controls.
   2. Prevent interference with marking operations and to prevent traffic on newly applied markings before markings dry.
   3. Maintain travel lanes between 7: 00 AM to 9: 00 AM, and between 4: 00 PM and 6: 00 PM.
   4. Maintain access to existing businesses and other properties requiring access.

C. Surface Preparation.
   1. Clean and dry paved surface prior to painting.
   2. Blow or sweep surface free of dirt, debris, oil, grease or gasoline.
   3. Spot location of final pavement markings as specified and as indicated on Drawings by applying pavement spots 25 feet on center.
   4. Notify Engineer after placing pavement spots and minimum 3 days prior to applying traffic lines.

3.3 DEMOLITION

A. Remove existing markings in an acceptable manner. Do not remove existing pavement markings by painting over with blank paint. Remove by methods that will cause least damage to pavement structure or pavement surface. Satisfactorily repair any pavement or surface damage caused by removal methods.

B. Clean and repair existing remaining lines and legends.

3.4 APPLICATION

A. Use preheaters with mixers having 360 degree rotation to preheat the thermoplastic material.

B. Apply the thermoplastic in a single uniform layer by spray or extrusion methods.

C. Completely coat and fill voids in the pavement surface with the thermoplastic.

3.5 TOLERANCES

A. Section 014500 - Quality Control: Tolerances.

B. Maximum Variation from Wet Film Thickness: 1 mil.

C. Maximum Variation from Wet Paint Line Width: Plus or minus 1/8 inch.

D. Maintain cycle length for skip lines at tolerance of plus or minus 6 inches per 40 feet and line length of plus or minus 3 inches per 10 feet.

E. Maximum Variation from Specified Application Temperature: Plus or minus 5 degrees F

3.6 FIELD QUALITY CONTROL

A. Section 014500 - Quality Control: Requirements for inspecting, testing.

B. Inspect for incorrect location, insufficient thickness, line width, coverage, retention, uncured or discolored material, and insufficient bonding.

C. Repair lines and markings, which after application and curing do not meet following criteria:
   1. Incorrect Location: Remove and replace incorrectly placed patterns.
   2. Insufficient Thickness, Line Width, Paint Coverage, Glass Bead Coverage or Retention: Prepare defective material by acceptably grinding or blast cleaning to remove substantial amount of beads and to roughen marking surface. Remove loose particles and debris. Apply new markings on cleaned surface in accordance with this Section.
   3. Uncured or Discolored Material, Insufficient Bonding: Remove defective markings in accordance with this Section and clean pavement surface one foot beyond affected area. Apply new markings on cleaned surface in accordance with this Section.

D. Replace defective pavement markings as specified throughout 3 year warranted period. Replace markings damaged by anti-skid materials, studded tires, tire chains, chemical deicers, snow plowing or other loss of marking material regardless of cause. When markings are damaged by pavement failure or by Owner’s painting, crack sealing, or pavement repair operations, Contractor is released from warranty requirements for damaged work.

E. Prepare list of defective areas and areas requiring additional inspection and evaluation to decide where material may need replaced. Provide traffic control as necessary if markings require more detailed evaluation.

F. Replace failed or defective markings in entire section of defective markings within 30 days after notification when any of the following exists during warranty period:

1. Average retroreflectivity within any 528 foot section is less than 1225 mcd/m2/1x for white pavement markings and 100 mcd/m2/1x for yellow pavement markings.
2. Marking is discolored or exhibits pigment loss, and is determined to be unacceptable by three member team based on visual comparison with beaded color plates.
3. More than 15 percent of area of continuous line, or more than 15 percent of combined area of skip lines, within any 528 foot section of roadway is missing.

G. Replace pavement marking material under warranty using original or better type material. Continue warranty to end of original 3 year period even when replacement materials have been installed as specified.

H. When eradication of existing paint lines is necessary, eradicate by shot blast or water blast method. Do not gouge or groove pavement more than 1/16 inch during removal. Limit area of removal to area of marking plus 1 inch on all sides. Prevent damage to transverse and longitudinal joint sealers, and repair any damage according to requirements in Section 321313 or Section 321216.

I. Maintain daily log showing work completed, results of above inspections or tests, pavement and air temperatures, relative humidity, presence of any moisture on pavement, and any material or equipment problems. Make legible entries in log in ink, sign and submit by end of each work day. Enter environmental data into log prior to starting work each day and at two additional times during day.

3.7 PROTECTION

A. Section 017700 - Closeout Procedures: Requirements for protecting finished Work.

B. Protect painted pavement markings from vehicular and pedestrian traffic until paint is dry and track free. Follow manufacturer's recommendations or use minimum of 30 minutes. Consider barrier cones as satisfactory protection for materials requiring more than 2 minutes dry time.

3.8 MAINTENANCE

A. Section 017700 - Closeout Procedures: Requirements for maintenance service.

END OF SECTION

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:
   1. Cast-in-place detectable warning tiles.
   2. Surface-applied detectable warning tiles.
   3. Detectable warning mats.

B. Related Sections:
   1. Section 321313 - Concrete Paving.

1.2 QUALITY ASSURANCE

A. Perform Work in accordance with Section 9-19 Detectable Warning Surface of the Washington State Department of Transportation Standard Specifications.

B. Due to various types of materials available, the Manufacturer shall certify, through independent laboratory testing, that the type of material used for detectable warnings will adhere to prepared surface.

PART 2 - PRODUCTS

2.1 TACTILE WARNING SURFACING, GENERAL

A. Accessibility Requirements: Comply with applicable provisions in the U.S. Architectural & Transportation Barriers Compliance Board's ADA-ABA Accessibility Guidelines for Buildings and Facilities for tactile warning surfaces.
   1. For tactile warning surfaces composed of multiple units, provide units that when installed provide consistent side-to-side and end-to-end dome spacing that complies with requirements.

2.2 DETECTABLE WARNING TILES

A. Cast-in-Place Detectable Warning Tiles: Accessible truncated-dome detectable warning tiles configured for setting flush in new concrete walkway surfaces, with slip-resistant surface treatment on domes and field of tile.
   1. Material: Units shall be composed of steel, iron, plastics, polymeric materials, resins, pigments. The units shall be uniform in color and texture, be free of cracks or other defects, and have clean-cut and well-defined edges.
   2. Color: Yellow and shall match SAE MS Standard 595, color number 33538.
   3. Shapes and Sizes:
      a. Rectangular panel, 12 by 12 inches (305 by 305 mm).
      b. Radius panel, nominal 24 inches (610 mm) deep by 6-foot (1829-mm) outside radius.
   4. Dome Spacing and Configuration: 1.60”-2.40” spacing, in square pattern.
   5. Mounting:
      a. Permanently embedded detectable warning tile wet-set into freshly poured concrete.

2.3 ACCESSORIES

A. Fasteners and Anchors: Manufacturer's standard as required for secure anchorage of tactile warning surfaces, noncorrosive and compatible with each material joined, and complying with the following:
   1. Furnish Type 304 stainless-steel fasteners for exterior use.
   2. Fastener Heads: For nonstructural connections, use flathead or oval countersunk screws and bolts with tamper-resistant heads, colored to match tile.

B. Adhesive: As recommended by manufacturer for adhering tactile warning surfacing unit to pavement.

C. Sealant: As recommended by manufacturer for sealing perimeter of tactile warning surfacing unit.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Prior to starting work, carefully inspect installed work of other trades and verify that such work is complete to the point where work of this Section may properly commence. Notify the Architect in writing of conditions detrimental to the proper and timely completion of the work.

B. Do not begin installation until all unsatisfactory conditions are resolved. Beginning work constitutes acceptance of site conditions and responsibility for defective installation caused by prior observable conditions.

3.2 INSTALLATION OF TACTILE WARNING SURFACING

A. General: Prepare substrate and install tactile warning surfacing according to manufacturer's written instructions unless otherwise indicated.

B. Place tactile warning surfacing units in dimensions and orientation indicated. Comply with location requirements of AASHTO MP 12.

C. Cast-in-Place Detectable Warning Tiles: Set each detectable warning tile accurately and firmly in place and completely seat tile back and embedments in wet concrete by tamping or vibrating. Set surface of tile flush with surrounding concrete and adjacent tiles. Remove concrete from tile surfaces and clean using methods recommended in writing by manufacturer.

