LONGVIEW SCHOOL DISTRICT HEAT PUMP REPLACEMENT AND INDOOR AIR QUALITY IMPROVEMENTS

BID SET
VOLUME 1 OF 1
DIVISIONS 00 THROUGH 33

CLIENT AGENCY:
LONGVIEW PUBLIC SCHOOL
2715 LILAC ST.
LONGVIEW, WA 98632

PREPARED BY:

integrus ARCHITECTURE

117 SOUTH MAIN ST. #100
SEATTLE, WA 98104

INTEGRUS PROJECT NO. 22220.00

BID SET

JANUARY 17, 2023

VOLUME 1

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DIVISION 00

PROCUREMENT AND CONTRACTING REQUIREMENTS

ADVERTISEMENT FOR BID

Bids will be accepted for the following project:

PROJECT NO.:	2023-01
TITLE:	Longview School District Heat Pump Replacement and Indoor Air Quality Improvements
AGENCY:	Longview School District No. 122
ESTIMATED BASE QUOTE COST:	**NTE $ 1,870,000 + WSST**
ABBREVIATED PROJECT DESCRIPTION:	Heat Pump Replacement and Indoor Air Quality Improvements work at Mark Morris High School, and Columbia Valley Gardens Elementary.
SUBMITTAL TIME/DATE/LOCATION:	**Prior to 2:00 P.M., Tuesday, January 31st, 2023.** **Bids will be accepted @** **Longview School District MOTF Office** **ATTN: Barbara Howe** **2080 38th Avenue** **Longview, WA 98632**
BY:	Longview School District No. 122 Barbara Howe
PRE-PROPOSAL WALK-THROUGHS:	**1:00 PM., Wednesday, January 25th, 2023**

Pre-proposal walk-throughs will be held at 1:00 PM starting at the Mark Morris High School, followed by Columbia Valley Garden Elementary. **Attendance of the Pre-Proposal Walk-through is Mandatory for bidders.**

The School District will make the plans available for contractors to view online without charge at:

https://www.longviewschools.com/departments/business-services/bids-proposals

Please direct questions regarding this project to the office of the project representative, Sara Wilder at Integrus Architecture, 117 South Main Street, Seattle WA, telephone (206) 628-3137, email: swilder@integrusarch.com

No contractor may withdraw his bid after the hour and date set for the submittal thereof, or thereafter, before award of the Contract, unless award is delayed for a period exceeding thirty (30) days from the proposal submittal date.

The Owner reserves the right to accept or reject any or all proposals and to waive informalities.

INSTRUCTIONS TO BIDDERS

1.01 DEFINITIONS

A. All definitions set forth in the General Conditions of the Contract for Construction or in other Contract Documents are applicable to the Bidding Documents.

B. "**Addenda**" are written or graphic instruments issued by the Architect or the Longview School District prior to the execution of the Contract which modify or interpret the Bidding Documents by additions, deletions, clarifications or corrections. The contents of Addenda are issued in no particular order and therefore should be carefully and completely reviewed. Addenda relating to administrative matters, such as, for example, the date or time of meetings or Bid receipt, may be issued in writing by fax, mail or other delivery.

C. An "**Alternate Bid**" (or "**Alternate**") is an amount stated in the Bid to be added to or deducted from the amount of the Base Bid if the corresponding change in the Work, as described in the Bidding Documents, is accepted by the Longview School District.

D. "**Award**" means the formal decision by the Longview School District notifying a Bidder with the lowest Responsive Bid of the Longview School District's acceptance of the Bid and intent to enter into a contract with the Bidder. A contract is only formed upon execution of the contract, and not simply by Award.

E. The "**Award Requirements**" include the following statutory requirements as a condition precedent to Award. The lowest Responsive Bidder shall:

(1) have a certificate of registration in compliance with RCW 18.27;

(2) have a current state unified business identifier number;

(3) if applicable, have industrial insurance coverage for the Bidder's employees working in Washington as required in Title 51 RCW;

(4) have an employment security department number as required in Title 50 RCW;

(5) have a state excise tax registration number as required in Title 82 RCW;

(6) not be disqualified from bidding on any public works contract under RCW 39.06.010 (unregistered or unlicensed contractors) or RCW 39.12.065(3) (prevailing wage violations);

(7) if bidding on a public works project subject to the apprenticeship utilization requirements in RCW 39.04.320, not have been found out of compliance by the Washington state apprenticeship and training council for working apprentices out of ratio, without appropriate supervision, or outside their approved work processes as outlined in their standards of apprenticeship under RCW 49.04 for the one-year period immediately preceding the date of the Bid solicitation;

(8) have received training on the requirements related to public works and prevailing wages under chapters 39.04 and 39.12 RCW, or be exempt from such training requirements if the Bidder has completed three or more public works projects and has had a valid business license in Washington for three or more years; and

(9) within the three-year period immediately preceding the date of the bid solicitation, not have been determined by a final and binding citation and notice of assessment issued by the department of labor and industries or through a civil judgment entered by a court of limited or general jurisdiction to have willfully violated, as defined in RCW 49.48.082, any provision of chapter 49.46, 49.48, or 49.52 RCW.

Further, under revised RCW 39.04.350, if the Bidder has a history of receiving monetary penalties for not achieving the apprentice utilization requirements pursuant to RCW 39.04.320, or is habitual in utilizing the good faith effort exception process, the bidder must submit an apprenticeship utilization plan within ten business days immediately following the Longview School District's notice to proceed.

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

G. A "**Bid**" is a complete and properly signed proposal to do the Work or designated portion thereof, submitted in accordance with the Bidding Documents, for the sums therein stipulated and supported by any data called for by the Bidding Documents.

H. A "**Bidder**" is a person or entity who submits a Bid for a prime contract with the Longview School District for the Work described in the Contract Documents.

I. The "**Bidding Documents**" include the Advertisement or Invitation to Bid, Instructions to Bidders, the Bid form, any other sample Bidding and contract forms, the Bid Bond, and the Contract Documents, including any Addenda issued prior to receipt of Bids.

J. The "**Contract Documents**" for the Work consist of the Agreement Between Owner and Contractor, the General Conditions of the Contract (as well as any Supplemental, Special or other Conditions included in the Project Manual), the Drawings, the Specifications, and all Addenda issued prior to, and all modifications issued after, execution of the Contract.

K. The "**Owner**" is the Longview School District No. 122.

L. To be considered "**Responsible**" or meet "**Responsibility**" requirements, a Bidder must meet the following supplemental criteria applicable to this Project to the satisfaction of the Architect and the Longview School District:

(1) The ability, capacity, and skill to perform the Contract;

(2) The character, integrity, reputation, judgment, experience, and efficiency of the Bidder;

(3) Whether the Bidder can perform the Contract within the time specified;

(4) The previous and existing compliance by the Bidder with laws relating to the Contract;

(5) The quality of performance of previous contracts, including demonstration of successful completion of three (3) similar projects of equal or greater size, scope and value in the last five (5) years;

(6) The designated Project Manager shall have a minimum of three (3) years of successful experience in project management and scheduling of projects of similar scope and complexity;

(7) The designated Superintendent shall have a minimum of five (5) years of successful supervision of projects of similar scope and complexity;

(8) Any other qualifications required by the Contract Documents or Bidding Documents; and

(9) Such other information as may be secured having a bearing on the decision to award the contract.

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

N. A "**Unit Price**" is an amount stated in the Bid as a price per unit of measurement for materials, equipment or services as described in the Bidding Documents or in the Contract Documents. The Longview School District reserves the right to reject at any time, without impairing the balance of the proposal, any or all such predetermined unit prices.

1.02 BIDDER'S REPRESENTATIONS

By making its Bid, each Bidder represents that:

A. BIDDING DOCUMENTS. The Bidder has read and understands the Bidding Documents, and its Bid is made in accordance with them.

B. POSSIBLE SELF-PERFORMED WORK REQUIREMENT. The Bidder will perform *with its own forces* at least that percentage (if any) of the Work required by the Bidding Documents or the Contract Documents.

C. PRE-BID MEETING. The Bidder has attended any pre-bid meeting(s) required by the Bidding Documents.

D. BASIS. Its Bid is based upon the materials, systems, services, and equipment required by the Bidding Documents, without exception.

E. EXAMINATION. The Bidder has carefully examined and understands the Bidding Documents, the Contract Documents (including, without limitation, any liquidated damages and insurance provisions), and the Project site, including any existing buildings, it has familiarized itself with the local conditions under which the Work is to be performed and has correlated its observations with the requirements of the Contract Documents and it has satisfied itself as to the nature, location, character, quality and quantity of the Work, the labor, materials, equipment, goods, supplies, work, services and other items to be furnished, and all other requirements of the Contract Documents. The Bidder has also satisfied itself as to the conditions and other matters that may be encountered at the Project site or affect performance of the Work or the cost or difficulty thereof, including but not limited to those conditions and matters affecting: transportation, access, disposal, handling and storage of materials, equipment and other items; availability and quality of labor, water, electric power and utilities; availability and condition of roads; climatic conditions and seasons; physical conditions at the Project site and the surrounding locality; topography and ground surface conditions; and equipment and facilities needed preliminary to and at all times during the performance of the Work. The failure of the Bidder fully to acquaint itself with any applicable condition or matter shall not in any way relieve the Bidder from the responsibility for performing the Work in accordance with, and for the Contract Sum and within the Contract Time provided for in, the Contract Documents.

F. PROJECT MANUAL. The Bidder has checked its copies of the Project Manual with the Table of Contents bound therein to ensure the Project Manual is complete.

G. SEPARATE WORK. The Bidder has examined and coordinated all Drawings, Contract Documents, and Specifications for any other contracts to be awarded separately from, but in connection with, the Work being bid upon, so that the Bidder is fully informed as to conditions affecting the Work under the contract being bid upon.

H. LICENSE REQUIREMENTS. Bidders and their proposed Subcontractors shall be registered and shall hold such licenses as may be required by the laws of Washington, including RCW 18.27, for the performance of the Work specified in the Contract Documents.

I. NO EXCEPTIONS. Bids must be based upon the materials, systems and equipment described and required by the Bidding Documents, and terms and conditions in the Contract Documents, without exception.

1.03 BIDDING DOCUMENTS

A. COPIES

1. **Deposit.** Bidders may obtain electronic copies of the Bidding Documents from the issuing office and from any other locations designated in the Advertisement or Invitation to Bid. Bidders that desire paper copies may have the electronic copies reproduced at the Bidder's expense.

2. **Sub-bidders.** Bidding Documents will not be issued directly to Sub-bidders or others unless specifically offered in the Advertisement or Invitation to Bid.

3. **Complete sets.** Bidders shall use complete sets of Bidding Documents in preparing Bids and are solely responsible for utilizing established plan holder identification processes to obtain updated bid information; neither the Longview School District nor the Architect assumes any responsibility for errors or misinterpretations resulting from the use of incomplete and/or superseded sets of Bidding Documents. Printed copies of plans take precedence over any on-line images.

4. **Conditions.** The Longview School District and/or the Architect make copies of the Bidding Documents available on the above terms only for the purpose of obtaining Bids on the Work and do not confer a license or grant permission for any other use.

5. **Legible Documents.** To the extent any drawings, specifications, or other Bidding documents are not legible, it is the Bidder's responsibility to notify the Longview School District and the Architect and to obtain legible documents from the plan center.

B. INTERPRETATION OR CORRECTION OF BIDDING DOCUMENTS

1. **Format.** The Contract Documents may be divided into parts, divisions, and sections for convenient organization and reference. Generally, there has been no attempt to divide the Specification sections into Work performed by the various building trades, any Work by separate contractors, or any Work required for separate facilities in or phases of the Project.

2. **Notify Owner and Architect.** Bidders and Sub-bidders shall promptly notify the Longview School District and the Architect in writing of any ambiguity, inconsistency, or error that they may discover upon examination of the Bidding Documents or of the site and local conditions. All Bidders and Sub-bidders shall thoroughly familiarize themselves with specified products and installation procedures and submit to the Longview School District and the Architect any objections (in writing) no later than seven (7) calendar days prior to the Bid Date. The submittal

of the Bid constitutes acceptance of products and procedures specified as sufficient, adequate, and satisfactory for completion of the Contract.

3. **Written request.** Bidders and Sub-bidders requiring clarification or interpretation of the Bidding Documents shall make a written request which shall reach the Architect at least seven (7) calendar days prior to the date for receipt of Bids.

4. **Addenda.** Any interpretation, correction or change of the Bidding Documents will be made by written Addendum. Interpretations, corrections or changes of the Bidding Documents made in any other manner will not be binding, and Bidders shall not rely upon such interpretations, corrections and changes.

5. **Singular references.** Reference in the singular to an article, device, or piece of equipment shall include as many of such articles, devices, or pieces as are indicated in the Contract Documents or as are required to complete the installation.

6. **Utilities and runs.** The Bidder should assume that the exact locations of any underground or hidden utilities, underground fuel tanks, and any plumbing and electrical runs may be somewhat different from any location indicated in the surveys or Contract Documents.

7. **Division of Contract Documents.** The Contract Documents may be divided into parts, divisions, and sections for convenient organization and reference. Generally, there has been no attempt to divide the Specification sections into Work performed by the various building trades, any Work by separate contractors, or any Work required for separate facilities in of phases of the Project.

C. SUBSTITUTIONS

1. **Standard.** The materials, products, procedures and equipment described in the Bidding Documents establish a standard of required function, dimension, appearance, and quality that must be met by any proposed substitution.

2. **Substitution procedure.** No substitution will be considered prior to receipt of Bids unless the Architect receives a written request for approval on the Architect's Substitution Request form for the Project, with all data requested on the form completed, at least seven (7) days prior to the date for receipt of Bids. Each such request shall be submitted with a Request for Substitution form identical to or equivalent in content to the form found in the Project Manual, and shall include the name of the material or equipment proposed to be replaced and a complete description of the proposed substitute, including drawings, cuts, performance and test data, warranty information, and any other information necessary for an evaluation. A statement setting forth any changes in other materials, equipment or other Work that incorporation of the substitute would require shall be included. The proposer has the burden to prove the merit of the proposed substitute; by proposing the substitution, the Bidder represents that it has personally investigated the proposed material or product and determined that it is equal or better in all respects to that specified, that the same or better warranty will be provided for the substitution, that complete cost data, including all direct and indirect costs of any kind, has been presented, that the Contract Time will not be increased, and that it will coordinate the installation of the substitute if accepted and make all associated changes in the Work. The Architect's decision to approve or disapprove a proposed substitution shall be final. Written requests for approval shall constitute a guarantee by the Bidder that the articles or materials are in all respects, including warranty and installation, equal or superior to those specified, unless otherwise noted. To the extent the proposed substitution will require additional services by the Architect or its consultants after Bid award, the Bidder, if successful, will be required to pay the Architect or its consultants for these services at their customary hourly rates.

3. **Addendum.** If the Architect approves a proposed substitution prior to receipt of Bids, the approval will be set forth in a written Addendum. Bidders shall not rely upon approvals made in any other manner. Substitution request forms returned by the Architect are a courtesy only, and Bidders/Sub-bidders shall rely solely on substitution approvals listed in an Addenda.

4. **Post-Bid substitutions.** After the Contract has been executed, the Longview School District and the Architect may consider a written request for the substitution of material or products in place of those specified in the Contract Documents only under the circumstances as specified therein.

D. ADDENDA

1. **Written.** All Addenda will be written. They will be mailed, emailed, faxed delivered, and/or posted electronically with notice to those the Architect knows to have registered with the Architect as a Bidder.

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

3. **Verification and acknowledgment of receipt.** Prior to bidding, each Bidder shall ascertain that it has received all Addenda issued. Each Bidder shall acknowledge its receipt of all Addenda in its Bid.

1.04 BIDDING PROCEDURE

A. FORM AND STYLE OF BIDS

1. **Form.** Bids (including any required attachments) shall be submitted on forms identical to the form included with the Bidding Documents. Bids on different forms may be rejected. No oral, email, or telephonic responses or modifications will be considered to be Bids.

2. **Entries on the Bid form.** All blanks on the Bid form shall be filled in by typewriter or manually in ink.

3. **Words and figures.** Where so indicated by the makeup of the Bid form, sums shall be expressed in both words and figures; in case of discrepancy between the two and regardless of any statement to the contrary on the Bid form, *the amount written in figures shall govern and the words shall be used to determine any ambiguities in the figures*. Portions of the Bid form may require the addition of component bids to a total or the identification of component amounts within a total. In case of discrepancy between component amounts listed and their sum(s), the component amounts listed shall govern.

4. **Initial changes.** Any interlineation, alteration or erasure must be initialed by an authorized representative of the Bidder.

5. **Alternates and Unit Prices.** All requested Alternates and unit prices should be bid. The Longview School District reserves the right, but is not obligated, to reject any Bid on which all requested Alternates or unit prices are not bid. If no change in the Base Bid is required for an Alternate, enter "*No Change.*" If there is no entry, it will be presumed that the Bidder has made no offer to accomplish this Alternate. If it is not otherwise clear from the Bid or nature of the Alternate, it will be presumed that the amount listed for an Alternate is an add rather than a deduct.

6. **No conditions.** The Bidder shall make no conditions or stipulations on the Bid form nor qualify its Bid in any other manner.

7. **Identity of Bidder.** The Bidder shall include in the specified location on the Bid form the legal name of the Bidder and, if requested, a description of the Bidder as a sole proprietor, a partnership, a joint venture, a corporation (including the state of incorporation), or another described form of legal entity. The Bid shall be signed by the person or persons legally authorized to bind the Bidder to a contract. A Bid submitted by an agent shall have a current power of attorney attached certifying the agent's authority to bind the Bidder, and provide other information requested.

8. **Bid amounts do not include sales tax.** The Bid shall include in the sum stated all taxes imposed by law, EXCEPT STATE AND LOCAL SALES TAX ON THE CONTRACT SUM.

9. **Bid breakdown.** The Bid form may contain, for the Longview School District's accounting purposes only, a breakdown of some or all of the components included in the Base Bid.

B. POTENTIAL LISTING OF SUBCONTRACTORS

1. **Procedure.** On certain projects of the Longview School District, the Bid form includes a requirement that certain Subcontractors be listed, and the list must be submitted to the Longview School District as described in the bidding documents. In these circumstances, the Bidder must name the Subcontractor with whom the Bidder, if awarded the Contract, will subcontract ***directly*** (i.e., not lower-tier Subcontractors) for performance of the work of:

   (a) HVAC (heating, ventilation and air conditioning),

   (b) plumbing as described in RCW 18.106,

   (c) electrical work as described in RCW 19.28,

   (d) structural steel installation,

   (e) rebar installation, and

   (f) any other categories of Work listed on the Subcontractor listing form(s).

   TIMING: The listing of HVAC, plumbing, and electrical subcontractors shall occur within one hour of the published bid submittal time. The listing of structural steel installation and rebar installation subcontractors shall occur within forty-eight hours of the published bid submittal time. The listing of any other categories of Work listed on the Subcontractor listing form(s) shall occur as indicated on such forms or as otherwise described in the bidding documents.

   SELF-PERFORMANCE: If the Bidder intends to self-perform any of these categories of Work, it must name itself for each such category of Work.

   IF NO SUBCONTRACTORS: If there is no work to be performed by a HVAC, plumbing, electrical, structural steel installation, rebar installation, or other subcontractor category identified on the Bid form(s), the Bidder should insert "None" or "N/A" on the Bid form. If a category is left blank, that shall indicate that the Bidder believes that there is no Work to be performed by that trade.

   MULTIPLE ENTRIES: The Bidder shall not list more than one (1) entity for a particular category of Work identified, unless a Subcontractor varies with an Alternate Bid, in which case the Bidder shall identify the Subcontractor to be used for the Alternate and the affected portion of the Work and otherwise make its Bid clear as to which subcontractor shall be utilized depending upon the selection of alternates.

MULTIPLE SUBMITTAL TIMES. In the event the Bidding Documents call for a second submittal time for receipt of alternate bids, and no additional Subcontractors are listed with such alternate bids, the Longview School District will consider that there is no change in the Subcontractors from those listed with regard to the base Bid.

2. **Failure to Submit.** In accordance with RCW 39.30.060, failure of a Bidder to submit the names of such proposed heating, ventilation and air conditioning, plumbing, electrical, structural steel installation, and rebar installation Subcontractors or to name itself to perform such Work or the naming of two or more Subcontractors to perform the same Work in the time periods described above shall render the Bidder's Bid nonresponsive and, therefore, void.

3. **Requirement to Subcontract.** The Bidder, if awarded the Contract, will subcontract with the listed Subcontractor for performance of the portion of the Work designated on the Form of Proposal, subject to the provisions of the Contract for Construction and RCW 39.30.060. The Bidder shall not substitute a listed Subcontractor in furtherance of bid shopping or bid peddling.

4. **Replacement.** If a listed Subcontractor is unable to comply with any bondability, qualification, or other requirements of the Contract or Bidding Documents (including without limitation a finding of Subcontractor non-Responsibility), the Longview School District may require the Bidder to replace the Subcontractor with a Subcontractor acceptable to the Longview School District at no change in the Contract Sum or Contract Time.

5. **Subcontractor Standards.** Subcontractors shall meet contractual and technical qualifications standards, and provide specialized certification, licensing, and/or payment and performance bonding where specified.

C. BID SECURITY

1. **Purpose and procedure.** Each Bid shall be accompanied by a bid security payable to the Longview School District in the form required in the Bidding Documents and equal to five percent (5%) of the Base Bid. The bid security constitutes a pledge that the Bidder will enter into the Contract with the Longview School District in the form provided, in a timely manner, and on the terms stated in its Bid and will furnish in a timely manner the payment and performance bonds, certificates of insurance, Contractor's Construction Schedule, and all other documents required in the Contract Documents. Should the Bidder fail or refuse to enter into the Contract or fail to furnish such documents, the amount of the bid security shall be forfeited to the Longview School District as liquidated damages, not as a penalty. By submitting its Bid and bid security, the Bidder agrees that any forfeiture is a reasonable prediction at the time of Bid submittal of future damages to the Longview School District.

2. **Form.** The bid security shall be in the form of a certified or bank cashier's check payable to the Longview School District or a bid bond executed by a bonding company acceptable to the Longview School District and licensed in the State of Washington on the form included with the Bidding Documents (if any) or on an acceptable and equivalent form. The Attorney-in-Fact who executes the bond on behalf of the surety shall be licensed to do business in the State of Washington and shall affix to the bond a certified and current copy of that person's Power of Attorney.

3. **Retaining Bid Security.** The Longview School District will have the right to retain the Bid Security of Bidders to whom an award is being considered until the earliest of either (a) the Contract has been executed, and payment and performance bonds have been furnished, or (b) the specified time has elapsed so that Bids may be withdrawn, or (c) all Bids have been rejected.

4. **Return of Bid Security.** Within forty-five (45) days after the Bid Date, the Longview School District will release or return Bid securities to Bidders whose Bids are not to be further considered in awarding the Contract. Bid securities of the three apparent low Bidders will be held until the Contract has been finally executed, after which all unforfeited Bid securities will be returned.

D. SUBMISSION OF BIDS

1. **Procedure.** The Bid, the Bid security, and any other documents required to be submitted with the Bid shall be enclosed in a sealed opaque envelope. The envelope shall be addressed to the party specified in the Advertisement or Invitation to Bidders and shall be identified with the Project name, the Bidder's name and address and, if applicable, the designated portion of the Work for which the Bid is submitted. If the Bid is sent by mail the sealed envelope shall be enclosed in a separate mailing envelope with the notation "*SEALED BID ENCLOSED*" on the face thereof.

2. **Deposit.** Bids shall be deposited at the designated location prior to the time and date for receipt of Bids indicated in the Advertisement or Invitation to Bid, or any extension thereof made by Addendum. Bids received after the time and date for receipt of Bids may be opened, retained unopened, or returned (open or unopened), all at the discretion of the Longview School District.

3. **Responsibility.** The Bidder assumes full responsibility for timely delivery at the location designated for receipt of Bids.

4. **Form.** Oral, fax, telephonic, email, electronic, or telegraphic Bids are invalid and will not be considered.

E. MODIFICATION OR WITHDRAWAL OF BID

1. **After receipt time.** A Bid may not be modified, withdrawn or canceled by the Bidder during a forty-five (45) day period following the time and date designated for the receipt of Bids, and each Bidder so agrees by virtue of submitting its Bid.

2. **Before receipt time.** Prior to the time and date designated for receipt of Bids, any Bid submitted may be modified or withdrawn only by notice to the party receiving Bids at the place designated for receipt of Bids. Such notice shall be in writing over the signature of the Bidder or by fax; if by fax, written confirmation over the signature of the Bidder shall be mailed and postmarked on or before the date and time set for receipt of Bids. The notice shall be worded so as not to reveal the amount of the original Bid. Email notice will not be considered. It shall be the Bidder's sole responsibility to verify that the notice has been received by the Longview School District in time to be withdrawn before the Bid opening.

3. **Resubmittal.** Withdrawn Bids may be resubmitted up to the time designated for the receipt of Bids provided that they are then fully in conformance with these Instructions to Bidders.

4. **Bid security with resubmission.** Bid security shall be in an amount sufficient for the Bid as modified or resubmitted.

F. NOTICE

1. Notice or a request from a Bidder under these Instructions to Bidders must be in writing over the signature of the Bidder and delivered in person or by mail, email, express delivery, or fax. If the notice is by email or fax, written confirmation over the signature of the Bidder must be mailed and postmarked on or before the date and time set for the notice.

1.05 CONSIDERATION OF BIDS

A. OPENING OF BIDS: Unless stated otherwise in the Advertisement or Invitation to Bid or any Addendum, the properly identified Bids received on time will be opened publicly and will be read aloud. An abstract of the Base Bids and Alternate Bids, if any, will be made available to Bidders and other interested parties.

B. REJECTION OF BIDS: The Longview School District shall have the right but not the obligation to reject any or all Bids for any reason or for no reason, to reject a Bid not accompanied by required Bid security or by other material or data required by the Bidding Documents, or to reject a Bid which is in any way incomplete or irregular.

C. ACCEPTANCE OF BID (AWARD)

1. **Owner.** The Longview School District intends (but is not bound) to award a Contract to the lowest Responsible and Responsive Bidder, provided the Bid has been submitted in accordance with the requirements of the Bidding Documents and does not exceed the funds available. The Longview School District has the right to waive any informality or irregularity in any Bid(s) received and to accept the Bid which, in its judgment, is in its own best interests.

2. **Alternates.** The Longview School District shall have the right to accept Alternates in any order or combination, unless otherwise specifically provided in the Contract Documents or Bidding Documents, and to determine the low Bidder on the basis of the sum of the Base Bid and the Alternates (if any) accepted. The Longview School District retains the right to accept Alternate Bid items at the price bid within forty-five (45) days after the Agreement is executed.

3. **Requirements for Award**. Before the Award, the lowest Responsive Bidder shall meet the Award Requirements.