D. Removable Cast-in-Place Detectable Warning Tiles: Set each detectable warning tile accurately and firmly in place with embedding anchors and fasteners attached, and firmly seat tile back in wet concrete by tamping or vibrating. Set surface of tile flush with surrounding concrete and adjacent tiles. Remove concrete from tile surfaces and clean tiles using methods recommended in writing by manufacturer.

E. Surface-Applied Detectable Warning Tiles: Prepare existing paving surface by grinding and cleaning as recommended by manufacturer. Apply adhesive to back of tiles in amounts and pattern recommended by manufacturer, and set tiles in place. Install anchor devices through face of tiles and into pavement using anchors located as recommended by manufacturer. Apply sealant in continuous bead around perimeter of installation.

F. Surface-Applied Detectable Warning Mats: Prepare existing paving surface by grinding and cleaning as recommended by manufacturer. Apply adhesive to back of mat and set mat in place. Firmly seat mat in adhesive bed. Install anchor devices through face of mat and into pavement using anchors located as recommended by manufacturer. Set heads of anchors flush with mat surface. Apply sealant in continuous bead around perimeter of mat.

G. Remove and replace tactile warning surfacing that is broken or damaged or does not comply with requirements in this Section. Remove in complete sections from joint to joint unless otherwise approved by Architect. Replace using tactile warning surfacing installation methods acceptable to Architect.

H. Protect tactile warning surfacing from damage and maintain free of stains, discoloration, dirt, and other foreign material.

END OF SECTION

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:
   1. Modular precast concrete manhole and structures with tongue-and-groove joints, covers, anchorage, and accessories.
   2. Bedding and cover materials.

B. Related Sections:
   1. Section 030013 - Concrete: Concrete type for manhole and structures base pad construction.
   2. Section 310513 - Soils for Earthwork: Soil for backfill in trenches.
   3. Section 310516 - Aggregates for Earthwork: Aggregate for backfill in trenches.
   4. Section 312000 - Earth Moving: Excavating for manholes and structures.
   5. Section 312323 - Fill: Backfilling after manhole and structure installation.

1.2 UNIT PRICE - MEASUREMENT AND PAYMENT

A. Sedimentation Manhole:
   1. Basis of Measurement: By each unit.
   2. Basis of Payment: Includes excavating, concrete base pad, concrete manhole sections, cover frame and cover, to indicated depth, forming and sealing pipe inlets and outlets.

B. Connection to Existing Sewer Manhole:
   1. Basis of Measurement: By each unit.
   2. Basis of Payment: Includes all work necessary to connect to existing sewer structure.

1.3 REFERENCES

A. American Concrete Institute:
   1. ACI 318 - Building Code Requirements for Structural Concrete.
   2. ACI 530/530.1 - Building Code Requirements for Masonry Structures and Specifications for Masonry Structures.

B. ASTM International:
   1. ASTM A48/A48M - Standard Specification for Gray Iron Castings.
   2. ASTM A123/A123M - Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products.
   3. ASTM C55 - Standard Specification for Concrete Brick.
   4. ASTM C62 - Standard Specification for Building Brick (Solid Masonry Units Made From Clay or Shale).
   5. ASTM C478 - Standard Specification for Precast Reinforced Concrete Manhole Sections.
   6. ASTM C497 - Standard Test Methods for Concrete Pipe, Manhole Sections, or Tile.
   7. ASTM C913 - Standard Specification for Precast Concrete Water and Wastewater Structures.
   8. ASTM C923 - Standard Specification for Resilient Connectors between Reinforced Concrete Manhole Structures, Pipes and Laterals.
   9. ASTM D3753 - Standard Specification for Glass-Fiber-Reinforced Polyester Manholes and Wetwells.

1.4 DESIGN REQUIREMENTS

A. Equivalent strength: Based on structural design of reinforced concrete as outlined in ACI 318.

B. Design of Lifting Devices for Precast Components: In accordance with ASTM C913.

C. Design of Joints for Precast Components: In accordance with ASTM C913; maximum leakage of 0.025 gallons per hour per foot of joint at 3 feet of head.

1.5 SUBMITTALS

A. Division 1 – Quality Requirements - Submittal Procedures: Requirements for submittals.

B. Product Data: Submit cover and frame construction, features, configuration, dimensions.

1.6 QUALITY ASSURANCE

A. Perform Work in accordance with Washington State Department of Transportation Standard Specifications.

1.7 DELIVERY, STORAGE AND HANDLING

A. Comply with precast concrete manufacturer's instructions for unloading, storing and moving precast manholes.

B. Store precast concrete manholes to prevent damage to Owner's property or other public or private property. Repair property damaged from materials storage.

C. Mark each precast structure by indentation or waterproof paint showing date of manufacture, manufacturer, and identifying symbols and numbers shown on Drawings to indicate its intended use.

1.8 ENVIRONMENTAL REQUIREMENTS

A. Cold Weather Requirements: ACI 530.

PART 2 - PRODUCTS

2.1 MANHOLES

A. Manufacturers:
   1. OldCastle.
   2. Wilbert Pre-Cast Co.
   3. Substitutions: as approved by Engineer.

B. Manhole Sections: Reinforced precast concrete in accordance with ASTM C478 with gaskets in accordance with ASTM C923.

2.2 FRAMES AND COVERS

A. Manufacturers:
   1. Neenah Foundry Co.
   2. Olympic Foundry
   3. Substitutions: as approved by Engineer.

B. Product Description: Product Description: ASTM A48/A48M, Class 30B Cast iron construction, machined flat bearing surface, removable lockable, open checkerboard grille cover design; HS20 live load rating; cover molded with identifying utility name.

2.3 COMPONENTS

A. Manhole Steps: fiberglass, spaced 16" on center.

B. Base Pad: Cast-in-place concrete of type specified in Section 030013, leveled top surface.

2.4 CONFIGURATION

A. Clear Inside Dimensions: 48 inch diameter.

B. Design Depth: As indicated on Drawings.

C. Clear Cover Opening: 24 inches diameter.

D. Pipe and Conduit Entry: Furnish openings as indicated on Drawings.

E. Steps: 16 inches on center vertically, set into manhole wall.

2.5 BEDDING AND COVER MATERIALS

A. Bedding: Granular Fill as specified in Section 310516.

B. Cover: Select Fill/Imported Fill as specified in Section 310513.

C. Soil Backfill from Above Pipe to Finish Grade: Select Fill/Imported Fill as specified in Section 310513.

2.6 FINISHING - STEEL

A. Galvanizing: ASTM A123/A123M; hot dip galvanize after fabrication.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Verify existing conditions before starting work.

B. Verify items provided by other sections of Work are properly sized and located.

C. Verify built-in items are in proper location, and ready for roughing into Work.

D. Verify correct size of manhole excavation.

3.2 PREPARATION

A. Coordinate placement of inlet and outlet pipe or duct sleeves required by other sections.

B. Do not install structures where site conditions induce loads exceeding structural capacity of structures.

C. Inspect precast concrete structures immediately prior to placement in excavation to verify structures are internally clean and free from damage. Remove and replace damaged units.

3.3 INSTALLATION

A. Excavation and Backfill:
   1. Excavate for manholes and structures in accordance with Section 312316 in location and to depth shown. Provide clearance around sidewalls of structure for construction operations.
   2. When groundwater is encountered, prevent accumulation of water in excavations. Place manholes and structures in dry trench.
   3. Where possibility exists of watertight structure becoming buoyant in flooded excavation, anchor structure to avoid flotation.

B. Place base pad, trowel top surface level.

C. Install manholes and structures supported at proper grade and alignment as shown on Drawings.

D. Backfill excavations for manholes and structures in accordance with Section 312323.

E. Cut and fit for pipe.

F. Grout base of shaft sections to achieve slope to exit piping. Trowel smooth. Contour as indicated on Drawings.

G. Set cover frames and covers level without tipping, to correct elevations.

H. Coordinate with other sections of Work to provide correct size, shape, and location.

3.4 PRECAST CONCRETE MANHOLE AND STRUCTURE INSTALLATION

A. Lift precast components at lifting points designated by manufacturer.

B. When lowering manholes and structures into excavations and joining pipe to units, take precautions to ensure interior of pipeline and structure remains clean.

C. Set precast structures bearing firmly and fully on Aggregate Base bedding, compacted in accordance with provisions of Section 312323 or on other support system shown on Drawings.

D. Assemble multi-section structures by lowering each section into excavation. Lower, set level, and firmly position base section before placing additional sections.

E. Remove foreign materials from joint surfaces and verify sealing materials are placed properly. Maintain alignment between sections by using guide devices affixed to lower section.

F. Joint sealing materials may be installed on site or at manufacturer’s plant.

G. Verify manholes and structures installed satisfy required alignment and grade.

H. Remove knockouts or cut structure to receive piping without creating openings larger than required to receive pipe. Fill annular space with mortar.

I. Cut pipe to finish flush with interior of structure.

J. Shape inverts through manhole and structures as shown on Drawings.

3.5 FRAME AND COVER INSTALLATION

A. Set frames using mortar and masonry. Install radially laid concrete brick with 1/4 inch thick vertical joints at inside perimeter. Lay concrete brick in full bed of mortar and completely fill joints. Where more than one course of concrete brick is required, stagger vertical joints.

B. Set frame and cover 2 inches above finished grade for manholes and structures with covers located within unpaved areas to allow area to be graded away from cover beginning 1 inch below top surface of frame.

3.6 FIELD QUALITY CONTROL

A. Vacuum test concrete manhole and structure sections in accordance with Washington State Department of Transportation Standard Specifications:

1. Each manhole shall be vacuum tested in the presence of the city inspector for acceptance prior to final paving and after all backfilling and compaction is completed. Industry standards recommend that the manholes be pre-tested immediately after assembly and prior to backfilling. Such pre-testing is for the contractor' s convenience and need not be in the presence of the inspector.

2. All testing equipment and labor shall be provided by the contractor.

3. All pipes entering the manhole shall be plugged, taking care to securely brace the plugs from being drawn into the manhole.

4. The test head shall be placed at the inside of the top of the cone section and the seal inflated in accordance with the manufacturer's recommendation.

5. A vacuum of 10 inches of mercury shall be drawn and the vacuum pump shut off. With the valves closed, the time shall be measured for the vacuum to drop to nine inches. The manhole shall pass if the time is greater than 60 seconds for 48" diameter manholes, 75 seconds for 60" diameter manholes, and 90 seconds for 72" diameter manholes.

6. If the manhole fails the initial test, necessary repairs shall be made with a non-shrink grout. Retesting shall proceed until a satisfactory test is obtained. No grout shall be placed in the horizontal joints before testing.

END OF SECTION

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:
   1. Precast concrete valve vaults.
   2. Precast concrete meter boxes.

B. Related Sections:
   1. Section 310516 - Aggregates for Earthwork.
   2. Section 312000 - Earth Moving.
   3. Section 331116 - Site Water Utility Distribution Piping.

1.2 UNIT PRICE - MEASUREMENT AND PAYMENT

A. Precast Concrete Valve Vaults:
   1. Basis of Measurement: Each.
   2. Basis of Payment: Includes excavation, valve vault, accessories, tests, and backfill.

B. Precast Concrete Meter Boxes:
   1. Basis of Measurement: Each.
   2. Basis of Payment: Includes excavation, meter box, accessories, test and backfill.

1.3 REFERENCES

A. ASTM International:
   1. ASTM A48/A48M - Standard Specification for Gray Iron Castings.
   2. ASTM A185/A185M - Standard Specification for Steel Welded Wire Fabric, Plain, for Concrete Reinforcement.
   3. ASTM A536 - Standard Specification for Ductile Iron Castings.
   4. ASTM A615/A615M - Standard Specification for Deformed and Plain Billet-Steel Bars for Concrete Reinforcement.
   5. ASTM C33 - Standard Specification for Concrete Aggregates.
   6. ASTM C150 - Standard Specification for Portland Cement.
   7. ASTM C260 - Standard Specification for Air-Entraining Admixtures for Concrete.
   8. ASTM B221 - Standard Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes.
   9. ASTM C478 - Standard Specification for Precast Reinforced Concrete Manhole Sections.
   10. ASTM C497 - Standard Test Methods for Concrete Pipe, Manhole Sections, or Tile.
   11. ASTM C890 - Standard Practice for Minimum Structural Design Loading for Monolithic or Sectional Precast Concrete Water and Wastewater Structures.
   12. ASTM C913 - Standard Specification for Precast Concrete Water and Wastewater Structures.
   13. ASTM C990 - Standard Specification for Joints for Concrete Pipe, Manholes, and Precast Box Sections Using Preformed Flexible Joints Sealants.
   14. ASTM D698 - Standard Test Method for Laboratory Compaction Characteristics of Soil Using Standard Effort (12,400 ft-lbf/ft3 (600 kN-m/m3)).
   15. ASTM D1557 - Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Modified Effort (56,000 ft-lbf/ft3 (2,700 kN-m/m3)).
   16. ASTM D2922 - Standard Test Method for Density of Soil and Soil-Aggregate in Place by Nuclear Methods (Shallow Depth).
   17. ASTM D3017 - Standard Test Method for Water Content of Soil and Rock in Place by Nuclear Methods (Shallow Depth).
   18. ASTM D4104 - Standard Test Method (Analytical Procedure) for Determining Transmissivity of Nonleaky Confined Aquifers by Overdamped Well Response to Instantaneous Change in Head (Slug Test)

1.4 DESIGN REQUIREMENTS

A. Design Criteria:

1. Watertight precast reinforced air-entrained concrete structures designed to ASTM C890 A16 live loading and installation conditions, and manufactured to conform to ASTM C913.
2. Minimum 28-day Compressive Strength: 5,000 psi.
3. Honeycombed or retempered concrete is not permitted.

1.5 SUBMITTALS

A. Division 1 – General Requirements - Submittal Procedures: Requirements for submittals.

B. Shop Drawing: Indicate plan, location and inverts of connecting piping.

C. Product Data: Submit data on valve vaults, meter boxes.

D. Manufacturer's Certificates: Submit Statement of Compliance, supporting data, from materials suppliers attesting that precast concrete valve vaults and meter boxes provided meet or exceed ASTM Standards and specification requirements.

E. Manufacturer's Installation Instructions: Submit special procedures for precast concrete valve vaults and meter boxes installation.

1.6 CLOSEOUT SUBMITTALS

A. Project Record Documents: Accurately record actual locations and inverts of buried pipe, components and connections.

1.7 QUALITY ASSURANCE

A. Perform Work in accordance with Washington State Department of Transportation Standard Specifications.

1.8 DELIVERY, STORAGE AND HANDLING

A. Transport and handle precast concrete units with equipment designed to protect units from damage.

B. Do not place concrete units in position to cause overstress, warp or twist.

1.9 ENVIRONMENTAL REQUIREMENTS

A. Conduct operations not to interfere with, interrupt, damage, destroy, or endanger integrity of surface or subsurface structures or utilities, and landscape in immediate or adjacent areas.

PART 2 - PRODUCTS

2.1 PRECAST CONCRETE VALVES AND METER BOXES

A. Manufacturers:
   1. Cook
   2. Christy
   3. Substitutions: As approved by Engineer.

B. Materials:
   1. Portland Cement: ASTM C150, Type II.
   2. Coarse Aggregates: ASTM C33; Graded 1 inch to No. 4 Sieve.
   3. Sand: ASTM C33; 2.35 fineness modulus.
   4. Water: Potable; clean and free of injurious amounts of acids, alkalis, salts, organic materials, and substances incompatible with concrete or steel.
   5. Air-Entraining Admixtures: ASTM C260.
   6. Reinforcing Steel:
      a. Deformed Bars: ASTM A615/A615M, Grade 40.
      b. Welded Wire Fabric: ASTM A185/A185M.
   7. Joint Sealant:
      a. ASTM C990.

C. Mixes:

1. Design concrete mix to produce required concrete strength, air-entrainment, watertight properties, and loading requirements.

D. Valve Vault and Meter Box Frames and Covers:
   1. Cast Iron Castings: ASTM A48/A48M, Class 30 or better; free of bubbles, sand and air holes, and other imperfections.
   2. Ductile Iron Castings: ASTM A536.
   3. Contact surfaces machined and matched.

2.2 BEDDING MATERIALS

A. Aggregate Bedding Material: Granular Fill as specified in Section 310516.

2.3 FABRICATION AND MANUFACTURE

A. Fabricate precast reinforced concrete structures in accordance with ASTM C913, to dimensions indicated on Drawings, and to specified design criteria.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Verify piping connection, size, location and invert are as indicated on Drawings.

3.2 PREPARATION

A. Ream pipe ends and remove burrs.

B. Remove scale and dirt from components before assembly.

C. Establish invert elevations for each component in system.

D. Hand trim excavation to suit valve vaults and meter boxes. Remove stones, roots or other obstructions.

3.3 TANK AND TANK BEDDING

A. Excavate in accordance with Section 312000 for work of this Section. Hand trim excavation for accurate placement of vaults and meter boxes to elevations indicated.