D. BID PROTEST PROCEDURES

1. **Procedure.** A Bidder protesting for any reason the Bidding Documents; a bidding procedure; the Longview School District's objection to the Bidder or a person or entity proposed by the Bidder, including but not limited to a finding of non-Responsibility; the rejection of a Bid; the award of the Contract; or any other aspect arising from or relating in any way to the bidding and award or lack thereof, shall cause a written protest to be filed with the Longview School District within two (2) business days of the event giving rise to the protest and, in any event, no later than two (2) business days after the date upon which Bids are opened. (Intermediate Saturdays, Sundays, and legal holidays are not counted.) The written protest shall include the name of the protesting Bidder, a detailed description of the specific factual and legal grounds for the protest, copies of all supporting documents, and the specific relief requested. The written protest shall be delivered to:

Patti Bowen, Executive Director of Business Services
Longview School District No. 122
2715 Lilac Street
Longview, Washington 98632
pbowen@longview.k12.wa.us

2. **Consideration.** Upon receipt of the written protest, the Longview School District will consider the protest. The Longview School District may, within three (3) business days of the Longview School District's receipt of the protest, provide any other affected Bidder(s) the opportunity to respond in writing to the protest. If the protest is not resolved by mutual agreement of the protesting Bidder and the Longview School District, the Superintendent of the Longview

School District or the Superintendent's designee will review the issues and promptly furnish a final and binding written decision to the protesting Bidder and any other affected Bidder(s) within six (6) business days of the Longview School District's receipt of the protest. (If more than one (1) protest is filed, the Longview School District's decision will be provided within six (6) business days of the Longview School District's receipt of the last protest.) If no reply is received from the Longview School District during the six (6) business-day period, the protest shall be deemed rejected.

3. **Waiver.** Failure to comply with these protest procedures will render a protest waived.

4. **Condition precedent.** Timely and proper compliance with and exhaustion of these protest procedures shall be a condition precedent to any otherwise permissible judicial consideration of a protest.

1.06 POST BID INFORMATION

A. INFORMATION FROM APPARENT LOW BIDDER

1. **Submittal.** Within forty-eight (48) hours of the Architect's request, the apparent low Bidder and any other Bidders so requested shall submit the following to the Architect and the Longview School District:

(a) additional information regarding the use of their own forces and the use of subcontractors and suppliers;

(b) a properly executed Contractor's Qualification Statement on the form provided (unless otherwise required to be submitted at the time of the Bid);

(c) a letter or form from the Bidder's insurance company stating that the insurance required by the Contract Documents will become effective upon execution of the Contract;

(d) a letter or form from the Bidder's surety stating that the bond(s) required by the Contract Documents will become effective upon execution of the Contract;

(e) if requested by the Longview School District, a detailed breakdown of the Bid in a form acceptable to the Longview School District;

(f) the names of the persons or entities (including a designation of the Work to be performed with the Contractor's own forces, and the names of those who are to furnish materials or equipment fabricated to a special design) proposed for each of the principal portions of the Work;

(g) the proprietary names and the suppliers of the principal items or systems of materials and equipment proposed for the Work;

(h) a State Board of Education Form D-9, if requested; and

(i) a signed statement in accordance with RCW 9A.72.085 verifying under penalty of perjury that the bidder is in compliance with the responsible bidder criteria of RCW 39.04.350(1)(g).

Failure to provide any of the above information in a timely manner may constitute an event of breach permitting forfeiture of the Bid security.

2. **Responsibility.** The Bidder will be required to establish to the satisfaction of the Architect and the Longview School District the reliability and Responsibility of the persons or entities proposed to furnish and perform the Work described in the Bidding Documents as well as

qualifications set forth in the Sections of the Project Manual pertaining to such proposed Subcontractor's respective trades. The Responsibility of the Bidder may be judged in part by the Responsibility of these proposed entities. The following will be considered:

- The ability, capacity, and skill to perform the contract;
- The character, integrity, reputation, judgment, experience, and efficiency of the Bidder;
- Whether the Bidder can perform the contract within the time specified;
- The quality of performance of previous contracts;
- The previous and existing compliance by the Bidder with laws relating to the contract; and
- Such other information as may be secured having a bearing on the decision to award the contract.

CONSIDERATION. In considering a Bidder's Responsibility, a Bidder shall be deemed to be unqualified to perform the Contract if, after review and verification of the representations included upon the Contractor's Qualification Statement submitted by the Bidder, conditions such as, but not limited to, the following appear:

(a) The Bidder does not have sufficient prior experience (or an acceptable substitute thereof, as described below) with projects of a similar nature in technical, managerial, and financial requirements to that in the present Contract being bid. In addition to such established contractors, a newly established contractor may be considered qualified if it has shown on the Contractor's Qualification Statement that it is staffed with sufficient technical, managerial, and financial personnel with prior experience in the nature of construction for which the Bids are invited.

(b) The Bidder does not have sufficient capability to undertake the obligations of the Contract. A determination will be made when the Longview School District's review of the probable cash flow needs of the Bidder for this Project (including payroll, cost of material and supplies, equipment rental costs, and any other direct or incidental costs of the Contract), concludes that the Bidder does not have sufficient financial resources to enable it to satisfy its financial obligations under the Contract.

(c) The Bidder has submitted unrealistic unit prices as determined by other Bidders' unit prices for this Project.

(d) The Bidder does not have sufficient staff, equipment, or plant available to perform the Contract. The Longview School District's determination in this matter will be based upon that represented by Bidder in the Contractor's Qualification Statement.

(e) The Bidder has a history of unsatisfactory performance of contracts of this or similar nature, regardless of whether such contracts existed between the Longview School District and the Bidder, or other parties.

- A determination of this nature will be made if the Longview School District, after review of the Bidder previous work experience, determines that the Bidder's unsatisfactory performance has resulted predominantly from the Bidder's failure rather than a failure to perform by another party. The Longview School District will give the Contractor an opportunity to explain such nonperformance's before any final determination is reached.
- A determination of failure to perform will be made if the Longview School District is satisfied after review of the Bidder's prior experience, that the Bidder has failed to satisfy its obligations under past contracts and the Longview School District cannot safely assume satisfactory performance of the Contract by the Bidder.
- In reaching its determination, the Longview School District may consider statements of other parties to the prior unperformed contracts, as well as the representations of the Bidder on its Contractor's Qualification Statement.

3. **Subcontractors.** The Responsibility of the Bidder may be judged in part by the Responsibility of its Subcontractors. Bidders must verify Responsibility criteria for each first-tier Subcontractor. A Subcontractor of any tier that hires other Subcontractors must verify Responsibility criteria for each of its next lower-tier Subcontractors. Verification shall include that each Subcontractor, at the time of subcontract execution, is Responsible and possesses an electrical contractor license, if required by RCW 19.28, or an elevator contractor license, if required by RCW 70.87, and can obtain any payment and performance bonds required by the Bidding or Contract Documents.

4. **Request to Modify Criteria**. No later than ten (10) days prior to the Bid Date, a potential Bidder may request in writing that the Longview School District modify the Responsibility criteria listed in clause (2) above or elsewhere in the Contract Documents or the Bidding Documents. The Longview School District will evaluate the information submitted by the potential Bidder and respond before the Bid Date. If the evaluation results in a change of the criteria, the Longview School District will issue an Addendum identifying the new criteria.

5. **Objection.** Prior to the Award of the Contract, the Architect will notify the Bidder in writing if either the Longview School District or the Architect, after due investigation, has reasonable objection to the Bidder or a person or entity proposed by the Bidder, and the Longview School District will provide the reasons for the determination. The Bidder may appeal the determination within two (2) business days of its receipt of the objection by presenting additional information to the Longview School District, and the Longview School District will consider the additional information before issuing its final determination. The Bidder may, after the Longview School District's objection or determination, and at Bidder's option, (1) withdraw the Bid, (2) submit an acceptable substitute person or entity with no change in the Contract Time and no adjustment in the Base Bid or any Alternate Bid, even if there is a cost to the Bidder occasioned by the substitution, or (3) appeal by filing a protest in accordance with paragraph 1.05.D. In the event of withdrawal, Bid security will not be forfeited.

6. **Change.** Persons and entities proposed by the Bidder and to whom the Longview School District or the Architect have made no reasonable objection must be used on the Work for which they were proposed and shall not be changed except with the written consent of the Longview School District and the Architect.

7. **Right to Terminate.** The Bidder's representations concerning its qualifications will be construed as a covenant under the Contract. Should it appear that the Bidder has made a material misrepresentation on its Contractor's Qualification Statement, the Longview School District shall have the right to terminate the Contract for cause for the Contractor's breach, and the Longview School District may then pursue such remedies as exist elsewhere under this Contract, or as otherwise are provided at law or equity.

B. INFORMATION FROM OTHER BIDDERS: All other Bidders designated by the Architect as under consideration for award of a Contract shall also provide a properly executed Contractor's Qualification Statement, if so requested by the Longview School District.

C. BIDDING MISTAKES: The Longview School District will not be obligated to consider notice of claimed bidding mistakes received more than three (3) business days after the Bid opening. In accordance with Washington law, a low Bidder that claims error and fails to enter into the Contract is prohibited from bidding on the Project if a subsequent call for Bids is made for the Project.

1.07 PERFORMANCE BOND AND LABOR AND MATERIAL PAYMENT BOND

A. BOND REQUIREMENTS: Within forty-eight (48) hours after the issuance of the Longview School District's notice of intent to award the Contract, and prior to the date of execution of the Contract,

the Bidder shall furnish evidence satisfactory to the Longview School District of its ability to obtain statutory bonds pursuant to RCW 39.08 covering the faithful performance of the Contract and the payment of all obligations arising thereunder in the form prescribed in the Contract Documents and in the full amount of the Contract Sum plus sales tax. The cost of such bond shall be included in the Base Bid.

B. SUBCONTRACTOR BONDS. The Longview School District reserves the right to require certain Subcontractors to furnish performance and labor and material payment bonds in form as set forth herein and as set forth under the Bidding Documents or Contract Documents. The Longview School District shall not, however, be responsible for any costs for any Subcontractor bonds unless the Longview School District, prior to the execution of the Owner-Contractor Agreement, requires the Bidder, in writing, to furnish such bonds from designated Subcontractors. Should any bonds be furnished by subcontract bidders, or be required by any Bidder to be furnished by any subcontract bidder or Subcontractor, without the written request of the Longview School District, the costs for any such bonds shall be at the expense of the Bidder and shall not be added to the Contract Sum.

C. TIME OF DELIVERY AND FORM OF BONDS. The Bidder shall deliver the bonds and other documents required by the Contract Documents (including but not limited to certificates of insurance) to the Longview School District pursuant to the Contract Documents and in no event any later than three (3) days after the date of execution of the Contract and prior to commencing operations at the site. The bonds shall be written in the form approved by the Longview School District for public work, as required by RCW 39.08. The bonds shall be written by a surety firm licensed to do business in the State of Washington, with an A.M. Best rating of at least A-/VII. The Bidder shall require the Attorney-in-Fact who executes the required bonds on behalf of the surety to affix thereto a certified and current copy of that person's Power of Attorney.

1.08 FORM OF AGREEMENT BETWEEN OWNER AND CONTRACTOR

A. FORM TO BE USED: The Agreement for the Work will be written on the form(s) contained in the Bidding Documents, including any General, Supplemental or Special Conditions, and the other Contract Documents included with the Project Manual. In the event no form is enclosed, an AIA Document A104-2017, "Standard Abbreviated Form of Agreement Between Owner and Contractor," as revised, modified and supplemented by the Longview School District, will be used. All references in these Instructions to Bidders to the A104 refers to the document as revised by the Longview School District.

B. CONFLICTS: In case of conflict between the provisions of these Instructions and any other Bidding Document, these Instructions shall govern. In case of conflict between the provisions of the Bidding Documents and the Contract Documents, the Contract Documents shall govern.

1.09 CONTRACT DOCUMENTS

This paragraph contains descriptions of some but not all of the provisions of the Contract Documents.

A. RETAINAGE: The Contract Documents specify the statutory retainage requirements of RCW 60.28 for this Project.

B. CONTRACT TIME: The Contract Documents specify the Contract Time. Timely completion of this Project is essential to the Longview School District.

C. PREVAILING WAGES: The Contract Documents contain requirements regarding the payment of prevailing wages pursuant to RCW 39.12.

D. WRITTEN CLAIMS AND NOTICE: The Contract Documents contain a number of provisions that require the Contractor to provide notice of Claims and to make and support Claims, in writing, within a specified time in order to maintain the Claim. The Longview School District is under no obligation to consider Claims that fail, in any respect, to meet these requirements.

E. CHANGES IN CONTRACT SUM: The Contract Documents contain provisions specifying requirements for and pricing of changes in the Contract Sum.

F. DISPUTE RESOLUTION: The Contract Documents contain alternative dispute resolution procedures which, among other things, requires non-binding mediation of all disputes.

G. CONTRACTOR REGISTRATION: Pursuant to RCW 39.06, the Bidder shall be registered or licensed as required by the laws of the State of Washington, including but not limited to, RCW 18.27.

H. TAXES. The Contractor shall include in its Bid and pay for all applicable taxes except Washington State Sales Tax and Local Sales Tax on the Contract Sum, which shall be excluded in the preparation of its Bid. Such State and Local Sales Taxes shall be added to the Contract Sum, paid by the Longview School District to the Contractor, and then paid by the Contractor over the course of the Project. Refer to general, supplementary or other conditions regarding further information.

I. OTHER PROVISIONS: The above paragraphs contain descriptions of some but not all of the provisions of the Contract Documents. Bidders should review in detail the Contract Documents themselves and not rely upon the above paragraphs in this article as complete or inclusive.

1.10 POSSIBLE TRENCH EXCAVATION SAFETY PROVISIONS

A. To ensure that the Bidder agrees to comply with relevant trenching safety requirements of RCW 39.04.180 and RCW 49.17, the Base Bid must include the cost of any required trench safety provisions. The Bidder shall enter in the blank (if any) provided on the Bid form the dollar amount the Bidder has included in its Base Bid for any trench safety provisions for trenching that will exceed a depth of four feet. If trench excavation safety provisions do not pertain to the Project, the Bidder may enter “N.A.” or “Not Applicable” in the blank (if any) on the Bid form.

END OF SECTION

Longview School District
Heat Pump Replacement and Indoor Air Quality Improvements
Mark Morris High School and Columbia Valley Gardens Elementary School

Bid Proposal FORM

January 31, 2023 at 2:00 p.m.

Project No. 2023-01-Longview Public Schools
for
(Sealed Base Bid and Alternate Bid Due 2:00 P.M. Tuesday January 31, 2023)

To: Longview Public Schools #301
Longview School District MOTF Office
ATTN: Barbara Howe
2080 38th Avenue
Longview, WA 98632

1.02 SUBMITTED BY (BIDDER TO ENTER NAME AND ADDRESS):

A. BIDDER'S NAME _____

B. ADDRESS: _____

C. CITY, STATE, ZIP: _____

1.03 OFFER:

Having carefully examined the Project Manual and the Drawings entitled Heat Pump Replacement and Indoor Air Quality Improvements, as well as the premises and conditions affecting the Work, the undersigned represents that it has the personnel, qualifications, expertise and means to complete the Work in a timely manner and proposes to furnish all labor, equipment, and materials to perform the Base Bid Work required in strict accordance with the proposed Contract Documents for the following amount:

Amount shall be shown in both words and figures. In case of discrepancy, the amount shown in figures shall govern.

2.01 THE BASE BID AMOUNT INCLUDES ALL WORK SHOWN ON THE DRAWINGS AND SPECIFIED IN THE BIDDING AND CONTRACT DOCUMENTS

TOTAL BASE BID:

_____

_____

DOLLARS ($_____)

2.04 OVERHEAD AND PROFIT:

All of the above bid prices include overhead and profit.

2.05 SALES TAX:

None of the above bid prices include State, County, or City Sales Tax.

ALTERNATE BID NO. 1 - Provide exhaust duct from existing range hoods up through roof and terminate each into a roof vent.

_____

_____

DOLLARS ($_____)

OVERHEAD AND PROFIT:
All of the above bid prices include overhead and profit.

SALES TAX:
None of the above bid prices include State, County, or City Sales Tax.

OVERHEAD AND PROFIT:
All of the above bid alternates include overhead and profit.

SALES TAX:
None of the above bid prices include State, County, or City Sales Tax.

ALTERNATE BID NO. 2 - Demolish (E) wall louvers, infill openings with brick veneer to match existing. Tooth bricks into (E) brick veneer adjacent to opening.

_____

_____

DOLLARS ($_____)

OVERHEAD AND PROFIT:
All of the above bid prices include overhead and profit.

SALES TAX:
None of the above bid prices include State, County, or City Sales Tax.

OVERHEAD AND PROFIT:
All of the above bid alternates include overhead and profit.

SALES TAX:
None of the above bid prices include State, County, or City Sales Tax.

ALTERNATE BID NO. 3 - Demo (12) hot water unit heaters, associated valves & controls. Furnish & install (12) hot water unit heaters, associated valves & controls.

_____

_____

DOLLARS ($_____)

OVERHEAD AND PROFIT:
All of the above bid prices include overhead and profit.

SALES TAX:
None of the above bid prices include State, County, or City Sales Tax.

OVERHEAD AND PROFIT:
All of the above bid alternates include overhead and profit.

SALES TAX:
None of the above bid prices include State, County, or City Sales Tax.

2.05 TRENCH EXCAVATION SAFETY SYSTEM INCLUDED ABOVE:

Included in the above Base Bid is an amount for Trench Excavation Safety for any trenching exceeding a depth of four feet. (In accordance with Chapter 39.04 RCW and WAC 296-155-650, all costs for adequate trench safety systems are required to be identified in this Bid.) The Bidder certifies that the following amount is included in the Base Bid for Trench Excavation Safety Provisions. **If no** amount is entered, the Owner will presume that the Bidder represents that there are no Trench Excavation Safety costs for this Project.

Trench Safety System DOLLARS($ _____)

3.01 SUBCONTRACTOR LISTING:

THE BIDDER SHALL LIST SUBCONTRACTORS ON THE ALTERNATE BID PROPOSAL FORM (PART 2). IF SUBCONTRACTORS VARY WITH BID ALTERNATES, THE BIDDER MUST SO INDICATE ON THE ALTERNATE BID PROPOSAL FORM.

4.01 CONTRACT, BOND, INSURANCE CERTIFICATES:

If the undersigned is notified of the acceptance of this Bid within forty-five (45) calendar days after the time set for opening of bids (the "Bid Date"), or such longer period identified in the Bidding Documents, it agrees to execute and deliver to the Owner the Agreement Between Owner and Contractor in the form provided by the Owner for a compensation computed from the above sum and any Alternates selected by the Owner and to furnish the bond, insurance certificates and other documents as required by the Contract Documents within ten (10) days after issuance of the Letter of Intent to Award a Contract.

4.02 TIME OF COMPLETION:

The undersigned agrees, if awarded the Contract, to achieve Substantial Completion of the Work as described in the Standard Form of Agreement Between the Owner and Contractor, AIA Document A104-2017.

4.03 LIQUIDATED DAMAGES:

The Bidder, by submitting its Bid, represents that the liquidated damages specified in the Contract Documents are a reasonable estimate of the costs and damages to the Owner that would be incurred if the Contractor fails to achieve Substantial Completion within the Contract Time.

4.04 BID SECURITY:

5% of the Base Bid

The undersigned further agrees that the Bid security accompanying this Bid shall be left in escrow with the Owner. The Bid security constitutes a pledge that the Bidder will, if issued a Letter of Intent to Award, enter into the Contract with the Owner on the form provided and on the terms stated in its Bid and will furnish the payment and performance bonds, certificates of insurance, and all other documents required in the Contract Documents. Should the Bidder fail or refuse to enter into the Contract or fail or refuse to furnish such documents, the amount of the Bid security shall be forfeited to the Owner as liquidated damages, and not as a penalty.

5.01. APPRENTICES

The undersigned understands that, pursuant to RCW 39.04.320, the Contractor will be required to achieve apprentice participation of at least fifteen percent (15%) of the total construction labor hours and that further information on this requirement is contains in the statute and the Contract Documents.

6.01. ADDENDA:

Receipt of the following addenda is hereby acknowledged and all costs of the Work therefore have been included in the proposal.

Addendum No. _____ Dated _____

Addendum No. _____ Dated _____

Addendum No. _____ Dated _____

6.02 AS A CONDITION OF SUBMITTAL OF THIS BID, THE CONTRACTOR CERTIFIES THAT:

A. It will comply with the current Cowlitz County prevailing wages pursuant to RCW 39.12. See Washington State Prevailing Wage Rates and Benefit Code Key.

B. It is a registered contractor with RCW 18.27.

C. It will comply with RCW 70.92, Aged and Physically Handicapped.

D. It will comply with RCW 28A.400.330, Crimes Against Children.

E. It has a current state unified business identifier number.

F. It has industrial insurance coverage for the its employees working in Washington as required in Title 51 RCW

G. It has an employment security department number as required in Title 50 RCW.

H. It has a state excise tax registration number as required in Title 82 RCW

I. It is not disqualified from bidding on any public works contract under RCW 39.06.010 (unregistered or unlicensed contractors) or RCW 39.12.065(3) (prevailing wage violations).

J. Within the three-year period immediately preceding the Bid Date, the Bidder has not been determined by a final and binding citation and notice of assessment issued by the Department of Labor and Industries or through a civil judgment entered by a court of limited or general jurisdiction to have willfully violated, as defined in RCW 49.48.082, any provisions of chapter 49.46, 49.48 or 49.52 RCW.

The undersigned certifies under penalty of perjury under the laws of the State of Washington that the foregoing representations are true and correct.

7.01 BID FORM SIGNATURES:

THE UNDERSIGNED CERTIFIES THAT THEY ARE AUTHORIZED TO BIND THE LEGAL ENTITY MAKING THIS PROPOSAL.

Date:_____

Name of Firm:_____

Bidder's Signature:_____

Bidder's Printed Name:_____

Title:_____

Street Address:_____

City:_____

State:_____Zip Code:_____

Telephone Number:_____

STATE OF WASHINGTON CONTRACTOR'S NO:_____

FEDERAL ID NO:_____

DEPARTMENT OF LABOR & INDUSTRY REG. NO:_____

WASHINGTON STATE DEPARTMENT OF REVENUE NO:_____

7.02 NOTE: IF A BIDDER IS A CORPORATION, WRITE STATE OF INCORPORATION; AND IF A PARTNERSHIP, PROVIDE FULL NAMES AND ADDRESSES OF ALL PARTNERS BELOW.

A. (If Corporation) – State of Incorporation: _____

B. (If Partnership) – List all Partners:

1. Name:_____

   a. Address:_____

2. Name:_____

   a. Address:_____

3. Name:_____

   a. Address:_____

8.01 SUBCONTRACTOR LIST:

THE BIDDER SHALL NOT LIST MORE THAN ONE SUBCONTRACTOR FOR EACH CATEGORY OF WORK IDENTIFIED BELOW. (IF SUBCONTRACTORS VARY WITH BID ALTERNATES, THE BIDDER MUST SO INDICATE IN 11.02 BELOW.)

A. If awarded the Contract for the Work, the undersigned Bidder will subcontract directly with the Subcontractors listed below for performance of the categories of the Work designated.

B. The Bidder must list itself if it intends to perform a category of the Work itself.

FAILURE OF THE BIDDER TO SUBMIT THE NAMES OF THE FOLLOWING SUBCONTRATORS OR TO NAME ITSELF TO PERFORM SUCH WORK WITHIN ONE HOUR OF THE PUBLISHED BID OPENING TIME SHALL RENDER THE BIDDER'S BID NONRESPONSIVE AND, THEREFORE VOID.

Category of Work	Subcontractor/Self
Heating, ventilation, and air conditioning	
Plumbing as described in RCW 18.106	
Electrical work as described in RCW 19.28	

FAILURE OF THE BIDDER TO SUBMIT THE NAMES OF THE FOLLOWING SUBCONTRATORS OR TO NAME ITSELF TO PERFORM SUCH WORK WITHIN FORTY-EIGHT HOURS OF THE PUBLISHED BID OPENING TIME SHALL RENDER THE BIDDER'S BID NONRESPONSIVE AND, THEREFORE VOID.

Category of Work	Subcontractor/Self
Structural Steel Installer	
Rebar Installer	

C. ALTERNATE SUBCONTRACTORS: Should the bid for an Alternate require a different Subcontractor, the Subcontractor must be identified in 11.02 below.

8.02 ALTERNATE SUBCONTRACTOR LIST:

SHOULD THE BID FOR AN ALTERNATE REQUIRE A SUBCONTRACTOR DIFFERENT FROM THE SUBCONTRACTOR LISTED IN 11.01 ABOVE, THE SUBCONTRACTOR MUST BE IDENTIFIED BELOW ALONG WITH THE AFFECTED CATEGORY OF THE WORK AND ALTERNATE NUMBER(S).

Name of Different Subcontractor for Alternate(s)	Category of Work	Alternate Number(s)

END OF BID PROPOSAL FORM

AIA® Document A104™ – 2017

Standard Abbreviated Form of Agreement Between Owner and Contractor

AGREEMENT made as of the ____day of _____in the year Two Thousand Twenty-Three
(In words, indicate day, month and year.)

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

Longview School District No. 122
2715 Lilac Street
Longview, Washington 98632

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

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

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

Heat Pump Replacement and Indoor Air Quality Improvements
Columbia Valley Gardens Elementary; 2644 30th Avenue, and
Mark Morris High School; 1602 Mark Morris Court
Longview, Washington 98632

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

Integrus Architecture
117 South Main Street, Suite 100
Seattle, Washington 98104

The Owner and Contractor agree as follows.

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ARTICLE 1 THE WORK OF THIS CONTRACT

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

ARTICLE 2 DATE OF COMMENCEMENT AND SUBSTANTIAL COMPLETION

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

~~[ ] The date of this Agreement.~~

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

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

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

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

§ 2.3 Substantial Completion

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

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

[X] By the following date: The Contractor shall achieve Substantial Completion of the entire Work no later than August 18, 2023, and shall achieve Final Completion within thirty days of achieving Substantial Completion.

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

Portion of Work	Substantial Completion Date

§ 2.3.3 If the Contractor fails to achieve Substantial Completion as provided in this Section 2.3, liquidated damages, if any, shall be assessed as set forth in Section 3.5.

ARTICLE 3 CONTRACT SUM

§ 3.1 The Owner shall pay the Contractor the Contract Sum in current funds for the Contractor's performance of the Contract. The Contract Sum shall be one of the following:
(Check the appropriate box.)

[X] Stipulated Sum, in accordance with Section 3.2 below

[~~– ~~] ~~Cost of the Work plus the Contractor's Fee, in accordance with Section 3.3 below~~

[~~– ~~] ~~Cost of the Work plus the Contractor's Fee with a Guaranteed Maximum Price, in accordance with Section 3.4 below~~

(Based on the selection above, complete Section 3.2, 3.3 or 3.4 below.)

§ 3.2 The Stipulated Sum shall be ~~($),~~ _____ Dollars ($_____), subject to additions and deductions as provided in the Contract Documents. This amount does not include Washington State or local sales tax.

§ 3.2.1 The Stipulated Sum is based upon the following alternates, if any, which are described in the Contract Documents and are hereby accepted by the Owner:
(State the numbers or other identification of accepted alternates. If the bidding or proposal documents permit the Owner to accept other alternates subsequent to the execution of this Agreement, attach a schedule of such other alternates showing the amount for each and the date when that amount expires.)

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§ 3.2.2 Unit prices, if ~~any:~~any are as follows; these descriptions are summary in nature, and the scope of this work is described in the Contract Documents:
(Identify the item and state the unit price and the quantity limitations, if any, to which the unit price will be applicable.)