B. Place bedding material level in one continuous layer not exceeding 6 inches compacted depth, compact to 95 percent.

C. Backfill around sides of vaults and meter boxes, tamped in place and compacted to 95 percent.

D. Maintain optimum moisture content of bedding material to attain required compaction density.

E. Install vaults and meter boxes and related components on bedding.

3.4 CONNECTING PIPING

A. Connect piping.

3.5 FIELD QUALITY CONTROL

A. Request inspection by Engineer prior to placing aggregate cover over piping.

B. Compaction Testing: In accordance with ASTM D698.

C. When tests indicate Work does not meet specified requirements, remove Work, replace and retest.

D. Frequency of Tests: one per location.

END OF SECTION

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:
   1. Pipe and fittings for site water line including domestic water line.
   2. Valves.
   3. Water meters.
   4. Double Check Valve Backflow Prevention Assembly.
   5. Backflow Prevention Assembly Vault.
   6. Meter Vault.
   7. Underground pipe markers.
   8. Precast concrete vault.
   9. Bedding and cover materials.

B. Related Sections:
   1. Section 030013 - Concrete: Concrete for thrust restraints.
   2. Section 310513 - Soils for Earthwork: Soils for backfill in trenches.
   3. Section 310516 - Aggregates for Earthwork: Aggregate for backfill in trenches.
   4. Section 312000 - Earth Moving.
   5. Section 312317 - Trenching: Execution requirements for trenching required by this section.
   6. Section 331300 - Disinfecting of Water Utility Distribution: Disinfection of site service utility water piping.

1.2 UNIT PRICE - MEASUREMENT AND PAYMENT

A. Pipe and Fittings:
   1. Basis of Measurement: By the linear foot.
   2. Basis of Payment: Includes trenching, hand trimming excavation, pipe and fittings, bedding, concrete thrust restraints, connection to building service piping, and to municipal utility water source, testing, and disinfection.

B. Valves:
   1. Basis of Measurement: By the unit.
   2. Basis of Payment: Includes valve, fittings and accessories.

C. Meters:
   1. Basis of Measurement: By the unit.
   2. Basis of Payment: Includes meter, fittings and accessories, and service connection fees.

D. Double Check Valve Backflow Prevention Assembly:
   1. Basis of Measurement: By the unit.
   2. Basis of Payment: Includes backflow preventer, isolation valves, fittings and accessories.

E. Fire Department Connection:
   1. Basis of Measurement: By the unit.
   2. Basis of Payment: Includes pipes, fittings and accessories.

F. Meter Vault:
   1. Basis of Measurement: By the unit.
   2. Basis of Payment: Includes vault, lid, access doors, ladder, if required, fittings and appurtenances, excavation and backfill.

G. Backflow Prevention Vault:
   1. Basis of Measurement: By the unit.
   2. Basis of Payment: Includes vault, lid, access doors, ladder, if required, fittings and appurtenances, excavation and backfill.

1.3 REFERENCES

A. American Association of State Highway and Transportation Officials:

1. AASHTO T180 - Standard Specification for Moisture-Density Relations of Soils Using a 4.54-kg (10-lb) Rammer and a 457-mm (18-in.) Drop.

B. American Society of Mechanical Engineers:
   1. ASME B16.18 - Cast Copper Alloy Solder Joint Pressure Fittings.
   2. ASME B16.22 - Wrought Copper and Copper Alloy Solder Joint Pressure Fittings.

C. American Society of Sanitary Engineering:
   1. ASSE 1012 - Backflow Preventer with Intermediate Atmospheric Vent.
   2. ASSE 1013 - Reduced Pressure Principle Backflow Preventers.

D. ASTM International:
   1. ASTM A48/A48M - Standard Specification for Gray Iron Castings.
   2. ASTM B88 - Standard Specification for Seamless Copper Water Tube.
   3. ASTM C858 - Standard Specification for Underground Precast Concrete Utility Structures.
   4. ASTM D698 - Standard Test Method for Laboratory Compaction Characteristics of Soil Using Standard Effort (12,400 ft-lbf/ft3 (600 kN-m/m3)).
   5. ASTM D1557 - Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Modified Effort (56,000 ft-lbf/ft3 (2,700 kN-m/m3)).
   6. ASTM D1785 - Standard Specification for Poly (Vinyl Chloride) (PVC) Plastic Pipe, Schedules 40, 80, and 120.
   7. ASTM D2241 - Standard Specification for Polyethylene (PE) Plastic Pipe (SIDR-PR) Based on Controlled Inside Diameter.
   8. ASTM D2466 - Standard Specification for Poly (Vinyl Chloride) (PVC) Plastic Pipe Fittings, Schedule 40.
   9. ASTM D2855 - Standard Practice for Making Solvent-Cemented Joints with Poly (Vinyl Chloride) (PVC) Pipe and Fittings.
   10. ASTM D2922 - Standard Test Method for Density of Soil and Soil-Aggregate in Place by Nuclear Methods (Shallow Depth).
   11. ASTM D3017 - Standard Test Method for Water Content of Soil and Rock in Place by Nuclear Methods (Shallow Depth).
   12. ASTM D3035 - Standard Specification for Polyethylene (PE) Plastic Pipe (DR-PR) Based on Controlled Outside Diameter.
   13. ASTM D3139 - Standard Specification for Joints for Plastic Pressure Pipes Using Flexible Elastomeric Seals.

E. American Welding Society:
   1. AWS A5.8 - Specification for Filler Metals for Brazing and Braze Welding.

F. American Water Works Association:
   1. AWWA C500 - Metal-Seated Gate Valves for Water Supply Service.
   2. AWWA C502 - Dry-Barrel Fire Hydrants.
   3. AWWA C504 - Rubber-Sealed Butterfly Valves.
   4. AWWA C508 - Swing-Check Valves for Waterworks Service, 2 in. (50 mm) Through 24 in. (600 mm) NPS.
   5. AWWA C509 - Resilient-Seated Gate Valves for Water-Supply Service.
   6. AWWA C605 – Underground Installation of PVC and PVCO Pressure Pipe and Fittings
   7. AWWA C606 - Grooved and Shouldered Joints.
   8. AWWA C700 - Cold-Water Meters - Displacement Type, Bronze Main Case.
   9. AWWA C701 - Cold-Water Meters - Turbine Type, for Customer Service.
   10. AWWA C702 - Cold-Water Meters - Compound Type.
   11. AWWA C706 - Direct-Reading, Remote-Registration Systems for Cold-Water Meters.
   12. AWWA C900 - Polyvinyl Chloride (PVC) Pressure Pipe, 4 in. through 12 in., for Water Distribution.
   13. AWWA C905 - Underground Installation of PVC and PVCO Pressure Pipe and Fittings
   14. AWWA M6 - Water Meters - Selection, Installation, Testing, and Maintenance.

G. Underwriters Laboratories Inc.:
   1. UL 246 - Hydrants for Fire - Protection Service.

1.4 SUBMITTALS

A. Section 013300 - Submittal Procedures: Requirements for submittals.

B. Product Data: Submit data on pipe materials, pipe fittings, valves and accessories.

C. Manufacturer's Certificate: Certify Products meet or exceed specified requirements.

1.5 CLOSEOUT SUBMITTALS

A. Section 017700 - Closeout Procedures: Requirements for submittals.

B. Project Record Documents: Record actual locations of piping mains, valves, connections, thrust restraints, and invert elevations.

C. Identify and describe unexpected variations to subsoil conditions or discovery of uncharted utilities.

1.6 QUALITY ASSURANCE

A. Valves: Manufacturer's name and pressure rating marked on valve body.

1.7 DELIVERY, STORAGE, AND HANDLING

A. Section 016000 - Product Requirements: Requirements for transporting, handling, storing, and protecting products.

B. Deliver and store valves in shipping containers with labeling in place.

PART 2 - PRODUCTS

2.1 WATER PIPING

A. PVC Pipe: AWWA C900 150:
   1. Fittings: Ductile Iron, mechanical joint (meeting AWWA C110 or AWWA C153), cement mortar lined, and petroleum asphaltic coating 1 mil thick.
   2. Joints: ASTM D3139 compression gasket ring.

2.2 GATE VALVES

A. Manufacturers:
   1. Mueller
   2. M & H
   3. Substitutions: As approved by the Engineer.

B. 3 inches to 12 inches: AWWA C509, Iron body, bronze trim, non-rising stem with square nut, single wedge, resilient seat, mechanical joint ends, control rod, extension box and valve key.

2.3 WATER METERS

A. Manufacturers:
   1. Per Tulalip Utility Department requirements.
   2. Substitutions: As approved by Engineer.

B. AWWA C701 Class II Standards, direct magnetic drive, lead-free bronze alloy, external strainer.

C. Meter:
   1. Typical Operating Range: 5 to 550 gpm (3-inch), 20 to 2500 gpm (6-inch).
   2. Maximum Continuous Flow: 450 gpm (3-inch), 2000 gpm (6-inch).
   3. Max Operating Pressure: 150 psi.
   4. Pipe Size: 3 inch and 6 inch.

2.4 DOUBLE CHECK VALVE BACKFLOW PREVENTION ASSEMBLY

A. Manufacturers:
   1. Wilkins Model 350ADA
      a. Lead free
      b. Non-rising stem flanged end gate valves.

2. Substitutions: Must be from the USC Approved Backflow Prevention Assemblies List (August 2017) and as approved by the Engineer.

B. 8 inches: AWWA C510-92, epoxy coated cast iron body, open stem, bronze disc, resilient replaceable seat, FDA epoxy coated strainer, corrosion resistant internal parts and stainless steel springs.

2.5 BACKFLOW PREVENTION ASSEMBLY VAULT

A. Oldcastle 687-WA
1. Substitutions: As approved by the Engineer.

B. Access Doors
1. ¼" aluminum channel, diamond plate access hatch. 316 stainless steel hardware.
2. BILCO JD-3AL or approved equal.

2.6 METER VAULT

A. Oldcastle 676-WA
1. Substitutions: As approved by the Engineer.

B. Access Doors
1. ¼" aluminum channel, diamond plate access hatch. 316 stainless steel hardware.
2. BILCO J-5AL or approved equal.

2.7 UNDERGROUND PIPE MARKERS

A. Wire:
Blue coated #10 awg solid copper, soft drawn wire shall be installed (taped @ 10' minimum intervals) with all mains, services, air relief, blowoff, fire services, and hydrants.

B. Tape:
A detectable metallic 2" wide warning tape, blue color coded, imprinted with "caution-buried water line below" shall be installed 12" above all water mains installed in unpaved areas. Tape shall be lineguard detectable marking tape, type ill or approved equal.

2.8 BEDDING AND COVER MATERIALS

A. Bedding: Pipe Zone Backfill as specified in Section 310516.

B. Cover: Pipe Zone Backfill, as specified in Section 310516.

2.9 ACCESSORIES

A. Concrete for Thrust Restraints: Concrete type specified in Section 030013.

B. Manhole and Cover: Refer to Section 330513.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Section 310000 - Site Clearing: Verification of existing conditions before starting work.

B. Verify building service connection and municipal utility water main size, location, and invert are as indicated on Drawings.

3.2 PREPARATION

A. Cut pipe ends square, ream pipe and tube ends to full pipe diameter, remove burrs.

B. Remove scale and dirt on inside and outside before assembly.

C. Prepare pipe connections to equipment with flanges or unions.

3.3 BEDDING

A. Excavate pipe trench in accordance with Section 312317 for Work of this Section.

B. Form and place concrete for pipe thrust restraints at change of pipe direction. Place concrete to permit full access to pipe and pipe accessories. Provide thrust restraints bearing on subsoil per Drawings.

C. Place bedding material at trench bottom, level fill materials in one continuous layer not exceeding 8 inches compacted depth; compact to 95 percent.

D. Backfill around sides and to top of pipe with cover fill, tamp in place and compact to 95 percent.

E. Maintain optimum moisture content of fill material to attain required compaction density.

F. Place fill material in accordance with Section 312000.

3.4 INSTALLATION - PIPE

A. Maintain separation of water main from sewer piping in accordance with Washington State Department of Transportation Standard Specifications Section 7-09.

B. Install pipe to indicated elevation to within tolerance of 5/8 inches.

C. Install PVC piping and fittings to AWWA C605.

D. Install grooved and shouldered pipe joints to AWWA C606.

E. Route pipe in straight line.

F. Install pipe to allow for expansion and contraction without stressing pipe or joints.

G. Install access fittings to permit disinfection of water system performed under Section 331300.

H. Encase ductile iron fittings in 8 mil polyethylene sheet held together with adhesive tape per AWWA C105.

I. Form and place concrete for thrust restraints at each elbow or change of direction of pipe main.

J. Establish elevations of buried piping with not less than 3ft of cover (4 ft of cover maximum).

K. Install plastic ribbon tape continuous buried 6 inches below finish grade, above pipe line; coordinate with Section 312317.

L. Backfill trench in accordance with Section 312000.

3.5 INSTALLATION - VALVES

A. Set valves on compacted soil.

B. Center and plumb valve box over valve. Set box cover flush with finished grade.

C. Install Pressure Sustaining and Pressure Reducing Valves in accordance with manufacturer’s recommendations.

D. Install Work in accordance with Washington State Department of Transportation Standard Specifications.

3.6 INSTALLATION - METERS

A. Install positive displacement meters in accordance with AWWA M6, with isolating valves on inlet and outlet. Provide full line size bypass with globe valve for liquid service meters.

3.7 SERVICE CONNECTIONS

A. Install water service in accordance with double check valve backflow preventer and water meter with by-pass valves and sand strainer.

B. Install water meter in concrete vault and backflow preventer in above ground enclosure as specified in this section, located on site.

C. Install water service to 5 feet of building. Connect to building water service. Refer to Drawings

3.8 DISINFECTION OF DOMESTIC WATER PIPING SYSTEM

A. Flush and disinfect system in accordance with Section 331300.

3.9 FIELD QUALITY CONTROL

A. Section 014500 - Quality Control: Field inspecting, testing, adjusting, and balancing.

B. Pressure test system in accordance with AWWA C605 and the following:
   1. Test Pressure: Not less than 150 psi or 30 psi in excess of maximum static pressure at any location (elevation point) along the line to be tested.
   2. Conduct hydrostatic test for at least two-hour duration.
   3. Fill section to be tested with water slowly, expel air from piping at high points. Install corporation cocks at high points. Close air vents and corporation cocks after air is expelled. Raise pressure to specified test pressure.
   4. Observe joints, fittings and valves under test. Remove and renew cracked pipe, joints, fittings, and valves showing visible leakage. Retest.
   5. Correct visible deficiencies and continue testing at same test pressure for additional 2 hours to determine leakage rate. Maintain pressure within plus or minus 5.0 psig of test pressure. Leakage is defined as quantity of water supplied to piping necessary to maintain test pressure during period of test.
   6. Compute maximum allowable leakage by the following formula:

$L = (SD\sqrt{P})/C$
L = testing allowance, in gallons per hour
S = length of pipe tested, in feet
D = nominal diameter of pipe, in inches
P = average test pressure during hydrostatic test, in psig
C = 148,000
When pipe under test contains sections of various diameters, calculate allowable leakage from sum of computed leakage for each size.

   7. When test of pipe indicates leakage greater than allowed, locate source of leakage, make corrections and retest until leakage is within allowable limits. Correct visible leaks regardless of quantity of leakage.

C. Compaction Testing for Bedding: In accordance with ASTM D698.

D. When tests indicate Work does not meet specified requirements, remove Work, replace and retest.

E. Frequency of Compaction Tests: Every 200 feet.

END OF SECTION

PART 1 - GENERAL

1.1 SUMMARY

A. Section includes disinfection of potable water distribution and transmission system; and testing and reporting results.

B. Related Sections:
   1. Section 331116 - Site Water Utility Distribution: Piping Product and Execution requirements for installation, testing, of site domestic water distribution piping.

1.2 UNIT PRICE - MEASUREMENT AND PAYMENT

A. Disinfection:
   1. Basis of Measurement: Not measured for payment but considered incidental to the water piping.
   2. Basis of Payment: Includes preparing, disinfecting, testing, and reporting.