Item	Units and Limitations	Price per Unit ($0.00)

§ 3.2.3 Allowances, if any, included in the stipulated sum:
(Identify each allowance.)

Item	Price

~~§ 3.3 Cost of the Work Plus Contractor's Fee~~
~~**§ 3.3.1** The Cost of the Work is as defined in Exhibit A, Determination of the Cost of the Work.~~

~~**§ 3.3.2** The Contractor's Fee:~~
(State a lump sum, percentage of Cost of the Work or other provision for determining the Contractor's Fee and the method of adjustment to the Fee for changes in the Work.)

~~**§ 3.4 Cost of the Work Plus Contractor's Fee With a Guaranteed Maximum Price**~~
~~**§ 3.4.1** The Cost of the Work is as defined in Exhibit A, Determination of the Cost of the Work.~~

~~**§ 3.4.2** The Contractor's Fee:~~
(State a lump sum, percentage of Cost of the Work or other provision for determining the Contractor's Fee and the method of adjustment to the Fee for changes in the Work.)

~~§ 3.4.3 Guaranteed Maximum Price~~
~~**§ 3.4.3.1** The sum of the Cost of the Work and the Contractor's Fee is guaranteed by the Contractor not to exceed ($), subject to additions and deductions by changes in the Work as provided in the Contract Documents. This maximum sum is referred to in the Contract Documents as the Guaranteed Maximum Price. Costs which would cause the Guaranteed Maximum Price to be exceeded shall be paid by the Contractor without reimbursement by the Owner.~~
(Insert specific provisions if the Contractor is to participate in any savings.)

~~**§ 3.4.3.2** The Guaranteed Maximum Price is based on the following alternates, if any, which are described in the Contract Documents and are hereby accepted by the Owner:~~
(State the numbers or other identification of accepted alternates. If the bidding or proposal documents permit the Owner to accept other alternates subsequent to the execution of this Agreement, attach a schedule of such other alternates showing the amount for each and the date when that amount expires.)

~~**§ 3.4.3.3** Unit Prices, if any:~~
(Identify the item and state the unit price and the quantity limitations, if any, to which the unit price will be applicable.)

Item	Units and Limitations	Price per Unit ($0.00)

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~~**§ 3.4.3.4** Allowances, if any, included in the Guaranteed Maximum Price:~~
(Identify each allowance.)

Item	Price

~~**§ 3.4.3.5** Assumptions, if any, on which the Guaranteed Maximum Price is based:~~

~~**§ 3.4.3.6** To the extent that the Contract Documents are anticipated to require further development, the Guaranteed Maximum Price includes the costs attributable to such further development consistent with the Contract Documents and reasonably inferable therefrom. Such further development does not include changes in scope, systems, kinds and quality of materials, finishes or equipment, all of which, if required, shall be incorporated by Change Order.~~

~~**§ 3.4.3.7** The Owner shall authorize preparation of revisions to the Contract Documents that incorporate the agreed-upon assumptions contained in Section 3.4.3.5. The Owner shall promptly furnish such revised Contract Documents to the Contractor. The Contractor shall notify the Owner and Architect of any inconsistencies between the agreed-upon assumptions contained in Section 3.4.3.5 and the revised Contract Documents.~~

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

The Owner will assess, and the Contractor will be responsible for, liquidated damages in the amount of $500 per day for each calendar day beyond the Contract Time that Substantial Completion of each site is not timely achieved. This liquidated damage amount shall apply separately and independently for each site, so if two or more sites are not timely complete the liquidated damage amount will be assessed for each site.

ARTICLE 4 PAYMENT

§ 4.1 Progress Payments

§ 4.1.1 Based upon Applications for Payment submitted to the Architect by the Contractor and Certificates for Payment issued by the Architect, the Owner shall make progress payments on account of the Contract Sum to the Contractor as provided below and elsewhere in the Contract Documents. Each Application for Payment shall be based upon the Schedule of Values submitted by the Contractor to the Architect prior to commencement of the Work. The Schedule of Values shall allocate the entire Contract Sum among the various portions of the Work and be prepared in such form and supported by such data to substantiate its accuracy as the Owner and the Architect may reasonably require. The Schedule of Values shall allocate, and list as separate line items, at least 3% of the Contract Sum to the Work to be completed between Substantial Completion and Final Completion. One half of this amount shall be allocated for punch list work; the other half shall be for providing approved operations and maintenance data, delivery of record drawings, warranties and bonds, extra stock, and all other documentation, work, or items necessary to achieve Final Completion. None of these percentages is the statutory retainage described in Section 4.1.4 or any other retainage but rather requires the Contractor to recognize that the Contractor and its Subcontractors will expend significant costs in advancing the Work from Substantial Completion to Final Completion. These amounts are not earned until Final Completion is accomplished.

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

§ 4.1.2.1 Draft Application. Within the first three days of each month, the Contractor shall submit to the Architect a report on the current progress of the Work as compared to the Contractor's CPM Construction Schedule, an updated Construction Schedule, and a draft, itemized application for payment for Work performed during the prior calendar month on a State of Washington Application for Payment on Contract form approved by the Owner. This shall not constitute a payment request. The Contractor, the Architect and the Owner shall meet within the next ten days and confer regarding the current progress of the Work and the amount of payment to which the Contractor is entitled. The

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Architect or the Owner may request the Contractor to provide data substantiating the Contractor's right to payment as the Owner or the Architect may require, such as copies of requisitions from Subcontractors of any tier, lien releases, and certified payroll records, and reflecting retainage as provided elsewhere in the Contract Documents. The Contractor shall not be entitled to make a payment request, nor is any payment due the Contractor, until such data is furnished.

§ 4.1.2.2 Payment Request. Within ten days after the Contractor and the Owner have met and conferred regarding the draft application, and the Contractor has furnished all data requested, the Contractor may submit a payment request in the agreed-upon amount, in the form of a notarized, itemized Application for Payment for Work performed during the prior calendar month on a form supplied or approved by Owner. Among other things, the Application shall state that prevailing wages have been paid in accordance with the prefiled statement(s) of intent to pay prevailing wages on file with the Owner and that all payments due Subcontractors from the Owner's prior payments have been made. The submission of this Application constitutes a certification that the Work is current on the Progress Schedule, unless otherwise noted on the Application.

§ 4.1.2.3 Disputed Amounts. If the Contractor believes it is entitled to payment for Work performed during the prior calendar month in addition to the agreed-upon amount, the Contractor may, within the same time periods, submit to the Owner and the Architect a separate written payment request specifying the exact additional amount due, the category in the Schedule of Values in which the payment is due, the specific Work for which the additional amount is due, and why the additional payment is due.

§ 4.1.2.4 Payments to Subcontractors. No payment request shall include amounts for a Subcontractor that the Contractor does not intend to pay to the Subcontractor. If, after making a request for payment but before paying a Subcontractor for its performance covered by the payment request, the Contractor determines that part or all of the payment otherwise due to the Subcontractor will be withheld from the Subcontractor for unsatisfactory performance, the Contractor may withhold the amount as allowed under its subcontract, but it shall give the Subcontractor, the Owner and the Architect written notice of the remedial actions that must be taken as soon as practicable after determining the cause for the withholding but before the due date for the Subcontractor payment, and pay the Subcontractor within eight working days after the Subcontractor satisfactorily completes the remedial action identified in the notice.

§ 4.1.3 Provided that an approved Application for Payment is received by the Architect ~~not later than the day of a month,~~ and the Owner as described above, the Owner shall make payment of the certified amount to the Contractor not later than ~~the day of the month. If an~~ thirty days after the Architect certifies the Application. If an approved Application for Payment is received by the Architect and the Owner after the date fixed above, payment shall be made by the Owner not later than thirty (30) days after the Architect ~~receives the~~ certifies the approved Application for Payment.
(Federal, state or local laws may require payment within a certain period of time.)

§ 4.1.4 For each progress payment ~~made prior to Substantial Completion of the Work, the~~ made, the Owner may withhold retainage from the payment otherwise due as follows:
(Insert a percentage or amount to be withheld as retainage from each Application for Payment and any terms for reduction of retainage during the course of the Work. The amount of retainage may be limited by governing law.)

Five percent (5%) retainage will be held and applied by the Owner as a trust fund in a manner required by RCW 60.28, "Lien for Labor, Materials, Taxes on Public Works." Release of the retainage will be processed in the ordinary course of business upon the expiration of sixty days following Final Acceptance of the Work by the Owner provided that no notice of lien shall have been given as provided in RCW 60.28, that no claims have been brought to the attention of the Owner and that the Owner has no known claims under this Contract; and provided further that release of retention has been duly authorized by the State. The following items must be obtained prior to release of retainage: pursuant to RCW 60.28, a certificate from the Department of Revenue; pursuant to RCW 50.24, "Contributions by Employers," a certificate from the Department of Employment Security; and a certificate from the Department of Labor and Industries.

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

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% Payments due and unpaid under the Contract Documents shall bear interest as specified in RCW 39.76, not to exceed Bank of America prime rate plus two percent.

§ 4.2 Final Payment

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

.1 the Contractor has fully performed the Contract except for the Contractor's responsibility to correct Work as provided in Section 18.2, and to satisfy other requirements, if any, which extend beyond final payment; and

.2 ~~the Contractor has submitted a final accounting for the Cost of the Work, where payment is on the basis of the Cost of the Work with or without a Guaranteed Maximum Price; and~~

.3 ~~a~~ final Certificate for Payment has been issued by the Architect in accordance with Section ~~15.7.1.~~ 15.7.1, Final Acceptance has occurred, and the requirements of Article 15 are completed.

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

The retainage will be paid to the Contractor in accordance with statutory requirements.

ARTICLE 5 DISPUTE RESOLUTION

§ 5.1 Binding Dispute Resolution

For any claim subject to, but not resolved by, mediation pursuant to Section 21.5, the method of binding dispute resolution shall be as follows:
(Check the appropriate box.)

~~[–] Arbitration pursuant to Section 21.6 of this Agreement~~

~~[–] Litigation in a court of competent jurisdiction~~

[X] Other *(Specify)*

Litigation in Cowlitz County Superior Court

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

ARTICLE 6 ENUMERATION OF CONTRACT DOCUMENTS

§ 6.1 The Contract Documents are defined in Article 7 and, except for Modifications issued after execution of this Agreement, are enumerated in the sections below.

§ 6.1.1 The Agreement is this executed revised AIA Document A104™–2017, Standard Abbreviated Form of Agreement Between Owner and Contractor.

~~**§ 6.1.2** AIA Document E203™–2013, Building Information Modeling and Digital Data Exhibit, dated as indicated below:~~
~~*(Insert the date of the E203–2013 incorporated into this Agreement.)*~~

~~**§ 6.1.3** The Supplementary and other Conditions of the Contract:~~ **§ 6.1.3** The Project Manual dated _____, 2023 and all documents therein:

Document	Title	Date	Pages
See the Table of Contents in the Project Manual.			

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Further, this contract is funded through the U.S. Department of Education's "Education Stabilization Fund Program Elementary and Secondary School Emergency Relief Fund" (ESSER Fund). See Article 19 and the attached "§5.5 Contract provisions and related matters" for applicable Federal ESSER terms and conditions.

§ 6.1.4 The Specifications:
(Either list the Specifications here or refer to an exhibit attached to this Agreement.)

See the Table of Specifications in the Project Manual.

Section	Title	Date	Pages

§ 6.1.5 The Drawings:
(Either list the Drawings here or refer to an exhibit attached to this Agreement.)

See the Index of Drawings in the Project Manual.

Number	Title	Date

§ 6.1.6 The Addenda, if any:

Number	Date	Pages

Portions of Addenda relating to bidding or proposal requirements are not part of the Contract Documents unless the bidding or proposal requirements are enumerated in this Article 6.

§ 6.1.7 Additional documents, if any, forming part of the Contract Documents:

.1 Other Exhibits:
(Check all boxes that apply.)

~~[ ] Exhibit A, Determination of the Cost of the Work.~~

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

~~_____~~

~~[ ] The Sustainability Plan:~~

~~Title~~	~~Date~~	~~Pages~~

~~[ ] Supplementary and other Conditions of the Contract:~~

~~Document~~	~~Title~~	~~Date~~	~~Pages~~

.2 Other documents, if any, listed below:
(List here any additional documents that are intended to form part of the Contract Documents.)

Department of Labor and Industries Prevailing Wage Rates.

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ARTICLE 7 GENERAL PROVISIONS

§ 7.1 The Contract Documents

The Contract Documents are enumerated in Article 6 and consist of this Agreement (including, if applicable, Supplementary and other Conditions of the Contract), Drawings, Specifications, Addenda issued prior to the execution of this Agreement, other documents listed in this Agreement, and Modifications issued after execution of this Agreement. 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. 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 to the extent consistent with the Contract Documents and reasonably inferable from them as being necessary to produce the indicated results. In the event of a conflict or discrepancy among or in the Contract Documents, interpretation shall be governed in the following priority, with an Addendum to a Contract Document having precedence over the original document and later Addenda having precedence over earlier:

.1 Agreement (revised A104-2017) (written amendments having precedence)
.2 Any Special Conditions
.3 Any Supplementary Conditions
.4 Specifications
.5 Drawings (large-scale having precedence over small-scale, and written or computed dimensions having precedence over scaled dimensions)
.6 Material and systems schedules.

In the event that Work is shown on drawings or described in schedules but not described in specifications, the Work as described or shown shall be provided at no change in the Contract Sum or Contract Time despite not being described in specifications.

§ 7.2 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 Architect and Contractor, (2) between the Owner and a Subcontractor or sub-subcontractor, (3) between the Owner and Architect or (4) between any persons or entities other than the Owner and the Contractor.

§ 7.3 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.

§ 7.4 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.

§ 7.5 Ownership and use of Drawings, Specifications and Other Instruments of Service

§ 7.5.1 ~~The~~ Subject to the rights of the Owner, 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 will 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.

§ 7.5.2 The Contractor, Subcontractors, Sub-subcontractors and suppliers are ~~authorized~~ granted a limited license to use and reproduce the Instruments of Service provided to them, subject to the protocols established pursuant to Sections 7.6 and 7.7, 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,

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Sub-subcontractors, and suppliers may not use the Instruments of Service on other projects or for additions to this Project outside the scope of the Work without the specific written consent of the Owner, Architect and the Architect's consultants.

§ 7.6 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.

§ 7.7 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,~~ an agreement for the use of such building information model 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.

§ 7.8 Severability

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.

§ 7.9 Notice

§ 7.9.1 Except as otherwise provided in Section 7.9.2, where the Contract Documents require one party to notify or give notice or a Claim to the other party, such notice or Claim 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 in accordance with AIA Document E203™–2013, Building Information Modeling and Digital Data Exhibit, if completed, or as otherwise set forth below:~~transmission. *(If other than in accordance with AIA Document E203–2013, insert requirements for delivering Notice in electronic format such as name, title and email address of the recipient and whether and how the system will be required to generate a read receipt for the transmission.)*

§ 7.9.2 Notice of Claims and Claims 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.~~of delivery, or by email if the email is clearly marked in the regarding line as a Notice of Claim or as a Claim.

§ 7.10 Relationship of the Parties

~~Where the Contract is based on the Cost of the Work plus the Contractor's Fee, with or without a Guaranteed Maximum Price, the~~ The Contractor accepts the relationship of trust and confidence established by this Agreement and covenants with the Owner to cooperate with the Architect and exercise the Contractor's skill and judgment in furthering the interests of the Owner; to furnish efficient business administration and supervision; to furnish at all times an adequate supply of workers and materials; and to perform the Work in an expeditious and economical manner consistent with the Owner's interests. The Owner agrees to furnish and approve, in a timely manner, information required by the Contractor and to make payments to the Contractor in accordance with the requirements of the Contract Documents.

ARTICLE 8 OWNER

§ 8.1 Information and Services Required of the Owner

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~~**§ 8.1.1** Prior to commencement of the Work, at the 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 8.1.1, the Contract Time shall be extended appropriately.~~

§ 8.1.2 The Owner shall furnish all necessary surveys and a legal description of the ~~site.~~site except to the extent that the Contract Documents otherwise require the Contractor to provide and/or maintain survey information. The Owner is the person or entity identified as such in the Agreement and means the School District's Board of Directors. The "Owner" does not include teachers, the school principal, staff, custodians, maintenance or safety workers, or other Owner employees or consultants that may contact the Contractor or be present at the Project sites. A WAIVER OF ANY PROVISION OF THE CONTRACT DOCUMENTS CAN ONLY BE MADE IN WRITING AND BY THE SCHOOL DISTRICT'S BOARD OF DIRECTORS. No other person is authorized to grant such waivers on behalf of the Owner.

§ 8.1.3 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.

§ 8.1.4 Except for permits and fees that are the responsibility of the Contractor under the Contract Documents, including those required to be secured by the Contractor under Section 9.6.1, the Owner shall secure and pay for ~~other necessary~~ the necessary environmental approvals, easements, assessments, and related charges required for the construction, use, or occupancy of permanent structures or for permanent changes in existing facilities.

§ 8.2 Owner's Right to Stop the Work

If the Contractor fails to perform Work in a good and workmanlike manner, or to correct Work which is not in accordance with the requirements of the Contract Documents, or materially or repeatedly fails to carry out the Work in accordance with the Contract Documents, the Owner may issue a written ~~order~~ order, signed personally or by an agent specifically so empowered by the Owner, to the Contractor to stop the Work, or any portion thereof, until the cause for such order is 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.

§ 8.3 Owner's Right to Carry Out the Work

If the Contractor defaults or fails 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,~~ or fails to perform a provision of the Contract, the Owner may, after five days' written notice to the Contractor and without prejudice to any 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~~ The Owner or Architect may, pursuant to Section 15.4.3, 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 the Owner's expenses and compensation for the Architect's additional services made necessary by such default, neglect, or failure. 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 21.

ARTICLE 9 CONTRACTOR

§ 9.1 Review of Contract Documents and Field Conditions by Contractor

§ 9.1.1 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. The Contractor represents and acknowledges that the Contract Sum is reasonable compensation for all the Work, that it is performing with its own forces any percentage of Work specified in the Contract Documents or Bidding Documents (not including general conditions), that the Contract Time is adequate for the performance of the Work, and that it has carefully examined the Contract Documents and the Project site, including any existing structures, and that it has satisfied itself as to the nature, location, character, quality and quantity of the Work, the labor, materials, equipment, goods, supplies, work, services and other items to be furnished and all other requirements of the Contract Documents, as well as the conditions and other matters that may be encountered at the Project site or affect performance of the Work or the cost or difficulty thereof, including but not limited to those conditions and matters affecting: transportation, access, disposal, handling and storage of materials,

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equipment and other items; availability and quality of labor, water, electric power and utilities; normal climatic conditions and seasons; physical conditions at the Project site and the surrounding locality; and equipment and facilities needed preliminary to and at all times during the performance of the Work.

§ 9.1.2 Because the Contract Documents are complementary, the Contractor shall, before starting each portion of the Work, carefully study and compare the various Drawings, Specifications, and other Contract Documents relative to that portion of the Work, as well as the information furnished by the Owner pursuant to Section 8.1.2, shall take field measurements of and verify any existing conditions related to that portion of the Work before commencing activities affected thereby 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 Owner and Architect any errors, inconsistencies, or omissions discovered by or made known to the Contractor as a request for information in such form as the Owner or 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. If the Contractor believes that additional cost or time is involved because of any design errors or omissions or inconsistencies noted by the Contractor during this review, or clarifications or instructions issued by the Owner or the Architect in response to the Contractor's notices or requests for information, the Contractor shall make Claims as provided herein.

§ 9.1.3 The Contractor shall comply with but 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 in writing to the Owner and Architect any nonconformity discovered by or made known to the Contractor as a request for information in such form as the Architect may require.

§ 9.2 Supervision and Construction Procedures

§ 9.2.1 The Contractor's designated representative shall have express authority to bind the Contractor with respect to all matters under this Contract. The Contractor will provide a project superintendent who will be on site continuously while work is being performed during the duration of the Project. The Owner shall have the right to approve the superintendent and project manager as well as any field engineers. 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, unless the Contract Documents give other specific instructions concerning these matters. The Contractor shall be an independent contractor in the performance of the Work and shall have complete control over and responsibility for all personnel performing the Work. The Contractor is not authorized to enter into any agreements on behalf of the Owner or to act as or be an agent or employee of the Owner. If the Contract Documents give specific instructions concerning construction means, methods, techniques, sequences or procedures, the Contractor shall be fully and solely responsible for the jobsite safety thereof unless the Contractor gives timely written notice to the Owner and Architect that such means, methods, techniques, sequences or procedures may not be safe.

§ 9.2.2 The Contractor shall be responsible to the Owner for acts and omissions of the Contractor's employees, Subcontractors of any tier 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.

§ 9.2.3 The Contractor shall take care that the new Work covered by this Agreement properly interfaces and is compatible with the existing structure. The Contractor should perform or direct performance of whatever reasonable on-site investigation may be necessary to determine the condition of the existing structure so that the Work which will result from this Agreement is compatible and interfaces with the as-built conditions of the existing structure.

§ 9.2.4 The Contractor shall perform such detailed examination, inspection and quality surveillance of the Work as will ensure that the Work is progressing and is being completed in strict accordance with the Contract Documents. The Contractor shall plan and lay out all Work in advance of operations so as to coordinate all Work without delay or revision. The Contractor shall be responsible for coordination of all the Drawings related to specific locations. 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. Under no conditions shall a section of Work proceed prior to preparatory Work having been completed and made satisfactory to receive the related Work. The Contractor shall ensure that the responsible Subcontractor has carefully examined all preparatory Work that has been executed to receive its Work and has notified the Contractor (who shall notify the Owner and Architect in writing) of any defects

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or imperfections in preparatory Work that will, in any way, affect satisfactory completion of the Work. The lack of such notification shall constitute an acceptance of preparatory Work, and a waiver of any later Claim or defect therein.

§ 9.2.5 Any investigations of hidden or subsurface conditions have been made for design purposes. The results of these investigations may be included in the Project Manual or otherwise available for the convenience of bidders but are not a part of the Contract Documents. While the Contractor may consider such investigation results, there is no guarantee, express or implied, that the conditions indicated are representative of those existing throughout the sites or that unforeseen developments may not occur. The Contractor is solely responsible for reasonably interpreting the information and extrapolating beyond the testing location, including each individual boring, test pit or other location.

§ 9.2.6 The Contractor shall do no Work without applicable Drawings, Specifications, or written modifications or, where required, Shop Drawings, Product Data, or Samples, unless instructed to do so in writing by the Architect and the Owner.

§ 9.3 Labor and Materials

§ 9.3.1 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.

§ 9.3.2 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 skilled in tasks assigned to them.

§ 9.3.3 After the Contract has been executed, the Owner and Architect may consider a written request for the substitution of material or products in place of those specified in the Contract Documents only under exceptional circumstances described in, and following the procedures of, the Contract Documents. The written request must include the specifications for the material or product and any proposed change in the Contract Sum or Contract Time. The Contractor may make a substitution only with the consent of the Owner, after evaluation by the Architect and in accordance with a Modification. By requesting a substitution, the Contractor represents that it has personally investigated the proposed material or product and determined that it is equal or better in all respects to that specified (or if not equal or better in all respects, the Contractor shall identify such deficiencies), that the same or better warranty will be provided for the substitution, that complete cost data, including all direct and indirect costs of any kind, has been presented, that it waives any other known or unknown Claim for an increase in Contract Sum or Contract Time resulting from the substitution, that it has coordinated with affected Subcontractors and the proposed substitution will not impact other parts of the Work, and that it will coordinate the installation of the substitute if accepted and make all associated changes in the Work.

§ 9.3.4 The Contractor shall deliver, handle, store and install materials in accordance with manufacturers' instructions.

§ 9.3.5 The Contractor shall be responsible to the Owner for the acts and omissions of the Contractor's employees, Subcontractors and their agents and employees, and other persons performing portions of the Work under a contract with the Contractor. The Contractor shall not permit employment of unfit persons or persons not skilled in tasks assigned to them. At no change to the Contract Sum or Contract Time, the Owner may provide written notice requiring the Contractor to remove from the Work any employee or other person carrying out the Work that the Owner considers objectionable. Pursuant to Washington law, a person shall be unfit if he or she is a registered sex offender or has pled guilty to or has been convicted of any felony crime involving the physical injury or death of a child (RCW 9A.32 or RCW 9A.36 but not RCW 46.61 – motor vehicle violation), the physical neglect of a child (RCW 9A.32), sexual offenses against a minor (RCW 9A.44), sexual exploitation of a child (RCW 9.68A), the sale or purchase of a minor child (RCW 9A.64.030), promoting prostitution of a child (RCW 9A.88), or violation of similar laws of another jurisdiction. The Contractor shall not permit any contact between children at the Project site and any such employee. Failure to comply with these requirements is grounds for immediate termination of the Agreement for cause.

§ 9.3.6 Apprenticeship.

§ 9.3.6.1 Pursuant to RCW 39.04.320, no less than fifteen percent (15%) of the Labor Hours shall be performed by apprentices, unless a different amount is permitted or otherwise required by law.

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§ 9.3.6.2 Apprenticeship hours shall be performed by participants in training programs approved by the Washington State Apprenticeship Council.

§ 9.3.6.3 "Labor Hours" means the total hours of workers receiving an hourly wage who are directly employed on the site of the public works project. "Labor hours" includes hours performed by workers employed by the Contractor and all Subcontractors working on the Project. "Labor hours" does not include hours worked by foremen, superintendents, owners, and workers who are not subject to prevailing wage requirements of RCW 39.12.

§ 9.3.6.4 During the term of this Contract, the Owner may adjust the apprenticeship labor hour requirement upon its finding or determination that includes:

(1) A demonstration of lack of availability of apprentices in the geographic area of the Project;
(2) A disproportionately high ratio of material costs to labor hours that does not make feasible the required minimum levels of apprenticeship participation;
(3) Demonstration by participating contractors of a good faith effort to comply with the requirements of RCW 39.04.300, 39.04.310 and 39.04.320;
(4) Small contractors or subcontractors (e.g., small or emerging businesses) would be forced to displace regularly employed members of their workforce;
(5) The reasonable and necessary requirements of the Contract render apprentice utilization infeasible at the required level (e.g., the number of skilled workers required and/or limitations on the time available to perform the Work preclude utilization of apprentices); or
(6) Other criteria the Owner deems appropriate, which are subject to review by the office of the Governor.

§ 9.3.6.5 The Contractor shall report apprentice participation to the Owner at least monthly, or directly to L&I, on forms provided or approved by the Owner. In addition, copies of monthly certified payroll records may be requested to document the goal including copies with any birthdates and social security numbers (and any other sensitive personal information) redacted so as such copies may be used to respond to any public records requests. The reports will include:

(1) The name of the Project;
(2) The dollar value of the Project;
(3) The date of the Contractor's notice to proceed;
(4) The name of each apprentice and apprentice registration number;
(5) The number of apprentices and labor hours worked by them, categorized by trade or craft;
(6) The number of journey level workers and labor hours worked by them, categorized by trade or craft; and
(7) The number, type, and rationale for the exceptions granted.