1.3 REFERENCES

A. American Water Works Association:
   1. AWWA B300 - Hypochlorites.
   2. AWWA B301 - Liquid Chlorine.
   3. AWWA B302 - Ammonium Sulfate.
   4. AWWA B303 - Sodium Chlorite.
   5. AWWA C651 - Disinfecting Water Mains.
   6. AWWA C900 - Polyvinyl Chloride (PVC) Pressure Pipe, 4 in. through 12 in., for Water Distribution.
   7. AWWA C905 - Underground Installation of PVC and PVCO Pressure Pipe and Fittings

1.4 SUBMITTALS

A. Section 013300 - Submittal Procedures: Requirements for submittals.

B. Product Data: Submit procedures, proposed chemicals, and treatment levels for review.

C. Test Reports: Indicate results comparative to specified requirements.

D. Certificate: Certify cleanliness of water distribution system meets or exceeds specified requirements.

1.5 CLOSEOUT SUBMITTALS

A. Section 017700 - Closeout Procedures: Requirements for submittals.

B. Disinfection Report:
   1. Type and form of disinfectant used.
   2. Date and time of disinfectant injection start and time of completion.
   3. Test locations.
   4. Name of person collecting samples.
   5. Initial and 24 hour disinfectant residuals in treated water in ppm for each outlet tested.
   6. Date and time of flushing start and completion.
   7. Disinfectant residual after flushing in ppm for each outlet tested.

C. Bacteriological Report:
   1. Date issued, project name, and testing laboratory name, address, and telephone number.
   2. Time and date of water sample collection.
   3. Name of person collecting samples.
   4. Test locations.
   5. Initial and 24 hour disinfectant residuals in ppm for each outlet tested.
   6. Coliform bacteria test results for each outlet tested.
   7. Certify water conforms, or fails to conform, to bacterial standards of the Tulalip Utility Department or the Washington State Department of Transportation Standard Specifications for Construction.

D. Water Quality Certificate: Certify water conforms to quality standards of the Washington State Department of Transportation Standard Specifications for Construction, suitable for human consumption.

1.6 QUALITY ASSURANCE

A. Perform Work in conformance with Washington State Department of Transportation Standard Specifications Section 7-09, unless otherwise noted herein

B. Perform Work in accordance with AWWA C651

1.7 QUALIFICATIONS

A. Water Treatment Firm: Company specializing in disinfecting potable water systems specified in this section with minimum three years experience.

B. Testing Firm: Company specializing in testing potable water systems, certified by State of Washington.

C. Submit bacteriologist's signature and authority associated with testing.

PART 2 - PRODUCTS

2.1 DISINFECTION CHEMICALS

A. Chemicals: AWWA B300, Hypochlorite, AWWA B301, Liquid Chlorine, and AWWA B303, Sodium Chlorite.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Section 311000 - Site Clearing: Verification of existing conditions before starting work.

B. Verify piping system has been cleaned, inspected, and pressure tested.

C. Perform scheduling and disinfecting activity with start-up, water pressure testing, adjusting and balancing, demonstration procedures, including coordination with related systems.

3.2 INSTALLATION

A. Provide and attach required equipment to perform the Work of this section.

B. Perform Work in accordance with Washington State Department of Transportation Standard Specifications Section 7-09.

3.3 FIELD QUALITY CONTROL

A. Section 014500 - Quality Control: Field inspecting, testing, adjusting, and balancing

B. Disinfect pipeline installation in accordance with AWWA C651. Use of liquid chlorine is not permitted.

C. After final flushing and before pipeline is connected to existing system, or placed in service, employ an approved independent testing laboratory to sample, test and certify water quality suitable for human consumption.

END OF SECTION

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:
   1. Sanitary sewage pipe.
   2. Underground pipe markers.
   3. Bedding and cover materials.

B. Related Sections:
   1. Section 030013 - Concrete: Concrete type for manhole base pad construction
   2. Section 310513 - Soils for Earthwork: Soils for backfill in trenches.
   3. Section 310516 - Aggregates for Earthwork: Aggregate for backfill in trenches.
   4. Section 312000 – Earth Moving: Product and execution requirements for excavation and backfill required by this section.
   5. Section 312317 - Trenching: Execution requirements for trenching required by this section.

1.2 UNIT PRICE - MEASUREMENT AND PAYMENT

A. Pipe and Fittings:
   1. Basis of Measurement: By the linear foot.
   2. Basis of Payment: Includes trenching, hand trimming excavation, pipe and fittings, bedding, backfill, connection to building service piping, and to municipal utility sanitary sewer source, and testing.

1.3 REFERENCES

A. American Association of State Highway and Transportation Officials:
   1. AASHTO T180 - Standard Specification for Moisture-Density Relations of Soils Using a 4.54-kg (10-lb) Rammer and a 457-mm (18-in.) Drop.

B. ASTM International:
   1. ASTM D698 - Standard Test Method for Laboratory Compaction Characteristics of Soil Using Standard Effort (12,400 ft-lbf/ft3 (600 kN-m/m3)).
   2. ASTM D1557 - Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Modified Effort (56,000 ft-lbf/ft3 (2,700 kN-m/m3)).
   3. ASTM D1785 - Standard Specification for Poly (Vinyl Chloride) (PVC) Plastic Pipe, Schedules 40, 80, and 120.
   4. ASTM D2321 - Standard Practice for Underground Installation of Thermoplastic Pipe for Sewers and Other Gravity-Flow Applications.
   5. ASTM D2466 - Standard Specification for Poly (Vinyl Chloride) (PVC) Plastic Pipe Fittings, Schedule 40.
   6. ASTM D2729 - Standard Specification for Poly (Vinyl Chloride) (PVC) Sewer Pipe and Fittings.
   7. ASTM D2922 - Standard Test Method for Density of Soil and Soil-Aggregate in Place by Nuclear Methods (Shallow Depth).
   8. ASTM D3017 - Standard Test Method for Water Content of Soil and Rock in Place by Nuclear Methods (Shallow Depth).
   9. ASTM D3034 - Standard Specification for Type PSM Poly (Vinyl Chloride) (PVC) Sewer Pipe and Fittings.
   10. ASTM F477 - Standard Specification for Elastomeric Seals (Gaskets) for Joining Plastic Pipe.

1.4 DEFINITIONS

A. Bedding: Fill placed under, beside and directly over pipe, prior to subsequent backfill operations.

1.5 SUBMITTALS

A. Division 1 – General Requirements: Submittal Procedures: Requirements for submittals.

B. Product Data: Submit data indicating pipe material used and pipe accessories.

C. Manufacturer's Installation Instructions: Indicate special procedures required to install Products specified.

D. Manufacturer's Certificate: Certify products meet or exceed specified requirements.

1.6 CLOSEOUT SUBMITTALS

A. Project Record Documents: Record location of pipe runs, connections, manholes, cleanouts, and invert elevations.

1.7 QUALITY ASSURANCE

A. Perform Work in accordance with Washington State Department of Transportation Standard Specifications.

1.8 FIELD MEASUREMENTS

A. Verify field measurements and elevations are as indicated.

1.9 COORDINATION

A. Section 013113 - Project Coordination: Coordination and project conditions.

PART 2 - PRODUCTS

2.1 SANITARY SEWAGE PIPE

A. Plastic Pipe: ASTM D3034, SDR 26, Poly (Vinyl Chloride) (PVC) material; bell and spigot style rubber ring sealed gasket joint.
   1. Fittings: PVC.
   2. Joints: ASTM F477, elastomeric gaskets.

2.2 UNDERGROUND PIPE MARKERS

A. Plastic Ribbon Tape: Bright colored, continuously printed, minimum 6 inches wide by 4 mil thick, manufactured for direct burial service.

B. Trace Wire: Magnetic detectable conductor, brightly colored plastic covering, imprinted with "Sewer " in large letters.

2.3 BEDDING AND COVER MATERIALS

A. Bedding: Pipe Bedding as specified in Section 310516.

B. Cover: Trench Zone Backfill as specified in Section 312317.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Verify existing conditions before starting work.

B. Verify trench cut is ready to receive work and excavations, dimensions, and elevations are as indicated on Drawings.

3.2 PREPARATION

A. Correct over excavation with fine coarse aggregate.

B. Remove large stones or other hard matter which could damage pipe or impede consistent backfilling or compaction.

3.3 BEDDING

A. Excavate pipe trench in accordance with Section 312317.

B. Place bedding material at trench bottom, level materials in continuous layer not exceeding 6 inches.

C. Maintain optimum moisture content of bedding material to attain required compaction density.

3.4 INSTALLATION - PIPE

A. Install pipe, fittings, and accessories in accordance with ASTM D2321. Seal joints watertight.

B. Lay pipe to slope gradients noted on drawings; with maximum variation from indicated slope of 1/8 inch in 10 feet.

C. Install bedding at sides and over top of pipe to minimum compacted thickness of 12 inches.

D. Refer to Section 310516 for backfilling and compacting requirements. Do not displace or damage pipe when compacting.

E. Connect to municipal sewer system as indicated on drawings.

F. Install trace wire continuous over top of pipe above pipe line; coordinate with Section 312317.

G. Install site sanitary sewage system piping to existing sanitary sewage piping as shown on drawings.

3.5 FIELD QUALITY CONTROL

A. Perform test on site sanitary sewage system in accordance with Washington State Department of Transportation Standard Specifications Section 7-17.