§ 9.3.6.6 To comply with the changes to RCW 39.04.320 that are effective as of January 1, 2020, the following provisions also apply:

(1) This Section 9.3.6 specifies that the 39.04.320 apprenticeship goals should be met;
(2) The Owner shall provide a monetary incentive of One Thousand Dollars for meeting these goals;
(3) The Contractor shall pay a monetary penalty of One Thousand Dollars for not meeting these goals;
(4) The Owner is not in a position within existing resources to identify an expected cost value to be included in the bid associated with meeting these goals; and
(5) Contractor and its Subcontractors are not required to exceed these apprenticeship utilization requirements.

§ 9.4 Warranty

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 be performed in a skillful and workmanlike manner, that the Contractor will exercise reasonable care in performing the Work, that the Work will strictly be completed in accordance with Drawings and Specifications, and 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~~ requirements, including substitutions not properly approved and authorized, may be considered defective. The Contractor's warranty excludes remedy for damage or defect caused by abuse, alterations to the Work not executed or supervised by the Contractor, improper or insufficient maintenance, improper operation or normal wear and tear under normal ~~usage.~~ usage, but does not exclude any implied warranty that may be available by applicable law. All other 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

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with Section 15.6.3. If requested by the Owner or Architect, the Contractor shall furnish satisfactory evidence as to the kind and quality of materials and equipment. The Contractor is not relieved of its general warranty obligations by the specification of a particular product or procedure in the Contract Documents. Warranties in the Contract Documents shall survive Final Completion and Final Acceptance. The Contractor shall collect, assign, and deliver to the Owner any specific written guarantees and warranties given by others. Prior to furnishing the Owner with written guarantees and warranties, the Contractor shall provide copies to the Owner and Architect for review and approval.

§ 9.5 Taxes

The Contractor shall pay sales, consumer, use, and other similar taxes that are legally enacted when bids are received or negotiations concluded, whether or not yet effective or merely scheduled to go into effect. Washington State sales tax will be paid by the Owner to the Contractor. A proportionate amount of the sales tax, in accordance with the sales tax rate at the project site, will be added to each payment voucher issued to the Contractor. All other taxes shall be paid by the Contractor.

§ 9.6 Permits, Fees, Notices, and Compliance with Laws

§ 9.6.1 Unless otherwise provided in the Contract Documents, the ~~Contractor shall secure and pay for the building permit as well as other permits, fees,~~ Owner will pay only for any permits and governmental fees explicitly listed as the Owner's responsibility in the Contract Documents, and the Contractor shall secure and pay for all as a part of the Contract Sum all other governmental fees and permits, including without limitation all subcontractor permits and fees including plan check fees for deferred submittals, application fees and review fees for any and all shop drawings or bidder designed systems, any inspection fees not covered by the initial building permit fee, including reinspection fees, mechanical and electrical permits, 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. The Contractor will be responsible for, and will not be reimbursed for, license fees or any renewals or penalties. The Contractor shall coordinate and schedule all Work with permitting agencies and utility companies necessary for completion of the Work.

§ 9.6.2 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. The Contractor shall promptly notify the Architect and Owner if the Drawings and Specifications are observed by the Contractor to be at variance therewith. 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.

§ 9.7 Allowances

The Contractor shall include in the Contract Sum all allowances stated in the Contract Documents. The Owner shall select materials and equipment under allowances with reasonable promptness. Allowance amounts shall include the costs to the Contractor of materials and equipment delivered at the site and all required taxes, less applicable trade discounts. Contractor's costs for unloading and handling at the site, labor, installation, overhead, profit, and other expenses contemplated for stated allowance amounts shall be included in the Contract Sum but not in the allowance. 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 the difference between actual, reasonable costs and the allowances under Section 3.2.3, except where the allowance is based upon a unit price specified in the Agreement in which case the unit prices shall be used in lieu of actual costs. Allowances are defined in the Contract Documents due to the uncertainty in the scope, price and quantity of the Allowance items at the time the Contract was executed. The Contractor must provide the Owner with written notice of its intent to exceed an allowance amount, with estimates and justification (providing the Owner with the opportunity to approve or reject the excess costs) before exceeding an allowance amount.

§ 9.8 Contractor's Construction Schedules

§ 9.8.1 The Contractor will be responsible for planning, scheduling, managing and reporting the progress of the Work in accordance with all of the specific methods and submittals described in the Contract Documents. 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~~ Work ("construction schedule"), which shall be consistent with the milestones set forth in the Contract Documents. Neither the Owner nor the Architect have responsibility for the substance of the Contractor's construction schedule. The construction schedule shall not exceed time limits current under the Contract Documents, shall be revised at appropriate intervals as required by the conditions of the Work and

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Project, shall be related to the entire Project to the extent required by the Contract Documents, and shall provide for expeditious and practicable execution of the Work. The Contractor shall perform the Work, and shall attain completion of the Work, in accordance with the most recent construction schedule submitted to the Owner and Architect and shall promptly notify the Owner and Architect of any deviations from the construction schedule.

§ 9.8.1.1 The Contractor's construction schedule shall be prepared by a competent scheduler, and used by the Contractor to plan, prosecute, and coordinate the Work in an orderly and expeditious manner. The construction schedule shall be submitted as both a paper copy and in native electronic format, any of which must include data files that can be loaded onto the Owner's copy of the scheduling software and be capable of being printed. The Contractor's construction schedule may be used by the Owner and the Architect to evaluate progress and status at the various stages of the Project, allocate funds consistent with the Schedule of Values, determine the impact of any changes to the Contract, and establish the basis for progress payments. Such review shall not constitute an approval or acceptance of the Contractor's construction means, methods or sequencing, or its ability to complete the Work in a timely manner.

§ 9.8.2 The Contractor shall perform the Work in general accordance with the most recent schedule submitted to the Owner and Architect. The Contractor shall not be entitled to any adjustment in the Contract Time, the Contractor's construction schedule, or the Contract Sum, or to any additional payment of any sort by reason of the loss or use of any float time, including time between the Contractor's anticipated completion date and end of the Contract Time, whether or not the float time is described as such on the Contractor's construction schedule. To ensure that the Owner is substantively aware and effectively able to mitigate any Project delays, the Contractor shall not be entitled to any extension of time, compensable or otherwise, for any delay that occurred during any time the Contractor has not timely submitted an updated construction schedule as required by the Contract Documents.

§ 9.8.3 The Contractor shall prepare and submit at the weekly Project status meetings three-week look-ahead schedules that relate to the overall construction schedule. At each weekly meeting with the Owner, the Contractor shall also submit (1) a short interval schedule in bar chart form showing the activities planned for the next week, and (2) a report showing actual starts and finishes from planned progress from the previous week.

§ 9.9 Submittals

§ 9.9.1 The Contractor shall ~~review for compliance with the Contract Documents~~ be responsible for tracking the status of submittals. The Contractor shall review for compliance with the Contract Documents, note any deviations from the Contract Documents, and submit to the Architect Shop Drawings, Product Data, Samples, and similar submittals required by the Contract Documents in coordination with the Contractor's construction schedule and in such sequence as to allow the Architect reasonable time for review. 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. The Work shall be in accordance with approved submittals.

§ 9.9.2 Shop Drawings, Product Data, Samples and similar submittals are not Contract Documents. These shall be available to the Architect and shall be delivered to the Architect for submittal to the Owner upon completion of the Work. Upon completion of the Work, the Contractor shall certify that the record documents reflect complete and accurate "as-built" conditions and shall deliver the documents as well as the approved permit set of plans in good condition to the Architect for submittal to the Owner in accordance with the provisions of the Contract Documents. Satisfactory maintenance of up-to-date record drawings will be a requirement for approval of progress payments.

§ 9.9.3 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 or unless the Contractor needs to provide such services in order to carry out the Contractor's own responsibilities. If professional design services or certifications by a design professional are specifically required, the Owner ~~and~~ or the Architect will specify the performance and design criteria that such services must satisfy. The Contractor shall cause such services or certifications to be provided by an appropriately licensed design professional. If no criteria are specified, the design shall comply with applicable codes and ordinances. Each Party shall be entitled to rely upon the information provided by the other Party. The Architect will review and approve or take other appropriate action on submittals for the limited purpose of checking for conformance with information provided and the design concept expressed in the Contract Documents. The Architect's review of Shop Drawings, Product Data, Samples, and similar submittals shall be for the

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limited purpose of checking for conformance with information given and the design concept expressed in the Contract Documents. In performing such review, the Architect will approve, or take other appropriate action upon, the Contractor's Shop Drawings, Product Data, Samples, and similar submittals.

§ 9.10 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.

§ 9.11 Cutting and Patching

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 and patching shall be restored to the condition existing prior to the cutting, fitting and patching, unless otherwise required by the Contract Documents.

§ 9.12 Cleaning Up

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 material from and about the Project. The Contractor shall only use waste receptacles provided by the Contractor and will appropriately dispose of any waste material off site.

§ 9.13 Access to Work

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

§ 9.14 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.

§ 9.15 Indemnification

§ 9.15.1 To the fullest extent permitted by ~~law, the Contractor shall~~ law and subject to the conditions of this Section 9.15, the Contractor shall defend, indemnify and hold harmless the Owner, Architect, Architect's consultants, and agents and employees of any of them ("Indemnified Parties") from and against all claims, damages, losses and expenses, direct and indirect, or consequential, including but not limited to attorneys' ~~fees,~~ fees and costs incurred on such claims and in proving the right to indemnification, arising out of or resulting from or connected to the performance of the Work, any act or omission of the Contractor, its agents, any of its Subcontractors of any tier, and anyone directly or indirectly employed by the Contractor or Subcontractors of any tier ("Indemnitor"), 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,~~ Indemnitor, 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 which would otherwise exist as to a party or person described in this Section 9.15.1.

§ 9.15.1.1 The Contractor shall fully defend, indemnify, and hold harmless the Indemnified Parties for the sole negligence of the Indemnitor.

§ 9.15.1.2 If such claims are caused by or are resulting from the sole negligence of the Indemnified Parties, their agents or employees, then the Contractor shall have no duty to defend, indemnify, and hold harmless the Indemnified Parties.

§ 9.15.1.3 If such claims are caused by or are resulting from the concurrent negligence of (i) the Indemnified Parties or the Indemnified Parties' agents or employees, and (ii) the Contractor or the Contractor's agents or employees, then the

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Contractor shall be obligated to defend, indemnify, and hold harmless the Indemnified only to the extent of the Indemnitor's negligence.

§ 9.15.1.4 The Contractor agrees to being added by the Owner or the Architect as a party to any arbitration or litigation with third parties in which the Owner or Architect alleges indemnification or contribution from the Contractor, any of its Subcontractors of any tier, anyone directly or indirectly employed by any of them, or anyone for whose acts any of them may be liable. The Contractor agrees that all of its Subcontractors of any tier shall, in their subcontracts, similarly stipulate; in the event any does not, the Contractor shall be liable in place of such Subcontractor(s) of any tier. To the extent any portion of this Section 9.15 is stricken by a court or arbitrator for any reason, all remaining provisions shall retain their vitality and effect.

§ 9.15.1.5 The obligations of the Contractor under this Section 9.15 shall not be construed to negate, abridge, or otherwise reduce any other right or obligations of indemnity which would otherwise exist as to any party or person described in this Section 9.15. To the extent the wording of this Section 9.15 would reduce or eliminate an available insurance coverage of the Contractor or the Owner, this Section 9.15 shall be considered modified to the extent that such insurance coverage is not affected.

§ 9.15.2 In claims against any person or entity indemnified under this Section 9.15 by an employee of the Contractor, a ~~Subcontractor,~~ Subcontractor of any tier, anyone directly or indirectly employed by them, or anyone for whose acts they may be liable, the indemnification obligation under Section 9.15.1 shall not be limited by a limitation on amount or type of damages, compensation or benefits payable by or for the Contractor or Subcontractor of any tier under workers' compensation acts, disability benefit acts or other employee benefit acts. After mutual negotiation of the parties, the Contractor waives immunity as to the Owner, the Architect, and their respective consultants only under Title 51 RCW, "Industrial Insurance." IF THE CONTRACTOR DOES NOT AGREE WITH THIS WAIVER, IT MUST PROVIDE A WRITTEN NOTICE TO THE OWNER PRIOR TO THE DATE FOR THE RECEIPT OF BIDS, OR THE CONTRACTOR WILL BE DEEMED TO HAVE NEGOTIATED AND WAIVED THIS IMMUNITY.

§ 9.16 Prevailing Wages.

§ 9.16.1 Pursuant to RCW 39.12, no worker, laborer, or mechanic employed in the performance of any part of the Work shall be paid less than the "prevailing rate of wage" (in effect as of the date that bids are due) as determined by the Industrial Statistician of the Department of Labor and Industries. The schedule of the prevailing wage rates for the locality or localities where this contract will be performed is attached to the executed contract and made a part of the Contract Documents by reference as though fully set forth herein; if not attached, then the applicable prevailing wages are determined as of the Bid Date for the county in which the Project is located and are available at http://www.lni.wa.gov/TradesLicensing/PrevWage/WageRates/default.asp. A copy is available for viewing at the Owner's office, and a hard copy will be mailed upon request. To the extent that there is any discrepancy between the attached or provided schedule of prevailing wage rates and the published rates applicable under WAC 296-127-011, or if no schedule is attached, the applicable published rates shall apply with no increase in the Contract Sum. It is the Contractor's responsibility to ensure that the correct prevailing wage rates be paid. The Contractor shall provide the respective Subcontractors with a schedule of the applicable prevailing wage rates. Questions relating to prevailing wage data should be addressed to the Industrial Statistician upon request.

Mailing Address:	Department of Labor and Industries Prevailing Wage Office PO Box 44540 Olympia, WA 98504
Telephone:	(360) 902-5335
Facsimile:	(360) 902-5300

§ 9.16.2 Pursuant to RCW 39.12.060, in case any dispute arises as to what are the prevailing rates of wages for work of a similar nature, and such dispute cannot be adjusted by the parties in interest, including labor and management representatives, the matter shall be referred for arbitration to the director of the Department of Labor and Industries of the state, and his or her decision therein shall be final and conclusive and binding on all parties involved in the dispute.

§ 9.16.3 The Contractor shall defend, indemnify and hold the Owner harmless, including attorneys' fees, from any violation or alleged violation of RCW 39.12 ("Prevailing Wages on Public Works") and RCW 51 ("Industrial Insurance"), including without limitation 51.12.050, by the Contractor or any Subcontractor of any tier.

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§ 9.16.4 The Contractor shall comply with all applicable provisions of RCW 49.28 ("Hours of Labor").

§ 9.16.5 Prevailing wage rates shall be the maximum wage rate payable for any Change in the Work.

§ 9.17 PROJECT MANAGEMENT

§ 9.17.1 The Contractor shall employ competent, experienced managers, including a project manager, superintendent, foremen, and necessary assistants, who shall be present at the Project site during performance of the Work and until termination of the Contract in accordance with the Contract Documents or Substantial Completion is attained. Similarly, appropriate Subcontractor supervisory personnel (foreman level or above) shall also be present at the Project site whenever such Subcontractor is performing Work, whether before or after Substantial Completion.

§ 9.17.2 The Contractor's project manager, superintendent, and foremen shall be employees of the Contractor. The project manager, superintendent and foremen shall represent the Contractor, and communications given to any of them shall be as binding as if given to the Contractor. Important communications shall be confirmed in writing. Other communications may be confirmed on request. The Contractor's foremen shall not be employed on any other project during the course of the Work.

§ 9.17.3 The Contractor, within seven days after award of the Contract, shall furnish in writing to the Owner through the Architect the name and qualifications of a proposed superintendent and project manager. The Owner or Architect may reply within a reasonable time to the Contractor stating (1) whether the Owner or the Architect has reasonable objection to the proposed superintendent or project manager or (2) that the Architect or Owner requires additional time to review. Failure of the Owner or Architect to reply within a reasonable time shall constitute notice of no reasonable objection. The Contractor shall not employ a proposed superintendent or project manager to whom the Owner or Architect has made reasonable and timely objection. The Contractor shall not change the superintendent or project manager without the Owner's consent, which shall not unreasonably be withheld or delayed.

ARTICLE 10 ARCHITECT

§ 10.1 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, unless otherwise modified in writing in accordance with other provisions of the Contract. The Architect is not the agent of the Owner and is not authorized to agree on behalf of the Owner to changes in the Contract Sum or Contract Time, or to direct the Contractor to take actions that change the Contract Sum or Contract Time. The "Architect" may not be a licensed architect, but may instead be an engineer.

§ 10.2 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.

§ 10.3 The Architect will visit the ~~site~~ site, but not as the agent of the Owner, at intervals appropriate to the stage of the construction 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 safety precautions and programs in connection with the Work, since these are solely the Contractor's rights and responsibilities under the Contract Documents. The presence of the Architect or the Owner at the site shall not in any manner be construed as assurance that the Work is being completed in compliance with the Contract Documents, nor as evidence that any requirement of the Contract Documents of any kind, including notice, has been met or waived.

§ 10.4 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~~ Neither the Owner nor the Architect will be responsible for the Contractor's failure to perform the Work in accordance with the requirements of the Contract Documents. ~~The Architect will not~~ Neither the Owner nor the Architect will have control over or charge of and will

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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.

§ 10.5 Based on the Architect's evaluations of the Work and of the Contractor's Applications for Payment, the Architect will review and ~~certify~~ make recommendations to and otherwise assist the Owner to determine the amounts due the Contractor and will issue Certificates for Payment in such amounts.

§ 10.6 The Architect ~~has~~ and the Owner each have authority to reject Work that does not conform to the Contract Documents and to require inspection or testing of the Work.

§ 10.7 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.

§ 10.8 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 will make initial decisions on all claims, disputes, and other matters in question between the Owner and Contractor but will not be liable to the Contractor for results of any interpretations or decisions rendered in good faith.

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

ARTICLE 11 SUBCONTRACTORS

§ 11.1 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.

§ 11.2 Unless otherwise stated in the bidding documents or the Contract Documents, the Contractor, as soon as practicable after award of the Contract, shall notify the Owner and Architect of the Subcontractors or suppliers proposed for each of the principal portions of ~~the Work.~~ the Work, which list shall be consistent with any listing required by the Bidding Documents. The Contractor shall not contract with any Subcontractor or supplier to whom the Owner or Architect has made reasonable written objection within ten days after receipt of the Contractor's list of Subcontractors and suppliers. A reasonable objection shall include without limitation lack of "responsibility" of the proposed Subcontractor, as defined in RCW 39.26.160(2) or the Contract Documents or Bidding documents, or lack of qualification as required within the technical sections of the Project Manual. 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. The Contractor shall not be required to contract with anyone to whom the Contractor has made reasonable objection.

§ 11.3 Contracts between the Contractor and Subcontractors shall (1) require each Subcontractor, to the extent of the Work to be performed by the Subcontractor, to be bound to the Contractor by the 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, which the Contractor, by the Contract Documents, assumes toward the Owner and Architect, and (2) allow the Subcontractor the benefit of all rights, remedies and redress against the Contractor that the Contractor, by these Contract Documents, has against the Owner.

§ 11.4 The Contractor shall promptly pay any undisputed sums it owes to Subcontractors. The Contractor shall promptly pay and (and secure the discharge of) any liens asserted by all persons or entities properly furnishing labor, services, equipment, materials or other items in connection with the performance of the Work by, through or on account of the Contractor. The Contractor shall furnish to the Owner such releases of claims and other documents as may be requested by the Owner from time to time to evidence such payment (and discharge). The Owner may withhold 150% of the amount of any lien unless the Contractor either (1) furnishes to the Owner such releases of claims and other documents as may be requested by the Owner from time to time to evidence such payment (and discharge) or (2) provides a reasonably acceptable surety bond to protect the Owner, the Project and the Site from lien claims. The Owner may, at its option, withhold payment, in whole or in part, to the Contractor until such documents are so furnished. The Owner may issue joint checks payable to the Contractor and the lien claimant. The Contractor

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shall defend, indemnify, and hold harmless the Owner from any liens, including all expenses and attorneys' fees, except to the extent a lien has been filed because of failure of payment by the Owner.

§ 11.5 The Contractor shall verify responsibility criteria for each first-tier Subcontractor. A Subcontractor of any tier that engages other Subcontractors must verify responsibility criteria for each of its lower-tier Subcontractors. Verification shall include that each Subcontractor, at the time of subcontract execution, meets the responsibility criteria listed in the Instructions to Bidders.

ARTICLE 12 CONSTRUCTION BY OWNER OR BY SEPARATE CONTRACTORS

§ 12.1 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. If the Contractor claims that delay or additional cost is involved because of such action by the Owner, the Contractor shall make such claim as provided in the Contract Documents except that the Contractor shall have no claim for such construction or operations to the extent disclosed in the bidding documents or Contract Documents

§ 12.2 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 activities with theirs as required by the Contract Documents.

§ 12.3 The Owner shall be reimbursed by the Contractor for costs incurred by the Owner which are payable to a Separate Contractor because of delays, improperly timed activities, or defective construction of the Contractor. The Owner shall be responsible to the Contractor for costs incurred by the Contractor because of delays, improperly timed activities, damage to the Work, or defective construction of a Separate Contractor.

ARTICLE 13 CHANGES IN THE WORK

§ 13.1 By appropriate Modification, changes in the Work may be accomplished after execution of the Contract. The Owner, without invalidating the Contract, may order changes in the Work within the general scope of the Contract consisting of additions, deletions, or other revisions, with the Contract Sum and Contract Time being adjusted accordingly. The Contractor shall provide proposed changes in the Contract Sum and Contract Time (if any) as soon as reasonably possible and within five days of the Owner's or Architect's request. Such changes in the Work shall be authorized by written Change Order signed by the Owner, Contractor, and Architect, or by written Construction Change Directive signed by the Owner and Architect. Upon issuance of the Change Order or Construction Change Directive, the Contractor shall proceed promptly with such changes in the Work, unless otherwise provided in the Change Order or Construction Change Directive.

§ 13.2 Adjustments in the Contract Sum and Contract Time resulting from a change in the Work shall be determined by mutual agreement of the parties ~~or, in the case of a Construction Change Directive signed only by the Owner and Architect, by the Contractor's cost of labor, material, equipment, and reasonable overhead and profit, unless the parties agree on another method for determining the cost or credit. Pending final determination of the total cost of a Construction Change Directive, the Contractor may request payment for Work completed pursuant to the Construction Change Directive. The Architect will make an interim determination of the amount of payment due for purposes of certifying the Contractor's monthly Application for Payment.~~ or as otherwise provided in this Agreement. When the Owner and Contractor agree on adjustments to the Contract Sum and Contract Time arising from a Construction Change Directive, the Architect will prepare a Change Order. The execution of a Change Order shall constitute a waiver of Claims by the Contractor arising out of the scope of Work to be performed or deleted pursuant to the Change Order, except as specifically described in the Change Order. Change Orders shall be on an AIA Change Order form or its equivalent acceptable to the Owner.

§ 13.3 The Architect will have authority to order minor changes in the Work not involving adjustment in the Contract Sum or extension of the Contract Time and not inconsistent with the intent of the Contract Documents. Such changes shall be effected by written order and shall be binding on the Owner and Contractor. The Contractor shall carry out such written orders promptly. 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 Owner and Architect and shall not proceed to implement the change in ~~the Work.~~the Work unless the Owner and Contractor agree on such change in writing or the Owner issues a Construction Change Directive.

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§ 13.4 If concealed or unknown physical conditions are encountered at the site that differ materially from those indicated in the Contract Documents or ~~from those conditions ordinarily found to exist, the Contract Sum and Contract Time shall be equitably adjusted as mutually agreed between the Owner and Contractor; provided that the Contractor provides notice to the Owner and Architect promptly and before conditions are disturbed.~~soils reports or other reports available to the Contractor or from those conditions ordinarily found to exist and generally recognized as inherent in construction activities of the character provided for in the Contract Documents, then the Contractor shall give written notice to the Owner and Architect promptly before conditions are disturbed and in no event later than seven days after the first observance of the conditions. If such conditions 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, the Contractor shall make any resulting Claim in accordance with the dispute resolution procedure in Article 21. No increase to the Contract Sum or Contract Time shall be allowed if the Contractor knew or should have known of the concealed conditions prior to its executing the Contract. If the Contractor encounters such a condition for which it seeks additional time or money, Contractor shall not commence any work or incur any additional job site costs in regard to the condition without written direction to do so from the Owner, except in the case of an emergency and except as may otherwise be required by any environmental or natural resource regulation.

§ 13.5 CLAIMS FOR ADDITIONAL COST OR TIME

§ 13.5.1 Claims for an increase in the Contract Sum or an extension of the Contract Time must be made before proceeding to execute the Work and within seven days after the occurrence of the event giving rise to the Claim. No claim shall be valid unless so made. The Contractor is not required to provide an advance written Claim for Claims relating to an emergency endangering life or property, in which case the Contractor shall proceed and then notify the Owner. Claims for additional cost resulting from a Claim for additional Contract Time shall not exceed the least cost reasonably necessary of achieving the completion date.

§ 13.6 WRITTEN NOTICE OF CLAIMS

§ 13.6.1 Any Claim of the Contractor against the Owner for damages, additional payment for any reason, or extension of time, whether under the Contract or otherwise, shall be conclusively deemed to have been waived by the Contractor unless a timely written notice and claim therefor is made pursuant to and in strict accordance with the applicable provisions of the Contract. No act, omission, or knowledge, actual or constructive, of the Owner or the Architect, including without limitation subsequent discussion, negotiation or consideration of the Claim, shall in any way be deemed to be a waiver of the requirement for timely written notice and for timely written Claims unless the Owner provides the Contractor with an explicit, unequivocal written waiver of timely notice and Claim.

§ 13.7 PRICING COMPONENTS

§ 13.7.1 If the Owner and Contractor cannot agree on the cost or credit to the Owner from a Change in the Work, or from an event giving rise to a claim, the Contractor shall keep and present, in such form as the Owner may prescribe, an itemized accounting together with supporting data. Approval may not be given without such itemization. Failure to provide data requested by the Owner shall constitute waiver of any claim for changes in the Contract Time or Contract Sum. The total cost of any increase or decrease in the Contract Sum shall be limited to the reasonable value, as determined by the Architect and the Owner, of the following:

§ 13.7.2 Direct labor costs: These are the labor costs determined either by estimated or actual number of additional craft hours and the hourly costs necessary to perform the change in the Work. The hourly cost shall be based upon the following:

.1 Basic wages and fringe benefits: Basic wages include the hourly wage rate (without markup or labor burden) and fringe benefits as included in the applicable prevailing wage rate per trade at the time of bid. Fringe benefits are paid by the Contractor to the employee as part of basic wages and as established by the Washington Department of Labor and Industries or contributed to labor trust funds as itemized fringe benefits, and may include hourly benefits for pension, annuity, training, and union benefits, not to exceed that specified in the applicable "Intent to Pay Prevailing Wage" for the laborers, apprentices, and journeymen performing the changed Work on the site. The premium portion of overtime wages or holiday wages is not included unless pre-approved in writing by the Owner. Costs paid or incurred by the Contractor for vacations, per diem, bonuses, stock options, or discretionary payments to employees are not reimbursable. Prevailing wage rates shall be the maximum wage rate payable for any Change in the Work.

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.2 Workers' insurances: Direct contributions to the State of Washington as industrial insurance, medical aid, and supplemental pension by class and rates established by the Washington Department of Labor and Industries. These costs are added to basic wages as part of the hourly costs necessary to perform the changes in the Work.