B. Request inspection prior to and immediately after placing bedding.

C. Compaction Testing: In accordance with ASTM D698.

D. When tests indicate Work does not meet specified requirements, remove work, replace and retest.

E. Frequency of Compaction Tests: every 200 feet.

3.6 PROTECTION OF FINISHED WORK

A. Protect pipe and aggregate cover from damage or displacement until backfilling operation is in progress.

END OF SECTION

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:
   1. Force mains.
   2. Bedding and cover materials.

B. Related Sections:
   1. Section 030013 - Concrete.
   2. Section 310513 - Soils for Earthwork.
   3. Section 310516 - Aggregates for Earthwork.
   4. Section 312317 - Trenching.
   5. Section 333100 - Sanitary Utility Sewerage Piping.

1.2 UNIT PRICE - MEASUREMENT AND PAYMENT

A. Pipe and Fittings:
   1. Basis of Measurement: By linear foot.
   2. Basis of Payment: Includes excavation, backfill, bedding, thrust restraints, pipe, and fittings and testing.

1.3 REFERENCES

A. American Association of State Highway and Transportation Officials:
   1. AASHTO T180 - Standard Specification for Moisture-Density Relations of Soils Using a 4.54-kg (10-lb) Rammer and a 457-mm (18-in.) Drop.

B. ASTM International:
   1. ASTM D698 - Standard Test Method for Laboratory Compaction Characteristics of Soil Using Standard Effort (12,400 ft-lbf/ft3 (600 kN-m/m3)).
   2. ASTM D1557 - Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Modified Effort (56,000 ft-lbf/ft3 (2,700 kN-m/m3)).
   3. ASTM D1785 - Standard Specification for Poly (Vinyl Chloride) (PVC) Plastic Pipe, Schedules 40, 80, and 120.
   4. ASTM D2466 - Standard Specification for Poly (Vinyl Chloride) (PVC) Plastic Pipe Fittings, Schedule 40.
   5. ASTM D2467 - Standard Specification for Poly (Vinyl Chloride) (PVC) Plastic Pipe Fittings, Schedule 80.
   6. ASTM D2922 - Standard Test Method for Density of Soil and Soil-Aggregate in Place by Nuclear Methods (Shallow Depth).
   7. ASTM D3017 - Standard Test Method for Water Content of Soil and Rock in Place by Nuclear Methods (Shallow Depth).

C. American Water Works Association:
   1. AWWA C104 - American National Standard for Cement-Mortar Lining for Ductile-Iron Pipe and Fittings for Water.
   2. AWWA C110 - American National Standard for Ductile-Iron and Grey-Iron Fittings, 3 in. through 48 in. (75 mm through 1200 mm), for Water and Other Liquids.
   3. AWWA C111 - American National Standard for Rubber-Gasket Joints for Ductile-Iron Pressure Pipe and Fittings.
   4. AWWA C151 - American National Standard for Ductile-Iron Pipe, Centrifugally Cast, for Water.
   5. AWWA C900 - Polyvinyl Chloride (PVC) Pressure Pipe and Fabricated Fittings, 4 In. Through 60 In.

1.4 SUBMITTALS

A. Section 013300 - Submittal Procedures: Requirements for submittals.

B. Product Data: Submit data indicating pipe material used, pipe accessories, restrained joint details and materials.

C. Manufacturer's Certificate: Certify products meet or exceed specified requirements.

1.5 CLOSEOUT SUBMITTALS

A. Section 017700 - Closeout Procedures: Requirements for submittals.

B. Project Record Documents: Record location of pipe runs, connections, and invert elevations.

1.6 QUALITY ASSURANCE

A. Design ductile iron pipe restrained joints in accordance with DIPRA Section 1X Standards.

B. Perform Work in accordance with Washington State Standard Specifications for Construction.

1.7 FIELD MEASUREMENTS

A. Verify field measurements and elevations are as indicated.

1.8 DELIVERY, STORAGE, AND HANDLING

A. Section 016000 - Product Requirements: Requirements for transporting, handling, storing, and protecting products.

B. Do not place materials on private property without written permission of property owner.

C. During loading, transporting and unloading, exercise care to prevent damage to materials.

D. Do not drop pipe or fittings.

E. Avoid shock or damage to pipe.

F. Take measures to prevent damage to exterior surface or internal lining of pipe.

G. Do not stack pipe higher than recommended by pipe manufacturer.

H. Store gaskets for mechanical and push-on joints in cool, dry location out of direct sunlight and not in contact with petroleum products.

1.9 COORDINATION

A. Section 013113 – Project Coordination: Coordination and project conditions.

B. Coordinate the Work with connection to existing sewer utility service and trenching.

PART 2 - PRODUCTS

2.1 FORCE MAIN

A. POLYVINYL CHLORIDE (PVC) PIPE
   1. PVC Pressure Sewer Pipe and Fittings - 4" Nominal Pipe Size and Larger:
      a. AWWA C900, with the same outside diameter as ductile iron pipe. PVC pipe for sanitary sewer force main shall be a minimum of SDR 18. Solvent welded pipe shall not be allowed.

B. DUCTILE IRON PIPE
   1. Ductile Iron Pipe: AWWA C150 minimum pressure class; nominal diameter of 6 inches; bell and spigot ends.
   2. Fittings: Ductile iron.
   3. Joints: AWWA C111, rubber gasket joint devices.

2.2 UNDERGROUND PIPE MARKERS

A. Trace Wire: Magnetic detectable conductor, [clear] [brightly colored] plastic covering, imprinted with "Sewage Force Main" in large letters.

2.3 BEDDING AND COVER MATERIALS

A. Bedding: Fill as specified in Section 310516.

B. Cover: Fill as specified in Section 310516.

2.4 CONCRETE

A. Concrete in accordance with Section 030013.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Pothole as required to verify size and material of existing force main before ordering new force main materials. New force main to match size and material of existing force main.

B. Verify trench cut is ready to receive work and excavations, dimensions, and elevations are as indicated on Drawings.

3.2 PREPARATION

A. Coordinate shutdown of, and connection to, existing force main with Tulalip Utility Department in order to minimize down time and disruption to wastewater treatment plant operations.

B. Correct over excavation with fine aggregate.

C. Remove large stones or other hard matter capable of damaging pipe or impeding consistent backfilling or compaction.

3.3 BEDDING

A. Excavate pipe trench in accordance with Section 312317.

B. Place bedding material at trench bottom, level materials in continuous layer not exceeding 6 inches.

C. Maintain optimum moisture content of bedding material to attain required compaction density.

3.4 INSTALLATION - PIPE

A. Install pipe, fittings, and accessories in accordance with Drawings.

B. Route piping in straight line.

C. Install bedding at sides and over top of pipe to minimum compacted thickness of 12 inches.

D. Refer to Section 312317 for backfilling and compacting requirements. Do not displace or damage pipe when compacting.

E. Connect to municipal sewer system.

F. Install detectable underground utility marking tape continuous over top of pipe above pipe line; coordinate with Section 312317.

3.5 INSTALLATION - THRUST RESTRAINT

A. Provide pressure pipeline with restrained joints or concrete thrust blocking at bends, tees, and changes in direction; construct concrete thrust blocking in accordance with Drawings.

3.6 FIELD QUALITY CONTROL

A. Section 014500 - Quality Control: Field inspecting, testing, adjusting, and balancing.

B. Perform test on site sanitary sewage system in accordance with Washington State Department of Transportation Standard Specifications Section 7-17.

C. Compaction Testing: In accordance with ASTM D698.

D. When tests indicate Work does not meet specified requirements, remove work, replace and retest.

E. Frequency of Compaction Tests: every 200 feet.

3.7 PROTECTION OF FINISHED WORK

A. Section 017700 - Closeout Procedures: Requirements for protecting finished Work.

B. Protect pipe and aggregate cover from damage or displacement until backfilling operation is in progress.

END OF SECTION

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:
   1. Storm drainage piping.
   2. Catch Basins.
   3. Accessories.
   4. Underground pipe markers.
   5. Bedding and cover materials.