.3 Federal insurances: Direct contributions required by the Federal Insurance Compensation Act (FICA), Federal Unemployment Tax Act (FUTA), and State Unemployment Compensation Act (SUCA). These costs are added to basic wages as part of the hourly costs necessary to perform the changes in the Work.

§ 13.7.3 Direct material costs: This is an itemization, including material invoice, of the quantity and cost of additional materials necessary to perform the change in the Work. The unit cost shall be based upon the net cost after all discounts or rebates, freight costs, express charges, or special delivery costs, when applicable. No lump sum costs will be allowed except when approved in advance by the Owner. Discounts and rebates based on prompt payment shall accrue to the Contractor only if the Contractor offers the Owner the opportunity to make such prompt payment to obtain the discount or rebate but the Owner declines the opportunity.

§ 13.7.4 Construction equipment usage costs: This is an itemization of the actual length of time that construction equipment appropriate for the Work will be used solely on the change in the Work at the site times the applicable rental cost as established by the lower of the local prevailing rate published in The Rental Rate Blue Book by Data Quest, San Jose, California, as modified by the AGC/WSDOT agreement or the actual rate paid as evidenced by rental receipts. Actual, reasonable mobilization costs are permitted if the equipment is brought to the Site solely for the change in the Work. If equipment is required for which a rental rate is not established by The Rental Rate Blue Book, an agreed rental rate shall be established for the equipment, which rate and use must be approved by the Owner prior to performing the work.

If more than one rate is applicable, the lowest rate will be utilized. The rates in effect at the time of the performance of the Change work are the maximum rates allowable for equipment of modern design and in good working condition and include full compensation for furnishing all fuel, oil, lubrication, repairs, maintenance, and insurance. Equipment not of modern design and/or not in good working condition will have lower rates. Hourly, weekly, and/or monthly rates, as appropriate, will be applied to yield the lowest total cost. The rate for equipment necessarily standing by for future use on the changed Work shall be 50% of the rate established above. The total cost of rental allowed shall not exceed the cost of purchasing the equipment outright.

§ 13.7.5 Cost of any change in insurance or bond premium: This is defined as:

.1 Contractors' liability insurance: The cost (expressed as a percentage) of any changes in the Contractor's liability insurance arising directly from the changed Work; and

.2 Public works bond: The cost (expressed as a percentage) of the change in the Contractor's premium for the Contractor's statutorily required performance and payment bonds arising directly from the changed Work.

Upon request, the Contractor shall provide the Owner with supporting documentation from its insurer or surety of any associated cost incurred.

§ 13.7.6 Subcontractor costs: These are payments the Contractor makes to Subcontractors for changed Work performed by Subcontractors. The Subcontractors' cost of changed Work shall be determined in the same manner as prescribed in this Section 13.7.

§ 13.7.7 Fee: This is the allowance for all combined overhead, profit and other costs, including all office, home office and site overhead (including project manager, project engineer, other engineers, project foremen, estimator, superintendent and their vehicles and assistants), taxes (except for sales tax), warranty, safety costs, printing and copying, quality control/assurance, small or hand tool charges (tools which cost $500 or less and are normally furnished by the performing contractor), preparation of as-built drawings, impact on unchanged Work, Claim preparation, acceleration, and delay and impact costs of any kind, added to the total cost to the Owner of any Change Order, Construction Change Directive, Claim or any other claim of any kind on this Project. It shall be limited in all cases to the following schedule:

.1 The Contractor shall receive 12% of the cost of any materials supplied or work properly performed by the Contractor's own forces.

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.2 The Contractor shall receive 7% of the amount owed directly to a Subcontractor or Supplier for materials supplied or work properly performed by that Subcontractor or Supplier.

.3 Each Subcontractor of any tier shall receive 12% of the cost of any materials properly supplied or work performed by its own forces.

.4 Each Subcontractor of any tier shall receive 5% of the amount it properly incurs for materials supplied or work performed by its suppliers or subcontractors of any lower tier.

.5 The cost to which this Fee is to be applied shall be determined in accordance with Section 13.7.2 – 13.7.5.

.6 The total summed Fee of the Contractor and all Subcontractors of any tier shall not exceed 23%. If the Fee would otherwise exceed 23%, the Contractor shall proportionally reduce the Fee percentage for the Contractor and all Subcontractors except for the Subcontractor supplying material or performing work with its own forces.

If a change in the Work involves both additive and deductive items, the appropriate Fee allowed will be added to the net difference of the items. If the net difference is negative, no Fee will be added to the negative figure as a further deduction. The parties acknowledge that the fees listed in this Section are substantially greater than the fees and overhead normally included in determining the Contract Sum bid; that these higher percentages are a sufficient amount to compensate the Contractor for all effects and impacts of Changes in the Work; and that the resultant overcompensation of the Contractor for some Changes compensates the Contractor for any Changes for which the Contractor believes the percentage is otherwise insufficient. The cost of any changed Work or of any other increase or decrease in the Contract Sum, including a Claim, shall not include, among other things, consultant costs, attorneys' fees, or Claim preparation expenses. Such items are not recoverable from the Owner.

ARTICLE 14 TIME

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

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

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

§ 14.4 The date of Substantial Completion is the date certified by the Architect in accordance with Section 15.6.3.

§ 14.5 If the Contractor is delayed at any time in the commencement or progress of the Work by (1) changes ordered in the Work; (2) by labor disputes, fire, unusual delay in deliveries, abnormal adverse weather conditions not reasonably anticipatable, unavoidable casualties, or any causes beyond the Contractor's control; or (3) by other causes that the Contractor asserts, and the ~~Architect~~ Owner determines, justify delay, then the Contract Time shall be extended for such reasonable time as the ~~Architect~~ Owner may determine, subject to the provisions of Article 21. Such causes do not entitle the Contractor to an increase in the Contract Sum. The Contractor shall re-schedule its Work as necessary so as to achieve completion dates. Any delay shall be measured by the change in the actual critical path of construction. The Contractor shall recover damages for delay from the Owner only if the acts or omissions of the Owner or persons acting for the Owner were the actual, substantial cause of the delay and the Contractor could not have reasonably avoided the delay by the exercise of due diligence. The Contractor shall not in any event be entitled to damages arising out of actual or alleged loss of efficiency; morale, fatigue, attitude, or labor rhythm; constructive acceleration; home office overhead; expectant underrun; trade stacking; reassignment of workers; concurrent operations; dilution of supervision; learning curve; beneficial or joint occupancy; logistics; ripple; season change; extended overhead; profit upon damages for delay; impact damages, cumulative impact, or similar damages.

§ 14.6 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, and that the Work was on schedule (or not behind schedule through the fault of the Contractor) at the time the adverse weather conditions occurred. Neither the Contract Time nor the Contract Sum will be adjusted for normal inclement weather. The Contractor shall be entitled to a change in the Contract Time only (but not a change in the Contract Sum) if the Contractor can substantiate to the reasonable satisfaction of the Owner and Architect that there was materially greater than normal inclement weather considering

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the full term of the Contract Time and using a ten-year average of accumulated record mean values from climatological data compiled by the U.S. Department of Commerce National Oceanic and Atmospheric Administration for the locale closest to the Project, and that the alleged abnormal inclement weather actually extended the critical path of the Work. The change in the Contract Time shall be provisional until Substantial Completion has been achieved, at which time the change in the Contract Time shall be the extent to which the total net accumulated number of calendar days lost due to inclement weather from commencement of the Work until Substantial Completion exceeds the total net accumulated number to be expected for the same period from the aforesaid data.

§ 14.7 The Contractor shall furnish sufficient forces, construction plant and equipment, and shall work such hours, including night shifts, overtime operations and weekend and holiday work as may be necessary to insure completion of the Work within the Contract Time and the approved Contractor's construction schedule. If the Contractor fails substantially to perform in a timely manner in accordance with the Contract Documents and, through the fault of the Contractor or Subcontractor(s) of any tier fails to meet the Contractor's construction schedule, the Contractor shall take such steps as may be necessary to immediately improve its progress by increasing the number of workers, shifts, overtime operations or days of work or other means and methods, all without additional cost to the Owner.

§ 14.8 THE TIMELY COMPLETION OF THIS PROJECT IS ESSENTIAL TO THE OWNER. The Owner will incur serious and substantial special, incidental and consequential damages if Substantial Completion of the Work does not occur within the Contract Time; however, it would be difficult if not impossible to determine the amount of such damages. Consequently, provisions for liquidated damages are included in the Contract. The Owner's right to liquidated damages is not affected by partial completion, occupancy, or beneficial occupancy. Liquidated damages due to the Owner may be apportioned between the Owner and Contractor according to their relative responsibility for the delay.

ARTICLE 15 PAYMENTS AND COMPLETION

§ 15.1 Schedule of Values

§ 15.1.1 ~~Where the Contract is based on a Stipulated Sum or the Cost of the Work with a Guaranteed Maximum Price pursuant to Section 3.2 or 3.4, the~~ The Contractor shall submit a schedule of values to the Architect before the first Application for Payment, allocating the entire Stipulated Sum or Guaranteed Maximum Price 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.~~ Owner and Article 4. This schedule of values shall be used as a basis for reviewing the Contractor's Applications for Payment. Payments shall be made as provided in Article 4 of this Agreement. Applications for Payment shall be in a form satisfactory to the Owner and Architect.

§ 15.1.2 The allocation of the Stipulated Sum ~~or Guaranteed Maximum Price~~ under this Section 15.1 shall not constitute a separate stipulated sum ~~or guaranteed maximum price~~ for each individual line item in the schedule of values.

~~§ 15.2 Control Estimate~~

~~**§ 15.2.1** Where the Contract Sum is the Cost of the Work, plus the Contractor's Fee without a Guaranteed Maximum Price pursuant to Section 3.3, the Contractor shall prepare and submit to the Owner a Control Estimate within 14 days of executing this Agreement. The Control Estimate shall include the estimated Cost of the Work plus the Contractor's Fee.~~

~~**§ 15.2.2** The Control Estimate shall include:~~

- ~~**.1** the documents enumerated in Article 6, including all Modifications thereto;~~
- ~~**.2** a list of the assumptions made by the Contractor in the preparation of the Control Estimate to supplement the information provided by the Owner and contained in the Contract Documents;~~
- ~~**.3** a statement of the estimated Cost of the Work organized by trade categories or systems and the Contractor's Fee;~~
- ~~**.4** a project schedule upon which the Control Estimate is based, indicating proposed Subcontractors, activity sequences and durations, milestone dates for receipt and approval of pertinent information, schedule of shop drawings and samples, procurement and delivery of materials or equipment the Owner's occupancy requirements, and the date of Substantial Completion; and~~

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.5 a list of any contingency amounts included in the Control Estimate for further development of design and construction.

§ 15.2.3 When the Control Estimate is acceptable to the Owner and Architect, the Owner shall acknowledge it in writing. The Owner's acceptance of the Control Estimate does not imply that the Control Estimate constitutes a Guaranteed Maximum Price.

§ 15.2.4 The Contractor shall develop and implement a detailed system of cost control that will provide the Owner and Architect with timely information as to the anticipated total Cost of the Work. The cost control system shall compare the Control Estimate with the actual cost for activities in progress and estimates for uncompleted tasks and proposed changes. This information shall be reported to the Owner, in writing, no later than the Contractor's first Application for Payment and shall be revised and submitted with each Application for Payment.

§ 15.2.5 The Owner shall authorize preparation of revisions to the Contract Documents that incorporate the agreed-upon assumptions contained in the Control Estimate. The Owner shall promptly furnish such revised Contract Documents to the Contractor. The Contractor shall notify the Owner and Architect of any inconsistencies between the Control Estimate and the revised Contract Documents.

§ 15.3 Applications for Payment

§ 15.3.1 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 15.1, for completed portions of the Work. The application shall be notarized, if required; be supported by all data substantiating the Contractor's right to payment that the Owner or Architect require; shall reflect retainage if provided for in the Contract Documents; and include any revised cost control information required by Section 15.2.4. 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.See Article 4.

§ 15.3.2 With each Application for Payment where the Contract Sum is based upon the Cost of the Work, or the Cost of the Work with a Guaranteed Maximum Price, the Contractor shall submit payrolls, petty cash accounts, receipted invoices or invoices with check vouchers attached, and any other evidence required by the Owner to demonstrate that cash disbursements already made by the Contractor on account of the Cost of the Work equal or exceed progress payments already received by the Contractor plus payrolls for the period covered by the present Application for Payment, less that portion of the progress payments attributable to the Contractor's Fee.

§ 15.3.3 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 stored, and protected from damage, off the site at a location agreed upon in writing.

§ 15.3.4 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 other encumbrances adverse to the Owner's interests.

§ 15.4 Certificates for Payment

§ 15.4.1 The Architect will, within seven days after receipt of the Contractor's approved Application for Payment, either issue to the Owner a Certificate for Payment, with a copy to the Contractor, for such amount as the Architect determines is properly due, or notify the Contractor and Owner of the Architect's reasons for withholding certification in whole or in part as provided in Section 15.4.3.

§ 15.4.2 The issuance of a Certificate for Payment will constitute a representation by the Architect to the Owner, based on the Architect's evaluations 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 the Contractor is entitled to payment in the amount certified.

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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.

§ 15.4.3 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 15.4.2 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 15.4.1. If the Contractor and the 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 9.2.2, 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 unsatisfactory prosecution of the Work by the Contractor, including but not limited to repeated or material failure to carry out the Work in accordance ~~with the Contract Documents.~~with the Contract Documents;
.8 failure to submit statements of intent or affidavits pertaining to wages paid as required by statute;
.9 failure to submit a properly updated Construction Schedule;
.10 liquidated damages;
.11 failure to properly maintain as-builts;
.12 failure to properly submit daily construction records;
.13 failure to properly submit certified payrolls; or
.14 failure to comply with a requirement of the Contract Documents in which the Owner has reserved the right to withhold payment.

§ 15.4.4 When either party disputes the Architect's decision regarding a Certificate for Payment under Section 15.4.3, in whole or in part, that party may submit a Claim in accordance with Article 21.

§ 15.5 Progress Payments

§ 15.5.1 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.

§ 15.5.2 Neither the Owner nor Architect shall have an obligation to pay or see to the payment of money to a Subcontractor or supplier except as may otherwise be required by law.

§ 15.5.3 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.

§ 15.5.4 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

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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.

§ 15.5.5 Pursuant to RCW 39.12, "Prevailing Wages on Public Works," the Contractor will not receive any payment until the Contractor and all Subcontractors of any tier have submitted state-approved "Statements of Intent to Pay Prevailing Wage" to the Owner. The statement must have the approval of the Industrial Statistician of the Department of Labor and Industries before it is submitted to the Owner. The statement must include the Contractor's registration number, the number of workers in each trade classification, and the applicable wage rate for each trade listed. The Contractor agrees to provide each Subcontractor of any tier with a schedule of applicable prevailing wage rates. The Contractor and the respective Subcontractors of any tier shall pay all fees required by the Department of Labor and Industries, including fees for the approval of the "Statement of Intent to Pay Prevailing Wages." Approved copies of the "Statement of Intent to Pay Prevailing Wages" must be posted where workers can easily read them.

§ 15.6 Substantial Completion

§ 15.6.1 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. All Work other than incidental corrective or punchlist work and final cleaning shall have been completed. The Work is not Substantially Complete if all systems and parts are not usable, if any applicable occupancy permit (temporary or final) has not been issued, if any related utilities are not connected and operating normally, or if the Work is not accessible by normal vehicular and pedestrian traffic routes. The fact that the Owner may occupy some or all of the Project does not indicate that the Work is substantially completed or that liquidated damages are tolled, changed, or eliminated.

§ 15.6.2 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.

§ 15.6.3 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. When the ~~Architect~~ Owner determines that the Work or designated portion thereof is substantially complete, ~~the Architect will~~ the Owner will direct the Architect to issue a Certificate of Substantial Completion which 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.

§ 15.6.4 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.~~

§ 15.7 Final Completion and Final Payment

§ 15.7.1 ~~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 and, when the Architect finds~~ The Contractor shall notify the Architect and the Owner in writing when the Contractor considers the Work ready for final inspection and complete. Upon receipt of the Contractor's written notice, the Architect will promptly make an inspection. Within 15 days after receiving the written notice, the Owner will either accept Final Completion of the Work or notify the Contractor of Work yet to be performed. If the Architect determines that some or all the punch list items are not yet completed, the Contractor shall be responsible to the Owner for all costs, including Architect's fees, for any subsequent Architect's inspections to determine compliance with the punch list. When the Architect finds all punch list items complete, 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~~

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~~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 stated in Section 15.7.2 as precedent to the Contractor's being entitled to final payment have been fulfilled.~~notify the Owner and the Contractor in writing.

§ 15.7.2 ~~Final payment shall not become due until the Contractor has delivered to the Owner a complete release of all liens arising out of this Contract or receipts in full covering all labor, materials and equipment for which a lien could be filed, or a bond satisfactory to the Owner to indemnify the Owner against such lien. If such lien 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 such lien, including costs and reasonable attorneys' fees.~~When the Owner and Architect find that the Work has been so concluded, the appropriate permit(s) have been issued, and the Contractor has submitted all the items below to the Owner, the Contractor may submit a final Application for Payment. The Architect will then promptly issue a final Certificate for Payment stating that the entire balance found to be due the Contractor and noted in the final Certificate is due and payable. The date of Final Completion is the date the Owner executes the Architect's final Certificate for Payment.

§ 15.7.3 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 claims reserved by the Owner in writing and any audits performed by the Owner, if permitted by the Contract Documents, after final payment.

§ 15.7.4 Acceptance of final payment by the Contractor, a Subcontractor or 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 the final Application for Payment.~~attached by that payee as unsettled to the final Application for Payment.

§ 15.7.5 Final payment shall not become due until the Owner's Board of Directors has formally accepted the Project ("Final Acceptance"). To achieve Final Acceptance, the Architect must have issued a final Certificate for Payment, any applicable permits must have been issued, Final Completion must have occurred, and the Contractor must have submitted the following to the Owner:

.1 an affidavit that all 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 (Affidavit of Payment of Debts and Claims, AIA form G706 or equivalent),

.2 a certificate evidencing that any insurance required by the Contract Documents to remain in force after Final Acceptance is currently in effect and will not be canceled or allowed to expire until at least 30 days' prior written notice has been given to the Owner,

.3 a written statement that the Contractor knows of no substantial 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 (AIA form G707 or equivalent),

.5 other data establishing payment or satisfaction of or protection against obligations, such as receipts, 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 (Contractor's Affidavit of Release of Liens, AIA form G706A or equivalent). 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. If such lien 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 such lien, including all costs and reasonable attorneys' fees,

.6 pursuant to RCW 39.12.040, an "Affidavit of Wages Paid" from the Contractor and from each Subcontractor of any tier certified by the Industrial Statistician of the Washington State Department of Labor and Industries, with the fees paid by the Contractor or Subcontractor,

.7 a letter from the Architect indicating that the Work is complete and recommending Final Acceptance of the Project by the Owner,

.8 certification that the materials in the Work are "lead-free" and "asbestos-free,"

.9 record documents that reflect complete and accurate "as-built" conditions and the approved permit set of plans in good condition, and

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.10 all warranties, guarantees, manuals, operation instructions, O&M manuals, certificates, spare parts, maintenance stock, specified excess material, and other documents or items required by the Contract Documents.

§ 15.7.6 Pursuant to RCW 60.28, completion of the Contract Work shall occur upon Final Acceptance.

§ 15.5.5 If a Subcontractor or supplier of any tier refuses to furnish a release or waiver required by the Owner, the Owner may (a) retain in the fund, account, or escrow funds in such amount as to defray the cost of foreclosing the liens of such claims and to pay attorneys' fees, the total of which shall be no less than 150% of the claimed amount, or (b) accept a bond from the Contractor, satisfactory to the Owner, to indemnify the Owner against such lien. If any such lien remains unsatisfied after all payments from the retainage are made, the Contractor shall refund to the Owner all moneys that the Owner may be compelled to pay in discharging such lien, including all costs and reasonable attorneys' fees.

§ 15.7.7 The execution of a Change Order shall constitute a waiver of Claims by the Contractor arising out of the Work to be performed or deleted pursuant to the Change Order, except as specifically described in the Change Order. Reservations of rights will be deemed waived and are void unless the reserved rights are specifically described in detail to the satisfaction of the Owner and are initialed by the Owner. If the Contractor adds a reservation of rights that has not been initialed by the Owner to any Change Order, Construction Change Directive, Change Order proposal, Application for Payment or any other document, all amounts therein shall be considered disputed and not due or payable unless and until costs are re-negotiated or the reservation is withdrawn or changed in a manner satisfactory to and, in all cases, initialed by the Owner. If the Owner makes payment for a Change Order or an Application for Payment that contains a reservation of rights not initialed by the Owner to indicate agreement with the reservation, and if the Contractor negotiates the check for such payment, then the reservation of rights shall be deemed waived, withdrawn and of no effect.

§ 15.7.8 The Contractor shall maintain books, ledgers, records, documents, estimates, bids, correspondence, logs, schedules, electronic data and other evidence relating to the costs and/or performance of the Contract ("records") to such extent and in such detail as will properly reflect and fully support compliance with the requirements of the Contract Documents and with all costs, charges and other amounts of whatever nature incurred directly or indirectly on the Work. The Contractor shall preserve such records for a period of three years following the date of Final Acceptance under the Contract and for such longer period as may be required by any other provision of the Contract. Within seven days of the Owner's request, the Contractor agrees to make available at the office of the Contractor during normal business hours all records for inspection, audit and reproduction including electronic copying by the Owner or its representatives. These requirements shall be applicable to each Subcontractor of any tier and included in each Subcontract and purchase order issued with respect to the Work, except fixed-price Subcontracts where the price is $25,000 or less. The Contractor agrees, on behalf of itself and Subcontractors of any tier or their respective representatives, that any rights under RCW 42.56 will commence at Final Acceptance, and that the invocation of such rights at any time by the Contractor or a Subcontractor of any tier or their representatives shall initiate an equivalent right to disclosures from the Contractor and Subcontractors of any tier for the benefit of the Owner. Failure to fully comply with this requirement shall also constitute a material breach of contract and shall conclusively waive any claim for additional costs asserted by the Contractor or Subcontractor of any tier that fails to so comply.

ARTICLE 16 PROTECTION OF PERSONS AND PROPERTY

§ 16.1 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. The Contractor shall have the right to control and 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.

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 and property and their protection from

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damage, injury, or loss. The Contractor shall promptly remedy damage and loss to property ~~caused in whole or in part~~ arising out of the Contractor's Work, whether 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 16.1.2 and 16.1.3. 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 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 9.15.

§ 16.2 Hazardous Materials and Substances

§ 16.2.1 The Contractor is responsible for compliance with the requirements of 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. 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 in the amount of the Contractor's reasonable additional costs of shutdown, delay, and ~~start-up.~~start-up, which adjustments shall be accomplished as provided in Article 13 of this Agreement. The Contractor shall proceed with the Work in areas not affected.

§ 16.2.2 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 16.2.1 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 (a) such damage, loss, or expense is due to the fault or negligence of the party seeking ~~indemnity.~~indemnity or (b) that such hazardous materials were identified as the Contractor's responsibility in the Contract Documents.

§ 16.2.3 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 indemnify the Contractor for all cost and expense thereby incurred.

§ 16.2.4 Pursuant to RCW 49.70, "Worker and Community Right to Know Act," and WAC 296-901 et seq., the Contractor shall provide the Owner copies of and have available at the Project Site a workplace survey or material safety data sheets for all "hazardous" chemicals under the control or use of Contractor or any Subcontractor of any tier at the Project Site. Contractor shall not be entitled to any additional Contract Time or compensation arising from its failure or alleged failure to comply with this statute or regulation.

ARTICLE 17 INSURANCE AND BONDS

§ 17.1 Contractor's Insurance

§ 17.1.1 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 this Section 17.1 or elsewhere in the Contract Documents. The Contractor shall purchase and maintain the insurance required by this Agreement from an insurance company or insurance companies lawfully authorized to issue insurance in the jurisdiction where the Project is ~~located.~~ located and possessing a Best's policyholder's rating of A- or better and a financial rating of no less than VIII and reasonably acceptable to the Owner. The Contractor shall maintain the required insurance until the expiration of the period for correction of Work as set forth in Section 18.4, unless a different duration is stated below:

Completed operations coverage shall remain in effect for six years from Substantial Completion.

§ 17.1.2 Commercial General Liability insurance for the Project written on an occurrence form with policy limits of not less than ~~($) each occurrence, ($) general aggregate, and ($)~~ one million dollars ($$1,000,000) each occurrence, two million dollars ($2,000,000) per project general aggregate, and two million dollars ($2,000,000) aggregate for products-completed operations hazard, providing coverage for claims including

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.1 damages because of bodily injury, sickness or disease, including occupational sickness or disease, and death of any person;
.2 personal and advertising injury;
.3 damages because of physical damage to or destruction of tangible property, including the loss of use of such property;
.4 bodily injury or property damage arising out of completed operations; and
.5 the Contractor's indemnity obligations under Section 9.15.

This insurance shall also cover work the Contractor may subcontract or sublet to others, premises, products/completed operations, personal injury, blanket contractual liability, and explosion, collapse or underground (XCU). This insurance will name the Owner, the Architect, their consultants, employees, and representatives, and any required governmental agencies as additional insureds on ISO Form CG 20 10 11/85 or its equivalent and will include a severability of interest (cross liability clause) for Work performed under this Contract. The Contractor's policy shall be designated primary coverage for both defense and indemnity, and any Owner's policies excess.

In addition, the Contractor shall maintain an umbrella policy which provides excess limits following form over the primary layer, in an amount not less than $5,000,000. The insurance required by above shall be written for not less than limits of liability specified in the Contract Documents or required by law, whichever coverage is greater.

§ 17.1.2.1 The Contractor shall ensure and require that Subcontractors of all tiers have insurance coverage to cover bodily injury and property damage on all operations and all vehicles owned or operated by Subcontractors of all tiers in the amount of $1,000,000 per occurrence with a $2,000,000 aggregate limit. Also, the Subcontractors shall name the Contractor and the Owner as an additional insured including completed operations and giving 30 days' notice of cancellation. The additional insured endorsement shall be issued on an ISO 20 10 11 85 form or its equivalent.

§ 17.1.3 Automobile Liability covering vehicles owned by the Contractor and non-owned vehicles used by the Contractor, with policy limits of not less than ~~($)~~ one million dollars ($$1,000,000) per accident, for bodily injury, death of any person, and property damage arising out of the ownership, maintenance, and use of those motor vehicles along with any other statutorily required automobile coverage.

§ 17.1.4 The Contractor may achieve the required limits and coverage for Commercial General Liability and Automobile Liability through a combination of primary and excess or umbrella liability insurance, provided such primary and excess or umbrella insurance policies result in the same or greater coverage as those required under Section 17.1.2 and 17.1.3, and in no event shall any excess or umbrella liability insurance provide narrower coverage than the primary policy. The excess policy shall not require the exhaustion of the underlying limits only through the actual payment by the underlying insurers.

§ 17.1.5 Workers' Compensation ~~at statutory limits.~~(industrial insurance), disability benefit and other similar employee benefit acts in at statutory limits with coverage of at least $500,000 each occurrence / $500,000 each accident.

§ 17.1.6 Employers' Liability (Stop Gap Liability insurance) with policy limits not less than ~~($) each accident, ($) each employee, and ($)~~ one million dollars ($1,000,000) each accident, one million dollars ($1,000,000) each employee, and two million dollars ($2,000,000) policy limit.

§ 17.1.7 If the Contractor is required to furnish professional services as part of the Work, the Contractor shall procure Professional Liability insurance covering performance of the professional services, shall maintain the Professional Liability insurance for six years following Substantial Completion, and with policy limits of not less than ~~($) per claim and ($)~~ one million dollars ($1,000,000) per claim and two million dollars ($2,000,000) in the aggregate.

§ 17.1.8 If the Work involves the transport, dissemination, use, or release of pollutants, the Contractor shall procure Pollution Liability insurance, shall maintain the Pollution Liability insurance for six years following Substantial Completion, and with policy limits of not less than ~~($) per claim and ($)~~ one million dollars ($1,000,000) per claim and two million dollars ($2,000,000) in the aggregate.

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§ 17.1.9 Coverage under Sections 17.1.7 and 17.1.8 may be procured through a Combined Professional Liability and Pollution Liability insurance policy, with combined policy limits of not less than ~~($) per claim and ($)~~ one million dollars ($1,000,000) per claim and two million dollars ($2,000,000) in the aggregate.

§ 17.1.10 The Contractor shall provide certificates of insurance acceptable to the Owner evidencing compliance with the requirements in this Section 17.1 at the following times: (1) prior to commencement of the Work; (2) upon renewal or replacement of each required policy of insurance; and (3) upon the Owner's written request. An additional certificate evidencing continuation of liability coverage, including coverage for completed operations, shall be submitted with the final Application for Payment and thereafter upon renewal or replacement of such coverage until the expiration of the period required by Section 17.1.1. The certificates will show the Owner as an additional insured on the Contractor's Commercial General Liability and excess or umbrella liability policy.

§ 17.1.11 The Contractor shall disclose to the Owner any deductible or self- insured retentions applicable to any insurance required to be provided by the Contractor. Any such any deductible or self- insured retentions must be acceptable to the Owner.

§ 17.1.12 To the fullest extent permitted by law, the Contractor shall cause the commercial liability coverage required by this Section 17.1 to include (1) the Owner, the Architect, and the Architect's Consultants as additional insureds for claims ~~caused in whole or in part by the Contractor's negligent acts or omissions~~ arising out of or caused by the Contractor's work during the Contractor's operations; and (2) the Owner as an additional insured for claims ~~caused in whole or in part by the Contractor's negligent acts or omissions~~ arising out of or caused by the Contractor's work for which loss occurs during completed operations. The additional insured coverage shall be primary and non-contributory to any of the Owner's general liability insurance policies and shall apply to both ongoing and completed operations. To the extent commercially available, the additional insured coverage shall be no less than that provided by Insurance Services Office, Inc. (ISO) ~~forms CG 20 10 07 04, CG 20 37 07 04,~~ form CG 20 10 11 85, and, with respect to the Architect and the Architect's Consultants, CG 20 32 07 04.

§ 17.1.13 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 this Section 17.1, 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.

§ 17.1.14 Other Insurance Provided by the Contractor
(List below any other insurance coverage to be provided by the Contractor and any applicable limits.)

Coverage	Limits

§ 17.1.15 If the Owner is damaged by the failure of the Contractor to maintain any of the above insurance or to so notify the Owner, then the Contractor shall bear all costs attributable thereto. THE OWNER MAY WITHHOLD PAYMENT PENDING RECEIPT OF ALL CERTIFICATES OF INSURANCE WITH ENDORSEMENTS ATTACHED. Failure to withhold payment shall not constitute a waiver.

§ 17.1.16 The Owner's specification or approval of the insurance in this Contract or of its amount shall not relieve or decrease the liability of the Contractor under the Contract Documents or otherwise. Coverages are the minimum to be provided and are not limitations of liability under the Contract, indemnification, or applicable law provisions. The Contractor may, at its expense, purchase larger coverage amounts.

§ 17.2 Owner's Insurance
§ 17.2.1 Owner's Liability Insurance
The Owner shall be responsible for purchasing and maintaining the Owner's usual liability insurance.

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§ 17.2.2 Property Insurance

§ 17.2.2.1 The Owner shall ~~purchase and maintain, from an insurance company or insurance companies lawfully authorized to issue insurance in the jurisdiction where the Project is located, property insurance written on a builder's risk "all-risks" completed value or equivalent policy form and~~ maintain its standard property insurance sufficient to cover the total value of the entire Project on a replacement cost basis. The Owner's property insurance coverage shall be no less than the amount of the initial Contract Sum, plus the value of subsequent Modifications and labor performed or materials or equipment supplied by others. The property insurance shall be maintained until Substantial Completion and thereafter as provided in Section 17.2.2.2, unless otherwise provided in the Contract Documents or otherwise agreed in writing by the parties to this Agreement. ~~This insurance shall include the interests of the Owner, Contractor, Subcontractors, and Sub-subcontractors in the Project as insureds. This insurance shall include the interests of mortgagees as loss payees.~~

§ 17.2.2.2 Unless the parties agree otherwise, upon Substantial Completion, the Owner shall ~~continue the insurance required by Section 17.2.2.1 or, if necessary,~~ replace the insurance policy required under Section 17.2.2.1 with ~~property insurance written for the total value of the Project~~ its standard property insurance that shall remain in effect until expiration of the period for correction of the Work set forth in Section 18.4.

§ 17.2.2.3 If the insurance required by this Section 17.2.2 is subject to deductibles or self-insured retentions, the ~~Owner~~ Contractor shall be responsible for all loss not covered because of such deductibles or retentions up to $25,000 per loss, unless the loss was caused by the Owner or by a natural occurrence, in which case the Owner shall be responsible for the deductibles or retentions.

§ 17.2.2.4 If the Work involves remodeling an existing structure or constructing an addition to an existing structure, the Owner shall purchase and maintain, until the expiration of the period for correction of Work as set forth in Section 18.4, ~~"all-risks" property insurance, on a replacement cost basis,~~ property insurance protecting the existing structure against direct physical loss or damage, notwithstanding the undertaking of the Work. The Owner shall be responsible for all co-insurance penalties.

§ 17.2.2.5 ~~Prior to commencement of the Work, the Owner shall secure the insurance, and provide evidence of the coverage, required under this Section 17.2.2 and, upon the Contractor's request, provide a copy of the property insurance policy or policies required by this Section 17.2.2. The copy of the policy or policies provided shall contain all applicable conditions, definitions, exclusions, and endorsements.~~Not used.

§ 17.2.2.6 Within three (3) business days of the date the Owner becomes aware of an impending or actual cancellation or expiration of any insurance required by this Section 17.2.2, 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.

§ 17.2.2.7 Waiver of Subrogation

§ 17.2.2.7.1 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 ~~this Agreement or other property insurance applicable to the Project,~~ Section 17.2.2.1, except such rights as they have to proceeds of such insurance. The Owner does not waive the subrogation rights to the extent of its property insurance on structures or portions of structures that do not comprise the Work. 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 17.2.2.7 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

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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.

~~**§ 17.2.2.7.2** 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 17.2.2.7.1 for damages caused by fire or other causes of loss covered by this separate property insurance.~~

§ 17.2.2.8 A loss insured under the Owner's property insurance 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. The Owner shall pay the Architect and Contractor their just shares of insurance proceeds received by the Owner, and by appropriate agreements, written where legally required for validity, the Architect and Contractor shall make payments to their consultants and Subcontractors in similar manner.

§ 17.2.3 Other Insurance Provided by the Owner

(List below any other insurance coverage to be provided by the Owner and any applicable limits.)

Coverage	Limits
N/A	

§ 17.3 Performance Bond and Payment Bond

§ 17.3.1 The ~~Owner shall have the right to require the Contractor to furnish bonds covering~~ Contractor shall secure from a surety company acceptable to the Owner, admitted and licensed in the State of Washington, and shall pay for and maintain bonds covering the faithful performance of the Contract and payment of obligations arising ~~thereunder as stipulated in the Contract Documents on the date of execution of the Contract.~~under the Contract Documents, each in the full amount of the Contract Sum plus sales tax, pursuant to RCW 39.08, "Contractor's Bond." Within two days after the issuance of the Notice of Intent to Award Contract, the Contractor shall deliver evidence of its bondability to the Owner, and within ten days of entering into the Contract, the Contractor shall deliver the originals of the bonds to the Owner and copies to the Architect. THE OWNER MAY DECLINE TO ENTER INTO THE CONTRACT IF EVIDENCE OF BONDABILITY IS NOT RECEIVED. THE OWNER MAY WITHHOLD ITS "NOTICE TO PROCEED" AND/OR WITHHOLD PAYMENT TO THE CONTRACTOR UNTIL SUCH SURETY BONDS ARE RECEIVED.

§ 17.3.2 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.

ARTICLE 18 CORRECTION OF WORK

§ 18.1 The Contractor shall promptly and at no cost to the Owner correct Work rejected by the Architect or Owner or failing to conform to the requirements of the Contract Documents, whether discovered before or after 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, unless compensable under Section A.1.7.3 in Exhibit A, Determination of the Cost of the Work.~~expense.

§ 18.2 In addition to the Contractor's obligations under Section 9.4, 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 15.6.3,~~ the Contract Documents, or by terms of an 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 according to the requirements of this Section with no change in the Contract Sum promptly after receipt of notice from the Owner to do so unless the Owner has previously given the Contractor a specific 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

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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.~~the Contractor. If the Contractor does not promptly initiate work to correct the Work designated in the notice, the Owner may proceed to correct the Work, the Owner may dispose of materials and equipment as it sees fit, and the Contractor will be liable for all costs. This obligation shall survive acceptance of the Work under the Contract and termination of the Contract, is in addition to other warranties provided by contract or law, and does not establish a time limit for damages.

§ 18.3 If the Contractor fails to correct nonconforming Work within a reasonable time, the Owner may correct it in accordance with Section 8.3.

§ 18.4 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.

§ 18.5 The one-year period for correction of Work shall not be extended by corrective Work performed by the Contractor pursuant to this Article 18.

ARTICLE 19 MISCELLANEOUS PROVISIONS

§ 19.1 Assignment of Contract

Neither party to the Contract shall assign the Contract without written consent of the ~~other, except that 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 such assignment.~~other.

§ 19.2 Governing Law

The Contract shall be governed by the internal 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 21.6.~~The Contractor shall abide by the provisions of all applicable Washington statutes. Those statutes include, but are not limited to:

.1 Contractor Registration and Related Requirements. Pursuant to RCW 39.06, "Registration, Licensing of Contractors," the Contractor shall be registered and licensed as required by the laws of the State of Washington, including but not limited to RCW 18.27, "Registration of Contractors." The Contractor shall: have a current state unified business identifier number; have industrial insurance coverage for the Contractor's employees working in Washington as required in Title 51 RCW; have an employment security department number as required in Title 50 RCW; have a state excise tax registration number as required in Title 82 RCW, and; not be disqualified from bidding on any public works contract under RCW 39.06.010 (unregistered or unlicensed contractors) or RCW 39.12.065(3) (prevailing wage violations).

.2 Law Against Discrimination. Contractor should comply with pertinent statutory provisions relating to public works of RCW 49.60.

.3 Provisions for Aged and Handicapped Persons. Contractor should comply with pertinent statutory provisions relating to public works of RCW 70.92.

.4 Safety Standards. Contractor should comply with pertinent provisions of Chapter 296-155 WAC, "Safety Standards for Construction Work," including without limitation trench safety requirements.

.5 Unemployment Compensation. Pursuant to RCW 50.24 in general and RCW 50.24.130 in particular, the Contractor shall pay contributions for wages for personal services performed under this Agreement or arrange for a bond acceptable to the commissioner.

.6 Drug-Free Workplace. The Contractor and all Subcontractors of any tier shall fully comply with all applicable federal, state, and local laws and regulations regarding drug-free workplace, including the Drug-Free Workplace Act of 1988. Any person not fit for duty for any reason, including the use of alcohol, controlled substances, or drugs, shall immediately be removed from the Work.

.7 Tobacco-Free Environment. Smoking or use of any kind of lighted pipe, cigar, cigarette or any other lighted smoking equipment or material, including vaping and any smokeless tobacco products, is prohibited on all school district property.

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§ 19.3 Tests and Inspections

Tests, inspections, and approvals of portions of the Work required by the Contract Documents or by applicable laws, statutes, ordinances, codes, rules and regulations, or lawful orders of public authorities having jurisdiction shall be made at an appropriate time. Unless otherwise provided, the Contractor shall make arrangements for such tests, inspections, and approvals with an independent testing laboratory or entity acceptable to or provided by the Owner, or with the appropriate public authority, and the Owner shall bear all related costs of necessary tests, inspections, and approvals. The Contractor shall give the Architect and Owner timely notice of when and where tests and inspections are to be made so that the Architect and Owner may be present for such procedures. The independent testing agency shall prepare the test reports, logs and certificates applicable to the specific inspections and tests and promptly and simultaneously deliver the specified number of copies of them to the designated parties. 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.

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

Patti Bowen
Executive Director of Business Services
Longview School District No. 122
2715 Lilac Street
Longview, Washington 98632
(360) 575-7017
pbowen@longview.k12.wa.us

All communications shall be directed to the Owner's Project Manager at the address below, except for notices required by this Agreement, which shall be directed to the Owner's Designated Representative above.

Andy Twyman, VMA
Project Manager
ESD 112 Construction Services Group
16703 SE McGillivray Blvd, Suite 240
Vancouver, Washington 98683
andrew.twyman@esd112.org
(360) 921-8294

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

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

§ 19.7 Federal ESSER Terms. In addition to the terms herein, because this Project is funded through the U.S. Department of Education's "Education Stabilization Fund Program Elementary and Secondary School Emergency Relief Fund" (ESSER Fund), the following terms and conditions also apply to this Project:

§ 19.7.1 Equal Employment Opportunity. Except as otherwise provided under 41 CFR Part 60, for all contracts that qualify as "federally assisted construction contracts" as defined in 41 CFR 60-1.3, Contractor agrees to comply with the equal opportunity clause at 41 CFR 60-1.4(b), incorporated herein by reference, and Executive Order 11246,

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"Equal Employment Opportunity," as amended by Executive Order 11375, "Amending Executive Order 11246 Relating to Equal Employment Opportunity," and as supplemented by regulations at 41 CFR Part 60.

§ 19.7.2 Davis Bacon Act. If the contract is in excess of $2,000 and involves construction, alteration, or repair of real property, Contractor shall comply with the Davis-Bacon Act (40 USC 3141-3144 and 3146-3148), as supplemented by Department of Labor regulations (29 CFR Part 5, "Labor Standards Provisions Applicable to Contracts Governing Federally Financed and Assisted Construction"). Under the Davis-Bacon Act, Contractor must pay wages to laborers and mechanics at a rate not less than the minimum wages specified in wage determinations made by the Secretary of Labor. In addition, Contractor must pay wages not less than once per week and otherwise comply with the applicable requirements of the clause at 29 CFR 5.5(a), which is incorporated herein in full. (See https://www.ecfr.gov/current/title-29/subtitle-A/part-5.) As this Project is also subject to Washington Prevailing Wage requirements, Contractor and its Subcontractors of all tiers must pay the higher of the two wages (Prevailing and Davis-Bacon) when they are not the same.

§ 19.7.3 Copeland "Anti-Kickback" Act. If the contract is in excess of $2,000 and involves construction, alteration, or repair of real property, Contractor shall comply with the Copeland "Anti-Kickback" Act (40 USC 3145), including pertinent Department of Labor regulations (29 CFR Part 3, "Contractors and Subcontractors on Public Building or Public Work Financed in Whole or in Part by Loans or Grants from the United States"). The Copeland "Anti-Kickback" Act provides in part that Contractor shall be prohibited from inducing, by any means, any person employed in the construction, alteration, or repair of public work, to give up any part of the compensation to which it is otherwise entitled.

§ 19.7.4 Contract Work Hours and Safety Standards Act. If the contract is in excess of $100,000 and involves the employment of mechanics or laborers, Contractor shall comply with 40 USC 3702 and 3704, as supplemented by Department of Labor regulations (29 CFR Part 5). Contractor must calculate the wages of every mechanic and laborer on the basis of a standard, 40-hour work week. Work in excess of the standard work week is permissible if the worker is compensated at a rate of not less than 1.5 times the basic rate of pay for all hours worked in excess of 40 hours in the work week. The requirements of 40 USC 3704 are applicable to construction work and provide that no laborer or mechanic shall be required to work in surroundings or under working conditions that are hazardous, unsanitary, or dangerous. These requirements do not apply to the purchases of supplies or materials ordinarily available on the open market, or to contracts for transportation or transmission of intelligence.

§ 19.7.5 Bayh-Dole Act. If the contract is for developmental, experimental, or research work, under a "funding agreement," as defined at 37 CFR 401.2(a), Contractor shall provide for the rights of the federal government and the Owner in any resulting invention pursuant to 37 CFR Part 401, "Rights to Inventions Made by Nonprofit Organizations and Small Business Firms Under Government Grants, Contracts and Cooperative Agreements," and meet the requirements of 37 CFR Part 401 and implementing regulations, if any, issued by the awarding agency.

§ 19.7.6 Clean Air Act and Federal Water Pollution Control Act. If the contract is in excess of $150,000, Contractor shall comply with all applicable standards, orders, and regulations issued per the Clean Air Act (42 USC 7401-7671q) and the Federal Water Pollution Control Act, as amended (33 USC 1251-1389). Any violations shall be reported to the federal awarding agency and the regional office of the Environmental Protection Agency ("EPA").

§ 19.7.7 Suspension and Debarment. Contractor represents and warrants that it is not listed on the governmentwide Excluded Parties List System in the System for Award Management in accordance with OMB guidelines at 2 CFR Part 180 that implement Executive Orders 12549 and 12689. This list contains the names of parties debarred, suspended, or otherwise excluded from federal contracting activities. Contractor must include requirements to comply with this regulation in any lower tier contracts it enters into. Contractor shall have a continuing duty during the term of this contract to disclose to the Owner any occurrence that would prevent Contractor from making the representations contained in this section.

§ 19.7.8 Byrd Anti-Lobbying Amendment. If the contract is in excess of $100,000, Contractor and its subcontractors shall file the certification required by this statute and associated regulations. Each tier shall certify to the tier above that it will not and has not used federal appropriated funds to pay any person or organization for influencing or attempting to influence an officer or employee of any agency, a member of Congress, officer or employee of Congress, or an employee of a member of Congress in connection with obtaining a federal contract, grant or any other award covered

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by 31 USC 1352. Each tier shall also disclose any lobbying with non-federal funds that takes place in connection with obtaining a federal award. Such disclosures shall be forwarded from tier to tier up to highest level grant recipient.

§ 19.7.9 Procurement of Recovered Materials. Generally, state agencies, political subdivisions, and their contractors must comply with Section 6002 of the Solid Waste Disposal Act, as amended by the Resource Conservation and Recovery Act ("Section 6002"). If applicable, Contractor shall comply with the requirements of Section 6002. These requirements include (1) procuring only items (designated in EPA guidelines at 40 CFR Part 247) that contain the highest percentage of recovered materials practicable, consistent with maintaining a satisfactory level of competition, where the purchase price of the item exceeds $10,000 or the value of the quantity acquired during the preceding fiscal year exceeded $10,000; (2) procuring solid waste management services in a manner that maximizes energy and resource recovery; and (3) establishing an affirmative procurement program for procurement of recovered materials identified in the EPA guidelines.

§ 19.7.10 Domestic Preferences. Contractor should, to the extent practicable and consistent with applicable law, provide a preference for the purchase, acquisition, or use of products, or materials produced in the United States (including but not limited to iron, steel, aluminum, cement, and other manufactured products). The requirements of this section must be included in all contracts and purchase orders under this contract. "Produced in the United States" means, for iron and steel products, that all manufacturing processes from the initial melting stage through the application of coatings, occurred in the United States. "Manufactured products" means items and construction materials composed in whole or in part of non-ferrous metals such as aluminum, plastics and polymer-based products such as polyvinyl chloride pipe, glass (including optical fiber), aggregates (such as concrete), and lumber.

§ 19.7.11 Prohibition on Certain Telecommunications and Video Surveillance Services or Equipment. Contractor shall not obligate or expend funds provided under this contract to (1) procure or obtain, (2) extend or renew a contract to procure or obtain; or (3) enter into a contract (or extend or renew a contract) to procure or obtain equipment, services, or systems that uses covered telecommunications equipment or services as a substantial or essential component of any system, or as critical technology as part of any system. Per Public Law 115-232, section 889, "covered telecommunications equipment" means any of the following:

a. Telecommunications equipment produced by Huawei Technologies Company or ZTE Corporation (or any subsidiary or affiliate of such entities).

b. For the purpose of public safety, security of government facilities, physical security surveillance of critical infrastructure, and other national security purposes, video surveillance and telecommunications equipment produced by Hytera Communications Corporation, Hangzhou Hikvision Digital Technology Company, or Dahua Technology Company (or any subsidiary or affiliate of such entities).

c. Telecommunications or video surveillance services provided by such entities or using such equipment.

d. Telecommunications or video surveillance equipment or services produced or provided by an entity that the Secretary of Defense, in consultation with the Director of the National Intelligence or the Director of the Federal Bureau of Investigation, reasonably believes to be an entity owned or controlled by, or otherwise connected to, the government of a covered foreign country.

§ 19.7.12 The attached "§5.5 Contract provisions and related matters" are hereby inserted in full into this Agreement. As used therein, "contracting officer" shall mean the Owner's representative and "contractor" means the "Contractor."

ARTICLE 20 TERMINATION OF THE CONTRACT

§ 20.1 Termination by the Contractor

If the Architect fails to certify payment ~~as provided in Section 15.4.1~~ for a period of 30 days through no fault of the Contractor, or if the Owner fails to make payment ~~as provided in Section 4.1.3 for a period of 30 days,~~ for a period of 30 days after payment is due and owing, and except as provided by RCW 60.28.080, the Contractor may, upon seven additional days' notice to the Owner and the Architect, during which period the Owner has the right to cure, terminate the Contract and recover from the Owner payment for Work ~~executed, including reasonable overhead and profit, costs incurred by reason of such termination, and damages.~~executed and for proven loss with respect to materials, equipment, tools, and construction equipment and machinery, including fees applicable to the project. The total recovery of the Contractor shall not exceed the unpaid balance of the Contract Sum.

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§ 20.2 Termination by the Owner for Cause

§ 20.2.1 The Owner may upon seven calendar days' written notice to the Contractor terminate (without prejudice to any right or remedy of the Owner) the whole or any portion of the Contract for cause if the Contractor

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

.2 fails to make prompt payment to Subcontractors for materials or labor in accordance with the respective agreements between the Contractor and the Subcontractors;

.3 materially or 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.~~a material or substantial breach of or default under a provision of the Contract Documents;

.5 fails to comply with Sections 9.3.5;

.6 fails to prosecute the Work or any portion thereof with sufficient diligence to ensure the Substantial and Final Completion of the Work within the Contract Time; or

.7 is adjudged bankrupt, makes a general assignment for the benefit of its creditors, or if a receiver is appointed on account of its insolvency.

If, after the Contractor has been terminated pursuant to this Section, it is determined that none of the circumstances set forth in Section 20.2.1 exists, then the termination shall be for convenience under Section 20.3.

§ 20.2.2 When any of the reasons described in Section 20.2.1 exists, the ~~Owner, upon certification by the Architect that sufficient cause exists to justify such action,~~ Owner may, without prejudice to any other remedy the Owner may have and after giving the Contractor seven calendar days' notice, terminate the Contract and take possession of the site and of all materials, equipment, tools, and construction equipment and machinery thereon owned by the Contractor and may finish the Work by whatever reasonable method the Owner may deem expedient. Upon 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.

§ 20.2.3 When the Owner terminates the Contract for one of the reasons stated in Section 20.2.1, the Contractor shall not be entitled to receive further payment until the Work is finished.

§ 20.2.4 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 Architect, upon application, and this obligation for payment shall survive termination of the Contract.

§ 20.3 Termination by the Owner for Convenience

The Owner may, at any time, terminate (without prejudice to any right or remedy of the Owner) the whole or any portion of the Contract for the Owner's convenience and without cause. The Owner shall pay the Contractor for Work executed; and costs incurred by reason of such termination, including costs attributable to termination of Subcontracts; and a termination fee, if any, as follows:

(Insert the amount of or method for determining the fee payable to the Contractor by the Owner following a termination for the Owner's convenience, if any.)

The Owner shall be liable to Contractor only for those costs reimbursable to Contractor in accordance with the following plus ten percent of the actual costs recovered under this Section: (1) the amount due under Article 15 of this Agreement for the performance of the Work completed and not terminated, and (2) other pre-approved costs, consistent with Section 13.7, necessary and reasonably incurred in connection with the termination of the Work. The total sum to be paid to the Contractor under this Section 20.3 shall not exceed the Contract Sum as reduced by the amount of payments otherwise made.

§ 20.4 EFFECTS OF TERMINATION

§ 20.4.1 Unless the Owner directs otherwise, after receipt of a Notice of Termination from the Owner pursuant to Section 20.2 or 20.3, the Contractor shall promptly:

.1 stop Work under the Contract on the date and as specified in the Notice of Termination;

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.2 place no further orders or subcontracts for materials, equipment, services or facilities, except as may be necessary for completion of any portion of the Work that is not terminated;

.3 procure cancellation of all orders and subcontracts, upon terms acceptable to the Owner, to the extent that they relate to the performance of Work terminated;

.4 assign to the Owner all of the right, title and interest of the Contractor under any orders and subcontracts, in which case the Owner shall have the right, in its discretion, to settle or pay any or all claims arising out of the termination of such orders and subcontracts;

.5 with the Owner's approval, settle all outstanding liabilities and all claims arising out of such termination of orders and subcontracts not assigned to the Owner;

.6 transfer title and deliver to the entity or entities designated by the Owner the fabricated or unfabricated parts, Work in process, partially completed supplies and equipment, materials, parts, tools, dies, jigs and other fixtures, completed Work, supplies and other material produced as part of, or acquired in connection with the performance of, the Work terminated, and the completed or partially completed plans, drawings, information and other property related to the Work;

.7 use its best efforts to sell any property of the types referred to in Section 20.4.1.6. The Contractor may acquire any such property under the conditions prescribed by and at a price or prices approved by the Owner, and the proceeds of any such transfer or disposition may be applied in reduction of any payments to be made by the Owner to the Contractor;

.8 take such action as may be necessary or as directed by the Owner to preserve and protect the Work and property related to this Project in the possession of the Contractor in which the Owner has an interest; and

.9 continue performance only to the extent not terminated.

ARTICLE 21 CLAIMS AND DISPUTES

§ 21.1 Claims, disputes, and other matters in question arising out of or relating to this Contract, including those alleging an error or omission by the Architect ~~but excluding those arising under Section 16.2, shall be referred initially to the Architect for decision.~~ ("Claims"), except claims which have been waived under the terms of the Contract Documents, shall be decided exclusively by the following dispute resolution procedure unless the parties mutually agree in writing otherwise. Such matters, except those waived as provided for in ~~Section 21.11~~ Article 21, Section 13.6, and Sections 15.7.3 and 15.7.4, shall, ~~after initial decision by the Architect or 30 days after submission of the matter to the Architect,~~ if the Owner and Contractor cannot come to a mutual resolution of the Claims, be subject to mediation as a condition precedent to binding dispute resolution. This requirement cannot be waived except by an explicit written waiver.