B. Related Sections:
   1. Section 030013 - Concrete: Concrete type for catch basin, cleanout base pad construction
   2. Section 310513 - Soils for Earthwork: Soils for backfill in trenches.
   3. Section 310516 - Aggregates for Earthwork: Aggregate for backfill in trenches.
   4. Section 312000 - Earth Moving: Product and execution requirements for excavation and backfill required by this section.
   5. Section 312317 - Trenching: Execution requirements for trenching required by this section.
   6. Section 330513 - Manholes and Structures.

1.2 UNIT PRICE - BASIS OF MEASUREMENT

A. Pipe and Fittings:
   1. Basis of Measurement: By the linear foot.
   2. Basis of Payment: Includes excavating, bedding, pipe and fittings, granular cover, connecting to building service piping.

B. Catch Basin:
   1. Basis of Measurement: By each unit.
   2. Basis of Payment: Includes excavating, bedding, foundation pad, unit installation with accessories, connecting to sewer piping.

1.3 REFERENCES

A. American Association of State Highway and Transportation Officials:
   1. AASHTO T180 - Standard Specification for Moisture-Density Relations of Soils Using a 4.54-kg (10-lb) Rammer and a 457-mm (18-in.) Drop.
   2. AASHTO M-294 – Standard Specification for Corrugated Polyethylene Pipe

B. ASTM International:
   1. ASTM D698 - Standard Test Method for Laboratory Compaction Characteristics of Soil Using Standard Effort (12,400 ft-lbf/ft3 (600 kN-m/m3)).
   2. ASTM D1557 - Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Modified Effort (56,000 ft-lbf/ft3 (2,700 kN-m/m3)).
   3. ASTM D2235 - Standard Specification for Solvent Cement for Acrylonitrile-Butadiene-Styrene (ABS) Plastic Pipe and Fittings.
   4. ASTM D2321 - Standard Practice for Underground Installation of Thermoplastic Pipe for Sewers and Other Gravity-Flow Applications.
   5. ASTM D2564 - Standard Specification for Solvent Cements for Poly (Vinyl Chloride) (PVC) Plastic Piping Systems.
   6. ASTM D2729 - Standard Specification for Poly (Vinyl Chloride) (PVC) Sewer Pipe and Fittings.
   7. ASTM D2751 - Standard Specification for Acrylonitrile-Butadiene-Styrene (ABS) Sewer Pipe and Fittings.
   8. ASTM D2855 - Standard Practice for Making Solvent-Cemented Joints with Poly (Vinyl Chloride) (PVC) Pipe and Fittings.
   9. ASTM D2922 - Standard Test Method for Density of Soil and Soil-Aggregate in Place by Nuclear Methods (Shallow Depth).
   10. ASTM D3017 - Standard Test Method for Water Content of Soil and Rock in Place by Nuclear Methods (Shallow Depth).

11. ASTM D3034 - Standard Specification for Type PSM Poly (Vinyl Chloride) (PVC) Sewer Pipe and Fittings.
12. ASTM F477 - Standard Specification for Elastomeric Seals (Gaskets) for Joining Plastic Pipe.

1.4 SUBMITTALS

A. Section 013300 - Submittal Procedures: Requirements for submittals.

B. Product Data: Submit data indicating pipe and pipe accessories.

C. Manufacturer's Installation Instructions: Submit special procedures required to install Products specified.

1.5 CLOSEOUT SUBMITTALS

A. Section 017700 - Closeout Procedures: Requirements for submittals.

B. Project Record Documents:
1. Accurately record actual locations of pipe runs, connections, catch basins, cleanouts, detention pipe and invert elevations.
2. Identify and describe unexpected variations to subsoil conditions or discovery of uncharted utilities.

1.6 QUALITY ASSURANCE

A. Perform Work in accordance with Caltrans Standard Specifications.

B. Comply with Washington State Department of Transportation Standard Specifications Section 7-04, for all storm sewer facilities, unless otherwise noted herein.

1.7 COORDINATION

A. Section 013113 – Project Coordination: Coordination and project conditions.

B. Coordinate the Work with termination of storm sewer connection outside building, trenching, connection to foundation drainage system.

PART 2 - PRODUCTS

2.1 STORM DRAINAGE PIPING

A. Plastic Pipe: ASTM D3034, SDR 35, Poly (Vinyl Chloride) (PVC) material; bell and spigot style rubber ring sealed gasket joint.
1. Fittings: PVC.
2. Joints: ASTM F477, elastomeric gaskets.

B. Plastic Pipe: AASHTO M-294, High Density Polyethylene (HDPE) material; integrally formed smooth interior, bell and spigot style rubber ring sealed gasket joint.
1. Fittings: HDPE
2. Joints: ASTM F477, elastomeric gaskets.

C. Perforated Underdrain: ABS Schedule 40, cast iron, or PVC Schedule 40; inside nominal diameter of 4-inch), bell and spigot style rubber ring sealed gasket joint.

2.2 CATCH BASIN

A. Catch Basin Lid and Frame:
1. Type 1 as identified by the Washington State Department of Transportation Standard Specifications B-5.20-03.

2.3 ACCESSORIES

A. Grout: Specified in Section 030013.

2.4 UNDERGROUND PIPE MARKERS

A. Plastic Ribbon Tape: Bright colored, continuously printed, minimum 6 inches wide by 4 mil thick, manufactured for direct burial service.

2.5 BEDDING AND COVER MATERIALS

A. Bedding: Pipe Zone Backfill as specified in Section 310516.

B. Cover: Pipe Zone Backfill as specified in Section 310516.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Section 311000 - Site Clearing: Verification of existing conditions before starting work.

B. Verify excavation base is ready to receive work and excavations, dimensions, and elevations are as indicated on drawings.

3.2 PREPARATION

A. Hand trim excavations to required elevations. Correct over excavation with fine aggregate.

B. Remove large stones or other hard matter which could damage piping or impede consistent backfilling or compaction.

3.3 BEDDING

A. Excavate pipe trench in accordance with Section 312317 for work of this Section. Hand trim excavation for accurate placement of pipe to elevations indicated.

B. Place bedding material at trench bottom, level materials in continuous layer not exceeding 8 inches compacted depth.

C. Maintain optimum moisture content of bedding material to attain required compaction density.

3.4 INSTALLATION - PIPE

A. Install pipe, fittings, and accessories in accordance with ASTM D2321. Seal joints watertight.

B. Place pipe on minimum 4 inch deep bed of Pipe Zone Backfill.

C. Lay pipe to slope gradients noted on drawings with maximum variation from indicated slope of 1/8 inch in 10 feet.

D. Install aggregate at sides and over top of pipe. Install top cover to minimum compacted thickness of 12 inches, compact to 95 percent.

E. Refer to Section 310516 for backfilling and compacting requirements. Do not displace or damage pipe when compacting.

F. Refer to Section 330513 for manhole requirements.

G. Install trace wire continuous buried 6 inches below finish grade, above pipe line; coordinate with Section 312317.

H. Install site storm drainage system piping to 5 feet of building. Connect to building storm drainage system.

3.5 INSTALLATION - CATCH BASINS

A. Form bottom of excavation clean and smooth to correct elevation.

B. Form and place Cast-In-Place Concrete base pad, with provision for storm sewer pipe end sections.

C. Level top surface of base pad; sleeve concrete shaft sections to receive storm sewer pipe sections.

D. Establish elevations and pipe inverts for inlets and outlets as indicated on Drawings.

E. Mount lid and frame level in grout, secured to top cone section to elevation indicated.

3.6 FIELD QUALITY CONTROL

A. Section 014500 - Quality Control: Field inspecting, testing, adjusting, and balancing.

B. Request inspection prior to placing aggregate cover over pipe.

C. Compaction Testing: In accordance with ASTM D698.

D. When tests indicate work does not meet specified requirements, remove work, replace and retest.

E. Frequency of Compaction Tests: Every 200 feet.

F. Infiltration Test: Test for leakage of detention pipes in accordance with ASTM C969.

G. Deflection Test: Mandrel.

3.7 PROTECTION OF FINISHED WORK

A. Section 017700 - Closeout Procedures: Protecting finished Work.

B. Protect pipe and aggregate cover from damage or displacement until backfilling operation is in progress.
   1. Take care not to damage or displace installed pipe and joints during construction of pipe supports, backfilling, testing, and other operations.
   2. Repair or replace pipe that is damaged or displaced from construction operations.

END OF SECTION