§ 21.2 Notice of Claims

§ 21.2.1 ~~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 18.2, shall be initiated by notice to the Architect 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.~~ The Contractor shall submit a written notice to the Owner of all Claims within seven days of the event giving rise to them and shall include a clear description of the event leading up to the Claim. The Contractor shall submit a written Claim within thirty days of the notice and shall include in the Claim a clear description of the Claim, the proposed change in the Contract Sum and/or Contract Time of the Claim and provide data supporting the Claim. Failure to comply with these requirements shall constitute waiver of the Claim. The Claim shall include all changes, direct and indirect, in cost and in time to which the Contractor (and Subcontractors of any tier) is entitled. Neither a Request for Information, nor an Owner's request for or the Contractor's response to a Change Order proposal, nor a notice of potential or future claim shall constitute a Claim.

§ 21.2.2 ~~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 18.2, shall be initiated by notice to the other party.~~

§ 21.3 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 in accordance with the requirements of the final dispute resolution method selected in this Agreement whether in contract, tort, breach of warranty, or otherwise, within the period specified by ~~applicable law,~~

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~~but in any case not more than 10 years after the date of Substantial Completion of the Work.~~ this Contract and applicable law. The Owner and Contractor waive all claims and causes of action not commenced in accordance with this Section 21.3.

§ 21.4 If a claim, dispute or other matter in question relates to or is the subject of a mechanic's lien, the party asserting such matter may proceed in accordance with applicable law to comply with the lien notice or filing ~~deadlines.~~ deadlines prior to resolution of the matter by mediation.

§ 21.5 The parties shall endeavor to resolve their disputes by mediation which, unless the parties mutually agree ~~otherwise, shall be administered by the American Arbitration Association in accordance with their Construction Industry Mediation Procedures in effect on the date of this Agreement.~~ in writing otherwise, shall be in accordance with the Construction Industry Mediation Rules of the American Arbitration Association then in effect, and shall be held in Seattle, Washington unless the parties agree upon another location. A request for mediation shall be made in writing, delivered to the other party to this ~~Agreement, and filed with the person or entity administering the mediation. The request may be made concurrently with the binding dispute resolution but, in such event,~~ Agreement. The parties will attempt to mutually agree upon a mediator; if the parties cannot agree on a mediator within thirty days of receipt of the request, either party may file the request with the American Arbitration Association. The mediation shall proceed in advance of binding dispute resolution proceedings, which shall be stayed pending mediation for a period of 60 days from the date of filing, unless stayed for a longer period by agreement of the parties or court order. ~~If an arbitration is stayed pursuant to this Section, the parties may nonetheless proceed to the selection of the arbitrator(s) and agree upon a schedule for later proceedings.~~This mediation requirement cannot be waived except by an explicit written waiver signed by the Owner and the Contractor.

§ 21.6 ~~If the parties have selected arbitration as the method for binding dispute resolution in this 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 the Construction Industry Arbitration Rules in effect on the date of this Agreement. 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 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.~~Claims, disputes and other matters in question arising out of or relating to the Contract that are not resolved by mediation, except matters relating to aesthetic effect and except those waived as provided for in Article 21, and Sections 13.6, 15.7.3 and 15.7.4, shall be decided by litigation unless the parties mutually agree in writing otherwise. All unresolved Claims shall be waived and released unless the Contractor has complied with the time limits of the Contract Documents, and the Contractor has served and filed litigation within the earlier of (a) 60 days after Final Acceptance, or (b) 120 days after Substantial Completion. This requirement cannot be waived except by an explicit written waiver signed by the Owner and the Contractor. The pendency of a mediation (commencing upon the written request for mediation) shall toll these deadlines until the earlier of the mediator providing written notice to the parties of impasse or thirty days after the date of the mediation session. These requirements are not applicable to any Owner's claim against the Contractor for defective work.

§ 21.7 ~~Subject to the rules of the American Arbitration Association or other applicable arbitration rules, either party, at its sole discretion, may consolidate an arbitration conducted under this Agreement with any other arbitration to which it is a party provided 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).~~**Written Notice and Waiver.** All notice and Claims shall be made in writing as required by the Contract. Any notice of a Claim of the Contractor against the Owner and any Claim of the Contractor, whether under the Contract Documents or otherwise, must be made pursuant to and in strict accordance with the applicable provisions of the Contract. No act, omission, or knowledge, actual or constructive, of the Owner or the Architect shall in any way be deemed to be a waiver of the requirement for timely, written notice and a timely, written Claim unless the Owner and the Contractor sign an explicit, unequivocal written waiver approved by the Owner's Board of Directors. The fact that the Owner and the Contractor may consider, discuss or negotiate an untimely, defective or waived Claim shall in no way be deemed to constitute a waiver of any notice or other provision of the Contract Documents unless the Owner and the Contractor sign an explicit, unequivocal written waiver approved by the Owner's Board of Directors. The Contractor expressly acknowledges and agrees that the Contractor's failure to timely submit required notices or timely submit Claims has a substantial impact upon and prejudices the Owner, including but not limited to the inability to investigate or verify the Claim, mitigate damages, choose alternative options, adjust the budget, delete or modify the impacted Work, and/or monitor time, cost and

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quantities. For these and other reasons, the parties stipulate that the Owner is prejudiced by the Contractor's failure timely to submit notices or Claims as required by the Contract Documents.

~~**§ 21.8** Subject to the rules of the American Arbitration Association or other applicable arbitration rules, any party to an arbitration 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 a Claim not described in the written Consent.~~

~~**§ 21.9** The foregoing agreement to arbitrate and other agreements to arbitrate with an additional person or entity duly consented to by parties to this Agreement, shall be specifically enforceable under applicable law in any court having jurisdiction thereof.~~

§ 21.10 Continuing Contract Performance

Pending final resolution of a Claim, except as otherwise agreed in writing, the Contractor shall proceed diligently with performance of the Contract and the Owner shall continue to make payments in accordance with the Contract Documents.

§ 21.11 Waiver of Claims for Consequential Damages

~~The~~ Unless specifically provided for in other provisions of the Contract Documents, the Contractor and Owner waive claims against each other for consequential damages arising out of or relating to this Contract. This mutual waiver includes without limitation

.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 and home office overhead and expenses including without limitation 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.~~ for losses on other projects, for financing costs, and for loss of profit on the Work properly performed.

This mutual waiver is also applicable, without limitation, to all consequential damages due to either party's termination in accordance with Article 20. Nothing contained in this Section 21.11 shall be deemed to preclude an award of liquidated damages, when applicable, in accordance with the requirements of the Contract ~~Documents.~~ Documents, or to preclude an obligation of the Contractor to indemnify the Owner for direct, indirect or consequential damages alleged by a third party.

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

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

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§5.5 Contract provisions and related matters.

(a) The Agency head shall cause or require the contracting officer to insert in full in any contract in excess of $2,000 which is entered into for the actual construction, alteration and/or repair, including painting and decorating, of a public building or public work, or building or work financed in whole or in part from Federal funds or in accordance with guarantees of a Federal agency or financed from funds obtained by pledge of any contract of a Federal agency to make a loan, grant or annual contribution (except where a different meaning is expressly indicated), and which is subject to the labor standards provisions of any of the acts listed in §5.1, the following clauses (or any modifications thereof to meet the particular needs of the agency, Provided, That such modifications are first approved by the Department of Labor):

(1) Minimum wages. (i) All laborers and mechanics employed or working upon the site of the work (or under the United States Housing Act of 1937 or under the Housing Act of 1949 in the construction or development of the project), will be paid unconditionally and not less often than once a week, and without subsequent deduction or rebate on any account (except such payroll deductions as are permitted by regulations issued by the Secretary of Labor under the Copeland Act (29 CFR part 3)), the full amount of wages and bona fide fringe benefits (or cash equivalents thereof) due at time of payment computed at rates not less than those contained in the wage determination of the Secretary of Labor which is attached hereto and made a part hereof, regardless of any contractual relationship which may be alleged to exist between the contractor and such laborers and mechanics. Contributions made or costs reasonably anticipated for bona fide fringe benefits under section 1(b)(2) of the Davis-Bacon Act on behalf of laborers or mechanics are considered wages paid to such laborers or mechanics, subject to the provisions of paragraph (a)(1)(iv) of this section; also, regular contributions made or costs incurred for more than a weekly period (but not less often than quarterly) under plans, funds, or programs which cover the particular weekly period, are deemed to be constructively made or incurred during such weekly period. Such laborers and mechanics shall be paid the appropriate wage rate and fringe benefits on the wage determination for the classification of work actually performed, without regard to skill, except as provided in §5.5(a)(4). Laborers or mechanics performing work in more than one classification may be compensated at the rate specified for each classification for the time actually worked therein: Provided, That the employer's payroll records accurately set forth the time spent in each classification in which work is performed. The wage determination (including any additional classification and wage rates conformed under paragraph (a)(1)(ii) of this section) and the Davis-Bacon poster (WH-1321) shall be posted at all times by the contractor and its subcontractors at the site of the work in a prominent and accessible place where it can be easily seen by the workers.

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

(1) The work to be performed by the classification requested is not performed by a classification in the wage determination; and

(2) The classification is utilized in the area by the construction industry; and

(3) The proposed wage rate, including any bona fide fringe benefits, bears a reasonable relationship to the wage rates contained in the wage determination.

(B) If the contractor and the laborers and mechanics to be employed in the classification (if known), or their representatives, and the contracting officer agree on the classification and wage rate (including the amount designated for fringe benefits where appropriate), a report of the action taken shall be sent by the contracting officer to the Administrator of the Wage and Hour Division, U.S. Department of Labor, Washington, DC 20210. The Administrator, or an authorized representative, will approve, modify, or disapprove every additional classification action within 30 days of receipt and so advise the contracting officer or will notify the contracting officer within the 30-day period that additional time is necessary.

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

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

(iii) Whenever the minimum wage rate prescribed in the contract for a class of laborers or mechanics includes a fringe benefit which is not expressed as an hourly rate, the contractor shall either pay the benefit as stated in the wage determination or shall pay another bona fide fringe benefit or an hourly cash equivalent thereof.

(iv) If the contractor does not make payments to a trustee or other third person, the contractor may consider as part of the wages of any laborer or mechanic the amount of any costs reasonably anticipated in providing bona fide fringe benefits under a plan or program, Provided, That the Secretary of Labor has found, upon the written request of the contractor, that the applicable standards of the Davis-Bacon Act have been met. The Secretary of Labor may require the contractor to set aside in a separate account assets for the meeting of obligations under the plan or program.

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

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

(ii)(A) The contractor shall submit weekly for each week in which any contract work is performed a copy of all payrolls to the (write in name of appropriate federal agency) if the agency is a party to the contract, but if the agency is not such a party, the contractor will submit the payrolls to the applicant, sponsor, or owner, as the case may be, for transmission to the (write in name of agency). The payrolls submitted shall set out accurately and completely all of the information required to be maintained under 29 CFR 5.5(a)(3)(i), except that full social security numbers and home

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addresses shall not be included on weekly transmittals. Instead the payrolls shall only need to include an individually identifying number for each employee (e.g., the last four digits of the employee's social security number). The required weekly payroll information may be submitted in any form desired. Optional Form WH-347 is available for this purpose from the Wage and Hour Division Web site at http://www.dol.gov/esa/whd/forms/wh347instr.htm or its successor site. The prime contractor is responsible for the submission of copies of payrolls by all subcontractors. Contractors and subcontractors shall maintain the full social security number and current address of each covered worker, and shall provide them upon request to the (write in name of appropriate federal agency) if the agency is a party to the contract, but if the agency is not such a party, the contractor will submit them to the applicant, sponsor, or owner, as the case may be, for transmission to the (write in name of agency), the contractor, or the Wage and Hour Division of the Department of Labor for purposes of an investigation or audit of compliance with prevailing wage requirements. It is not a violation of this section for a prime contractor to require a subcontractor to provide addresses and social security numbers to the prime contractor for its own records, without weekly submission to the sponsoring government agency (or the applicant, sponsor, or owner).

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

(1) That the payroll for the payroll period contains the information required to be provided under §5.5 (a)(3)(ii) of Regulations, 29 CFR part 5, the appropriate information is being maintained under §5.5 (a)(3)(i) of Regulations, 29 CFR part 5, and that such information is correct and complete;

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

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

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

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

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

(4) Apprentices and trainees—(i) Apprentices. Apprentices will be permitted to work at less than the predetermined rate for the work they performed when they are employed pursuant to and individually registered in a bona fide apprenticeship program registered with the U.S. Department of Labor, Employment and Training Administration, Office of Apprenticeship Training, Employer and Labor Services, or with a State Apprenticeship Agency recognized by the Office, or if a person is employed in his or her first 90 days of probationary employment as an apprentice in such an apprenticeship program, who is not individually registered in the program, but who has been certified by the Office of Apprenticeship Training, Employer and Labor Services or a State Apprenticeship Agency (where appropriate) to be eligible for probationary employment as an apprentice. The allowable ratio of apprentices to journeymen on the job site in any craft classification shall not be greater than the ratio permitted to the contractor as to the entire work force under the registered program. Any worker listed on a payroll at an apprentice wage rate, who is

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not registered or otherwise employed as stated above, shall be paid not less than the applicable wage rate on the wage determination for the classification of work actually performed. In addition, any apprentice performing work on the job site in excess of the ratio permitted under the registered program shall be paid not less than the applicable wage rate on the wage determination for the work actually performed. Where a contractor is performing construction on a project in a locality other than that in which its program is registered, the ratios and wage rates (expressed in percentages of the journeyman's hourly rate) specified in the contractor's or subcontractor's registered program shall be observed. Every apprentice must be paid at not less than the rate specified in the registered program for the apprentice's level of progress, expressed as a percentage of the journeymen hourly rate specified in the applicable wage determination. Apprentices shall be paid fringe benefits in accordance with the provisions of the apprenticeship program. If the apprenticeship program does not specify fringe benefits, apprentices must be paid the full amount of fringe benefits listed on the wage determination for the applicable classification. If the Administrator determines that a different practice prevails for the applicable apprentice classification, fringes shall be paid in accordance with that determination. In the event the Office of Apprenticeship Training, Employer and Labor Services, or a State Apprenticeship Agency recognized by the Office, withdraws approval of an apprenticeship program, the contractor will no longer be permitted to utilize apprentices at less than the applicable predetermined rate for the work performed until an acceptable program is approved.

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

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

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

(6) Subcontracts. The contractor or subcontractor shall insert in any subcontracts the clauses contained in 29 CFR 5.5(a)(1) through (10) and such other clauses as the (write in the name of the Federal agency) may by appropriate instructions require, and also a clause requiring the subcontractors to include these clauses in any lower tier subcontracts. The prime contractor shall be responsible for the compliance by any subcontractor or lower tier subcontractor with all the contract clauses in 29 CFR 5.5.

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

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

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(9) Disputes concerning labor standards. Disputes arising out of the labor standards provisions of this contract shall not be subject to the general disputes clause of this contract. Such disputes shall be resolved in accordance with the procedures of the Department of Labor set forth in 29 CFR parts 5, 6, and 7. Disputes within the meaning of this clause include disputes between the contractor (or any of its subcontractors) and the contracting agency, the U.S. Department of Labor, or the employees or their representatives.

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

(ii) No part of this contract shall be subcontracted to any person or firm ineligible for award of a Government contract by virtue of section 3(a) of the Davis-Bacon Act or 29 CFR 5.12(a)(1).

(iii) The penalty for making false statements is prescribed in the U.S. Criminal Code, 18 U.S.C. 1001.

(b) Contract Work Hours and Safety Standards Act. The Agency Head shall cause or require the contracting officer to insert the following clauses set forth in paragraphs (b)(1), (2), (3), and (4) of this section in full in any contract in an amount in excess of $100,000 and subject to the overtime provisions of the Contract Work Hours and Safety Standards Act. These clauses shall be inserted in addition to the clauses required by §5.5(a) or §4.6 of part 4 of this title. As used in this paragraph, the terms laborers and mechanics include watchmen and guards.

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

(2) Violation; liability for unpaid wages; liquidated damages. In the event of any violation of the clause set forth in paragraph (b)(1) of this section the contractor and any subcontractor responsible therefor shall be liable for the unpaid wages. In addition, such contractor and subcontractor shall be liable to the United States (in the case of work done under contract for the District of Columbia or a territory, to such District or to such territory), for liquidated damages. Such liquidated damages shall be computed with respect to each individual laborer or mechanic, including watchmen and guards, employed in violation of the clause set forth in paragraph (b)(1) of this section, in the sum of $25 for each calendar day on which such individual was required or permitted to work in excess of the standard workweek of forty hours without payment of the overtime wages required by the clause set forth in paragraph (b)(1) of this section.

(3) Withholding for unpaid wages and liquidated damages. The (write in the name of the Federal agency or the loan or grant recipient) shall upon its own action or upon written request of an authorized representative of the Department of Labor withhold or cause to be withheld, from any moneys payable on account of work performed by the contractor or subcontractor under any such contract or any other Federal contract with the same prime contractor, or any other federally-assisted contract subject to the Contract Work Hours and Safety Standards Act, which is held by the same prime contractor, such sums as may be determined to be necessary to satisfy any liabilities of such contractor or subcontractor for unpaid wages and liquidated damages as provided in the clause set forth in paragraph (b)(2) of this section.

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

(c) In addition to the clauses contained in paragraph (b), in any contract subject only to the Contract Work Hours and Safety Standards Act and not to any of the other statutes cited in §5.1, the Agency Head shall cause or require the contracting officer to insert a clause requiring that the contractor or subcontractor shall maintain payrolls and basic payroll records during the course of the work and shall preserve them for a period of three years from the completion of the contract for all laborers and mechanics, including guards and watchmen, working on the contract. Such records shall contain the name and address of each such employee, social security number, correct classifications, hourly rates

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of wages paid, daily and weekly number of hours worked, deductions made, and actual wages paid. Further, the Agency Head shall cause or require the contracting officer to insert in any such contract a clause providing that the records to be maintained under this paragraph shall be made available by the contractor or subcontractor for inspection, copying, or transcription by authorized representatives of the (write the name of agency) and the Department of Labor, and the contractor or subcontractor will permit such representatives to interview employees during working hours on the job.

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Certification of Document's Authenticity

AIA® Document D401™ – 2003

I, Graehm Wallace, hereby certify, to the best of my knowledge, information and belief, that I created the attached final document simultaneously with this certification at 11:39:12 ET on 01/09/2023 under Order No. 2114314097 from AIA Contract Documents software and that in preparing the attached final document I made no changes to the original text of AIA® Document A104™ – 2017, Standard Abbreviated Form of Agreement Between Owner and Contractor, as published by the AIA in its software, other than changes shown in the attached final document by underscoring added text and striking over deleted text.

_____

(Signed)

_____

(Title)

_____

(Dated)

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AHERA Triennial Asbestos Reinspection

Mark Morris High School
1602 Mark Morris Court
Longview, Washington

LONGVIEW
PUBLIC SCHOOLS
CREATING THE FUTURE TODAY

Inspection Date(s): February 12, 2020

Report Date: March 9, 2020

Prepared for: Jason Reetz
Facilities Manager

Facility Owner/Operator: Longview School District
2715 Lilac Street
Longview, Washington 98632

Prepared By:

Sterling Technologies, LLC
317 NE 144th Street
Vancouver, WA 98685

AHERA Triennial Asbestos Reinspection
Mark Morris High School

Introduction

Sterling Technologies (Sterling) conducted an AHEARA Triennial Reinspection of the Mark Morris High School located at 1602 Mark Morris Court, in Longview Washington on February 12, 2020. The purpose of the inspection was to comply with the "Asbestos Hazards Emergency Response Act" (AHERA) requirement to visually inspect all known and suspect asbestos containing-materials (ACM) present in the school, sufficient to designate an AHERA "Hazard Rank" and "Recommended Response Action" to each component ACM material.

An EPA accredited Asbestos Inspector and Management Planner, Ed Wilson, performed the inspection.

The scope and approach of the inspection included the following:

1. The 2016 AHERA Triennial Reinspection document was the primary guide used to determine the location and type of friable and non-friable ACM that remained in the school.
2. The 1998 AHERA Inspection was used as a reference to determine the location and type of the friable and non-friable ACM that had originally been identified in the school.
3. A visual inspection of all accessible areas of the school was performed to identify known and suspect friable and non-friable ACM; create photo log of same. The scope of this task includes the identification of any homogeneous areas of previously unidentified suspect friable and non-friable ACM.
4. Assign the AHERA "Hazard Rank" and "Recommended Response Action" classifications to all known and suspect friable and non-friable ACM identified in the school.
5. Report findings.

The sections of this document that follow catalog the findings of the inspection. The "Asbestos Material Identification and Hazard Rank/Recommended Response Summary Table" that immediately follows details the location and identification of ACM that remains in the school, along with a hazard ranking, and recommended response action for each respective ACM component per AHERA classification standards.

The "Response Action Notes" section of the document further elaborates and details recommended response actions for respective homogeneous areas of ACM identified in the school, as needed.

The "Follow-ups" section of the document outlines recommended follow-up actions for the school relating to homogenous areas of ACM identified in the 1998 inspection of the school that were also noted during our inspection, that were not included in the 2016 Triennial Inspection documentation.

The "Photo Log" section of the document contains representative photos of the ACM or suspect ACM visually inspected during the onsite physical inspection of the school.

Note: For the sake of communicating potential hazards, please be advised of suspect mold impacts to the compressor room wall (failure of condensation drain line) across the hall from the kitchen area of the school, and an active roof leak in the technology classroom in the shop building; see photo log.

AHERA Triennial Asbestos Reinspection
Mark Morris High School

Asbestos Material Identification and Hazard Rank / Recommended Response Summary Table

Number of Buildings: 6	Building AHERA Documents Referenced:
Facility Size: 156,983 sq. ft.	AHERA Management Plan 1988; Environmental Health Sciences INC
Year Built: 1957 (Additions: 1970, 1974, 1977)	AHERA Triennial Reinspection 2016; Migizi Group

Area Identification	Type of Material	Hazard Rank		Quantity (Approx.)	Recommended Response		Reinspection Comments
		Last	Current		Last	Current	
MM 02 - Classrooms and office	Vinyl floor tile	1	1	(4,000 ft^2)*	3	3,4	Overall good condition; some localized floor tile damage noted in high traffic areas (e.g. doorways)*1
MM 2020-1 - Bathroom near speech office	Sheet vinyl flooring; heavy guage	8	1	300 ft^2	n/a	3,4	Overall good condition; some localized damage noted in high traffic areas (e.g. wall partition end)*2
MM 2020-2 - Throughout school	Wall composite materials; suspect ACM	8	1	.LT. 156,000 ft^2	n/a	3,4	Overall good condition; some localized wall and covebase baseboard damage noted in high traffic areas (e.g. doorways)*3
MM-2020-3 - Metal Shop	Cement board welding partitions	8	1	300 ft^2	n/a	3,4	Overall good condition; some localized damage due to suspect student vandalism; e.g. gouges, holes, burns, etc*4
MM-2020-4 - Boiler Room	Boiler chimney flue; suspect ACM TSI	8	1	35 LF	n/a	3	The suspect ACM TSI on the boiler chimney flue appears to be in good condition*5
MM-2020-5 - Boiler Room	Ceiling concrete composite material	8	1	.LT. 156,000 ft^2	n/a	3	The suspect ACM ceiling concrete composite material appears to be in good condition

Hazard Rank:	**Response Action:**	**Inspector:**	Ed Wilson
1. Limited potential for fiber release	1. Isolate	**Affiliation:**	Sterling Technologies, LLC
2. Potential for damage	2. Remove		317 NE 144th Street
3. Potential for significant damage	3. O&M		Vancouver, WA 98685
4. Damaged	4. Repair	**Certification No:**	IMR-19-7445B
5. Damaged and potential for damage	5. Encapsulate	**Course ID:**	PBS Environmental
6. Damaged and potential for significant damage	6. Enclose	**Course Exp:**	10/2/2020
7. Significantly damaged			
8. New material addition to Management Plan			

AHERA Triennial Asbestos Reinspection
Mark Morris High School

Response Action Notes

1. The floor tile surface areas in the main school building, AA classrooms building, shop building, boiler room-ceramics building, and pool building, are in good condition overall and what floor tile damage there is (e.g. gouges, cracks, etc.), is for the most part evenly distributed and well below 10% of the total floor tile surface area. Where floor tile damage is more localized in high traffic areas (e.g. doorways), the extent of damage is less than 25% for each respective localized area[a]. Continue monthly O&M visual inspection of floor areas containing suspect ACM floor tiles. As needed, encapsulate floor areas with exposed floor tiles with a suitable floor wax at an interval sufficient to protect and maintain the floor tile surface. Pay particular attention to floor tiles that exhibit hair-line cracks; continue O&M of floor tiles where the hair-line cracks do not affect the structural integrity of the floor tile. Promptly isolate and replace severely cracked and/or damaged floor tiles and underlying mastics where the structural integrity of the floor tile(s) is compromised with suitable non-ACM flooring materials.

   *a. *The photo log (memory stick) that accompanies this document contains photos of the damaged floor tile areas noted during the inspection of the school that require more immediate repair attention.*

2. The heavy gauge sheet vinyl flooring noted in the bathroom near the speech office area of the main school building is in good condition overall, and what damage there is (e.g. cracks, etc.), is well below 10% of the total sheet vinyl flooring surface area. Where the sheet vinyl damage is more localized at the end of a wall partition, the extent of damage is less than 25% for the localized area[a]. Continue monthly O&M visual inspection of this floor area containing suspect ACM sheet vinyl and mastics. As needed, encapsulate floor and baseboard areas that exhibit cracks with a suitable mastic (add suitable corner guards as needed); continue O&M of sheet vinyl flooring where the cracks do not affect the structural integrity of the sheet vinyl. Promptly isolate and replace severely cracked and/or damaged sheet vinyl and underlying mastics where the structural integrity of the sheet vinyl flooring is compromised with suitable non-ACM flooring materials.

   *a. *The photo log (memory stick) that accompanies this document contains photos of the damaged bathroom sheet vinyl flooring area noted during the inspection of the school that requires more immediate repair attention*

3. The wall surface areas (composite materials) in the main school building, AA classrooms building, shop building, boiler room-ceramics building, and pool building, are in good condition overall; the extent of minor wall damage (e.g. gouges, cracks, damaged or missing cove base baseboards, etc.) is for the most part evenly distributed and well below 10% of the total wall surface area. Where wall damage is more localized in high traffic areas (e.g. doorways), the extent of damage is less than 25% for each respective localized area[a]. Continue monthly O&M visual inspection of wall areas containing suspect ACM materials (e.g. drywall mudding, cove base baseboard mastics). As needed, encapsulate wall areas with minor damage (e.g. gouges, cracks, etc.) with suitable wall mudding and paint, and/or replace damaged or missing cove base baseboards. Pay particular attention to wall corners in high traffic or high impact areas (e.g. kitchen and gymnasium areas); consider the installation of wall corner guards. Also pay close attention to areas of active moisture intrusion around windows, etc.; make the building envelop watertight, and repair moisture impacted wall areas as needed

   *a. *The photo log (memory stick) that accompanies this document contains photos of the damaged wall and cove base baseboard areas noted during the inspection of the school that require more immediate repair attention.*

*4. The concrete board student welding station fire-proof wall partitions in the metal shop area of the shop building are in good condition overall; the extent of minor damage (e.g. gouges, holes, burns, etc.) is for the most part evenly distributed and well below 10% of the total wall surface area of each respective welding station wall partition. Where the cement board wall partition damage is more localized (suspect student vandalism), the extent of the damage is less than 25% for each respective welding station fire-proof wall partition localized area. Continue monthly O&M visual inspection of the concrete board welding station wall partitions in the metal shop. As needed, encapsulate the concrete board welding station fire-proof wall partitions with minor damage (e.g. gouges, holes, burns, etc.) with suitable fire-proof mudding and and/or replace unrepairable concrete board welding station fire-proof wall partitions. Suitable asbestos warning signage should be considered for all entry points to the metal shop; e.g. "Danger Asbestos Hazard - Authorized Entry Only". Within the student welding station areas of the metal shop, suitable asbestos warning signage should also be installed on both sides of the concrete board welding station fire-proof wall partitions; "Danger: Contains Asbestos Fibers – Avoid Creating Dust – Cancer and Lund Disease Hazard".

*5. Suitable asbestos warning signage should be considered for all entry points to the boiler room (e.g. "Danger Asbestos - may cause cancer - causes damage to lungs - Authorized Personnel Only"). Inside the boiler room, asbestos warning signage must also be installed immediately adjacent to the boiler chimney flue; "CAUTION: ASBESTOS. HAZARDOUS. DO NOT DISTURB WITHOUT PROPER TRAINING AND EQUIPMENT."

Follow-ups

1. The May 1988 AHERA Inspection Summary document for the Mark Morris High School makes reference to ACM thermal system insulation (TSI) on the boiler, hot water tank and steam lines in the boiler room. The 2016 Triennial Reinspection document for the school makes no mention of ACM in the boiler room. In our inspection of the boiler room, it was noted that the insulation on the boiler, other supplemental tanks and equipment, and all steam/hot water lines appeared to be fiberglass, other than the boiler chimney flue noted above. Per the findings of Item 7 below, a more thorough inspection of the water piping in the attic crawlspaces may be required.
2. The May 1988 AHERA Inspection Summary document for the Mark Morris High School makes reference to ACM TSI on steam lines in an underground tunnel. The 2016 Triennial Reinspection document makes no mention of these materials. Per the 2016 Triennial Reinspection, we did not investigate nor discover an underground tunnel during our inspection. Per the findings of Item 7 below, inspection of the tunnel for TSI ACM on steam lines may be required.
3. The May 1988 AHERA Inspection Summary document for the Mark Morris High School makes reference to asbestos-containing cementitious hard fittings on the steam runs in the AA classrooms building above the suspended ceiling. The 2016 Triennial Reinspection document makes no mention of these materials. In our inspection of the AA classrooms building, all hot water and/or steam lines observed in the building appeared to be fiberglass, however the ceiling area above the dropped ceilings were not investigated. Per the findings of Item 7 below, a more thorough inspection of the water piping in the attic crawlspaces may be required.

4. The May 1988 AHERA Inspection Summary document for the Mark Morris High School makes reference to asbestos-containing cementitious hard fittings on the steam runs in the A classrooms area of the main school building, and in what the report defined as the MM 04, and MM 20 homogeneous areas of the school. Note that as the we do not obtain a full copy of the May 1988 AHERA Inspection report, the MM 04, and MM 20 homogeneous areas of the school referred to in the document are undetermined at the time of writing this report. The 2016 Triennial Reinspection document makes no mention of these materials. None-the-less, in our inspection of the occupied areas of the school, all steam and hot water piping insulation appeared to be fiberglass. Per the findings of Item 7 below, a more thorough inspection of the water piping in the attic crawlspaces may be required.
5. The May 1988 AHERA Inspection Summary document for the Mark Morris High School makes reference to asbestos-containing HVAC vibration dampener ducting in what the report defined as the MM 26 homogeneous area of the school. Note that as the we do not obtain a full copy of the May 1988 AHERA Inspection report, the MM 26 homogeneous area of the school referred to in the document is undetermined at the time of writing this report. The 2016 Triennial Reinspection document makes no mention of these materials. None-the-less, in our inspection of the occupied areas of the school, all steam and hot water piping insulation appeared to be fiberglass. Per the findings of Item 7 below, a more thorough inspection of the water piping in the attic crawlspaces may be required.
6. The May 1988 AHERA Inspection Summary document for the Mark Morris High School makes reference to asbestos-containing cement board (included corrugated asbestos boards) on the breezeway eaves and ceilings of the school, and above classroom windows. The 2016 Triennial Reinspection document makes no mention of these materials. In our inspection of the school, suspect ACM materials were not noted on the breezeway eaves and ceilings, nor above classroom windows. Per the findings of Item 7 below, a more thorough inspection of the water piping in the attic crawlspaces may be required.
7. A document search of ACM abatement work completed at the Mark Morris High School should be performed to determine if abatement of the above referenced materials not included in the 2016 Triennial Reinspection in the locations indicated has been completed.

Conclusions and Recommendations

Every effort was made to identify all ACM during this inspection of the accessible areas of the Mark Morris High School. As with any inspection, there is always a chance that additional suspect materials might be encountered by district or school maintenance staff or contractors (e.g. within wall or ceiling cavities) that were not identified during the inspection. Should additional suspect ACM's be identified in the course of the performance of any maintenance activity at the school that involves disturbing said suspect materials, work must stop until the materials have been tested and properly removed as needed.

Our inspection of the Mark Morris High School found it to be well maintained and very clean. The occupied areas of the school where ACM or suspect ACMs were located, were noted to not be friable, and appear to be well managed via the current operations and maintenance (O&M) program for the school. Presuming a continuation of the current O&M program, the identified ACM and suspect ACM within the school should pose no health hazard to the student and staff occupants of the school.

Limitations

This report is for the exclusive use of the client, applies only to the specific subject property detailed above, and shall not be relied upon by any other party without the prior written consent of the undersigned.

Sterling Technologies acknowledges that despite thorough inspection during the inspection, hidden suspect materials may be present on site. Care should be taken not to disturb such materials until the actual content of these materials has been confirmed. Suspect materials must be treated as ACM until testing proves otherwise.

Within the limitations of scope, schedule, and budget, our services have been executed in accordance with generally accepted practices in this area at the time this report was prepared. No other hazardous materials/wastes were investigated. No other conditions, expressed or implied, should be understood.

Should there be any questions regarding the methods by which the triennial asbestos inspection of the school was conducted, or how the inspection findings were compiled in this document, please do not hesitate to contact our office. Thank you for allowing us to be of service.

Sincerely,

Nadermann

Thomas Nadermann, M.S.
Principal
AHERA Inspector #155212

AHERA Triennial Asbestos Reinspection
Mark Morris High School

Photo Log



Classroom M5 Doorway



Classroom AA1 Outside Entry Doorway

Representative photos of cracked and / or damaged floor tiles



Bathroom near Speech Office

Representative photo of cracked and / or damaged sheet vinyl flooring – suspect ACBM

AHERA Triennial Asbestos Reinspection
Mark Morris High School

Photo Log (continued)

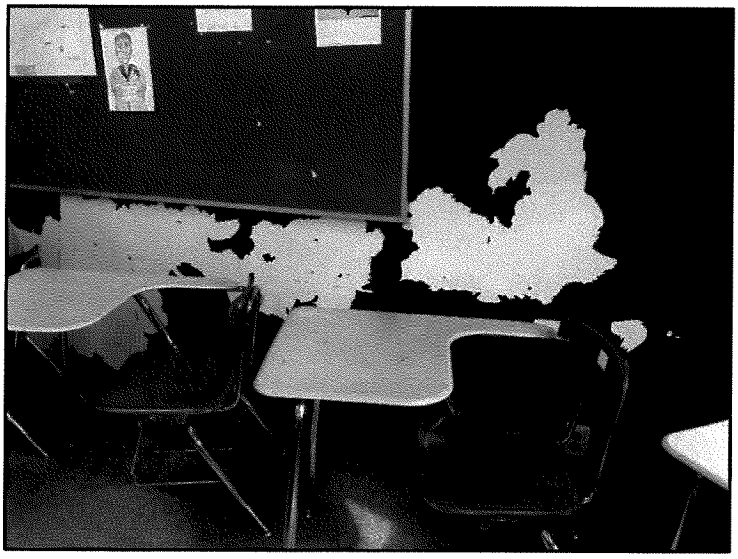


Classroom M5 Entry Doorway



Health Office wall

epresentative photos of missing and/or damaged cove base baseboards; mastic - suspect ACM



Classroom AA8

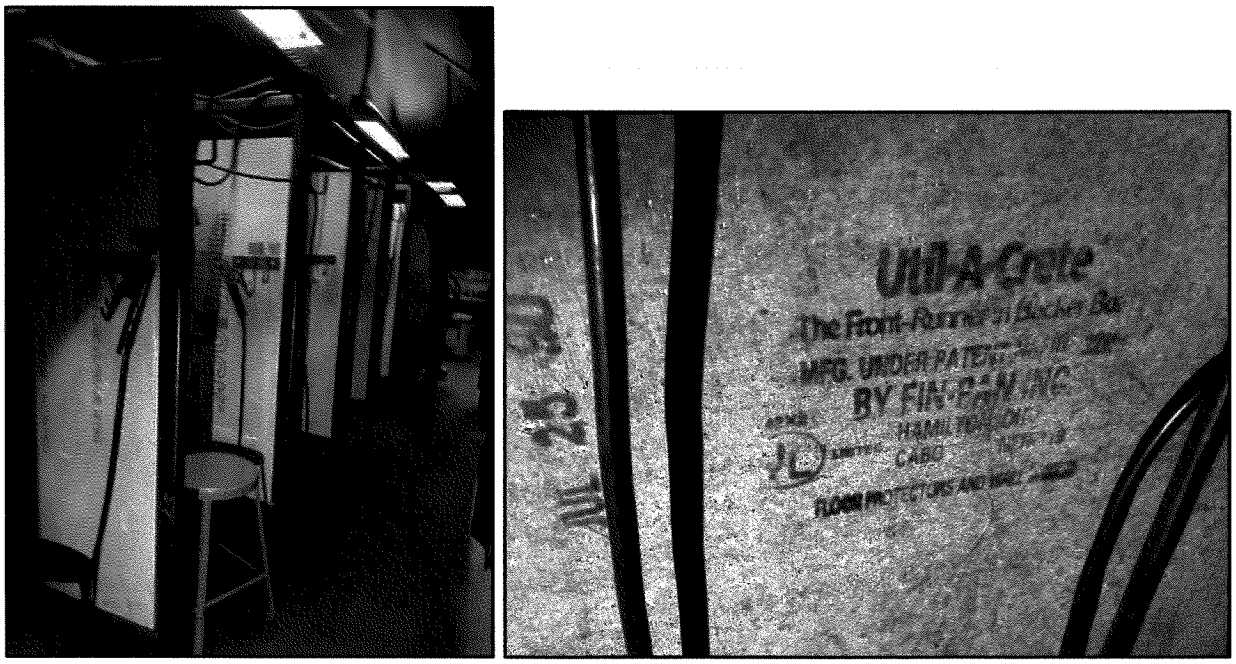


Outside Doorway by Girls Locker Room

Representative photos of wall damage; plaster-tape-texture-mudding-wallboard - suspect ACM

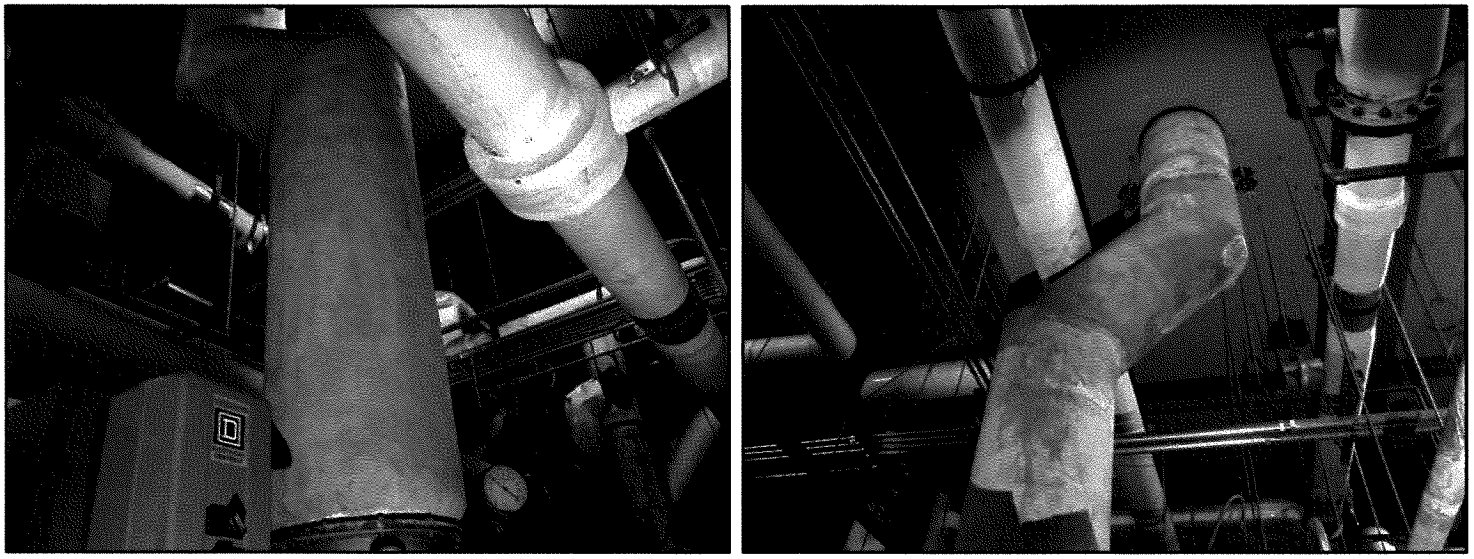
AHERA Triennial Asbestos Reinspection
Mark Morris High School

Photo Log (continued)



Metal Shop - welding curtain cement board

Representative photos of suspect asbestos containing materials (ACM)

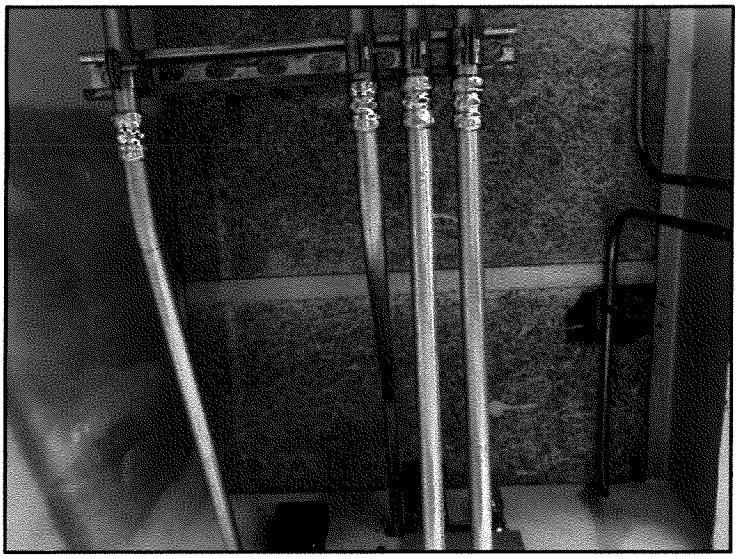


Boiler Room - Boiler Chimney Flue - Thermal System Insulation (TSI)

Representative photos of suspect TSI ACM

AHERA Triennial Asbestos Reinspection
Mark Morris High School

Photo Log (continued)



Fire Alarm Panel Closet Ceiling - concrete composite material

Representative photos of suspect asbestos containing materials (ACM)



Classroom AA8 – wall debris pile in corner



Compressor Room by Kitchen – drip line damage

Representative photos of suspect insect damage and moisture/mold impacts to wall & flooring

AHERA Triennial Asbestos Reinspection
Mark Morris High School

Photo Log (continued)



Technology Classroom Ceiling

Representative photos of suspect active roof leak and ceiling panel damage

Appendix A

Inspector's Certification

AHERA Triennial Asbestos Reinspection
Mark Morris High School



THIS IS TO CERTIFY THAT

THOMAS NADERMANN

HAS SUCCESSFULLY COMPLETED THE TRAINING COURSE

for

ASBESTOS INSPECTOR REFRESHER

In accordance with TSCA Title II, Part 763, Subpart E, Appendix C of 40 CFR

Course Date: 03/07/2019

Course Location: Portland, OR

Certificate: IR-19-[illegible]

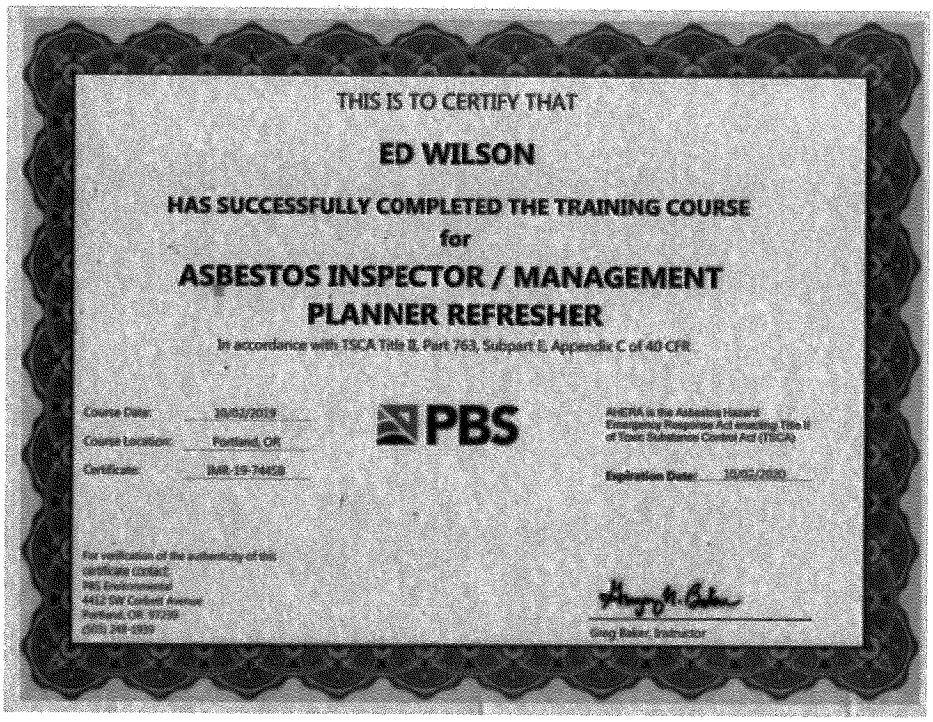
PBS

4-Hour Online AHERA Asbestos Inspector Refresher

expiration date: 03/07/2020

For verification of the authenticity of this certificate contact:
PBS Environmental
4412 SW Corbett Avenue
Portland, OR 97239
(503) 248-1939

Greg Baker, Instructor



THIS IS TO CERTIFY THAT

ED WILSON

HAS SUCCESSFULLY COMPLETED THE TRAINING COURSE

for

ASBESTOS INSPECTOR / MANAGEMENT PLANNER REFRESHER

In accordance with TSCA Title II, Part 763, Subpart E, Appendix C of 40 CFR

Course Date: 10/02/2019

Course Location: Portland, OR

Certificate: IMR-19-74458

PBS

AHERA is the Asbestos Hazard Emergency Response Act enacting Title II of Toxic Substances Control Act (TSCA)

Expiration Date: 10/02/2020

For verification of the authenticity of this certificate contact:
PBS Environmental
4412 SW Corbett Avenue
Portland, OR 97239
(503) 248-1939

Greg Baker, Instructor

AHERA Triennial Asbestos Reinspection

Columbia Valley Gardens Elementary
2644 30th Avenue
Longview, Washington

LONGVIEW
PUBLIC SCHOOLS
CREATING THE FUTURE TODAY

Inspection Date(s): January 29, 2020

Report Date: March 9, 2020

Prepared for: Jason Reetz
Facilities Manager

Facility Owner/Operator: Longview School District
2715 Lilac Street
Longview, Washington 98632

Prepared By:

Indoor Air Quality ASSOCIATION MEMBER

Sterling Technologies, LLC
317 NE 144th Street
Vancouver, WA 98685

AIHA MEMBER

AHERA Triennial Asbestos Reinspection
Columbia Valley Gardens Elementary

Introduction

Sterling Technologies (Sterling) conducted an AHEARA Triennial Reinspection of the Columbia Valley Gardens Elementary School located at 2644 30h Avenue in Longview, Washington on January 29, 2020. The purpose of the inspection was to comply with the "Asbestos Hazards Emergency Response Act" (AHERA) requirement to visually inspect all known and suspect asbestos-containing materials (ACM) present in the school, sufficient to designate an AHERA "Hazard Rank" and "Recommended Response Action" to each component ACM material.

An EPA accredited Asbestos Inspector and Management Planner, Ed Wilson, performed the inspection.

The scope and approach of the AHEARA Triennial Reinspection of the Columbia Valley Gardens Elementary School included the following:

1. The 2016 AHERA Triennial Reinspection document was the primary guide used to determine the location and type of friable and non-friable ACM that remained in the school.
2. The 1998 AHERA Inspection document was used as a reference to determine the location and type of the friable and non-friable ACM that had originally been identified in the school.
3. A visual inspection of all accessible areas of the school was performed to identify known and suspect friable and non-friable ACM and create a photo log of same. The scope of this task includes the identification of any homogeneous areas of previously unidentified suspect friable and non-friable ACM.
4. Assign the AHERA "Hazard Rank" and "Recommended Response Action" classifications to all known and suspect friable and non-friable ACM identified in the school.
5. Report findings.

The sections of this document that follow catalog the findings of the inspection. The "Asbestos Material Identification and Hazard Rank/Recommended Response Summary Table" that immediately follows details the location and identification of ACM that remains in the school, along with a hazard ranking, and recommended response action for each respective ACM component per AHERA classification standards.

The "Response Action Notes" section of the document further elaborates and details recommended response actions for respective homogeneous areas of ACM identified in the school, as needed.

The "Follow-ups" section of the document outlines recommended follow-up actions for the school relating to homogenous areas of ACM identified in the 1998 inspection of the school that were also noted during our inspection, that were not included in the 2016 Triennial Inspection documentation.

The "Photo Log" section of the document contains representative photos of the ACM or suspect ACM visually inspected during the onsite physical inspection of the school.

AHERA Triennial Asbestos Reinspection
Columbia Valley Gardens Elementary

Asbestos Material Identification and Hazard Rank / Recommended Response Summary Table

Number of Buildings: 2	Building AHERA Documents Referenced:
Facility Size: 39,152 sq ft	AHERA Management Plan 1988; Environmental Health Sciences INC
Year Built: 1925,1982 (Additions: 1938,1948,1963,1970; Renovations: 1950,1976)	AHERA Triennial Reinspection 2016; Migizi Group

Area Identification	Type of Material	Hazard Rank		Quantity (Approx.)	Recommended Response		Reinspection Comments
		Last	Current		Last	Current	
CVG 04 - Trim around building/foyer, some classrooms	Cement board	4	1	3000 ft^2	5	3	Overall good condition; no issues noted
CVG 05 - In corners of 1982 classrooms	12" x 12" cream vinyl floor tile	1	1	1200 ft^2	3	3, 4	Overall good condition; some localized floor tile damage noted in high traffic areas (e.g. doorways)*1
CVG 09 - Health room, kitchen	Yellow vinyl floor covering	1	1	900 ft^2	3	3, 4	Overall good condition; some localized floor tile damage noted in high traffic areas (e.g. doorways)*1
CVG 10 - Hallway ceiling panels	White cement board	1	1	200 ft^2	3	3	Overall good conditions; no issues noted
CVG 14 - Classrooms E-2, E-3, E-4, 1962 addition	9" x 9" grey/pink vinyl floor tile	1	1	2500 ft^2	3	3, 4	Overall good condition; some localized floor tile damage noted in high traffic areas (e.g. doorways)*1
CVG 19 - Multi-purpose, stage, foyer exercise room	12" x 12" cream vinyl floor tile	1	1	3000 ft^2	3	3, 4	Overall good condition; some localized floor tile damage noted in high traffic areas (e.g. doorways)*1
CVG 20 - Multi-purpose, stage entrance	9" x 9" light brown vinyl floor tile	1	1	20 ft^2	3	3, 4	Overall good condition; some localized floor tile damage noted in high traffic areas (e.g. doorways)*1
CVG 21 - Kitchen around kiln	Cement wall board	5	5	24 ft^2	5	3, 4	Overall good condition; impact damage to outside edge*2

Hazard Rank:	**Response Action:**	**Inspector:**	Ed Wilson
1. Limited potential for fiber release	1. Isolate	**Affiliation:**	Sterling Technologies, LLC
2. Potential for damage	2. Remove		317 NE 144th Street
3. Potential for significant damage	3. O&M		Vancouver, WA 98685
4. Damaged	4. Repair	**Certification No:**	IMR-19-7445B
5. Damaged and potential for damage	5. Encapsulate	**Course ID:**	PBS Environmental
6. Damaged and potential for significant damage	6. Enclose	**Course Exp:**	10/2/2020
7. Significantly damaged			
8. New material addition to Management Plan			

AHERA Triennial Asbestos Reinspection
Columbia Valley Gardens Elementary

Asbestos Material Identification and Hazard Rank / Recommended Response Summary Table

Number of Buildings: 2	Building AHERA Documents Referenced:
Facility Size: 39,152 sq ft	AHERA Management Plan 1988; Environmental Health Sciences INC
Year Built: 1925,1982 (Additions: 1938,1948,1963,1970; Renovations: 1950,1976)	AHERA Triennial Reinspection 2016; Migizi Group

Area Identification	Type of Material	Hazard Rank		Quantity (Approx.)	Recommended Response		Reinspection Comments
		Last	Current		Last	Current	
CVG 2020-1 - Throughout the school and gymnasium buildings	Wall composite materials; suspect ACM	8	1	.GT. 35,000 ft^2	n/a	3, 4	Overall good condition; some localized wall and covebase baseboard damage noted in high traffic areas (e.g. doorways)*3
CVG 2020-2 - Throughout the school and gymnasium buildings	Ceiling tiles and glue dots; suspect ACM	8	1	.LT. 39,000 ft^2	n/a	3, 4	Overall good condition; some localized ceiling tile damage noted; suspect roof leaks*4
CVG 2020-3 - Kitchen	Kiln	8	5	9 ft^2	n/a	1, 3, 5	The lid of the kiln is suspect ACM and is physically damaged; lid needs to be contained until repaired
CVG 2020-4 - Classroom 11	Chalkboard	8	1	50 ft^2	n/a	3, 5	Lower portion of chalkboard is not covered; remove chalkboard or fully cover with whiteboard
CVG 2020-5 - Mechanical Room	Hot water line insulation; suspect ACM TSI	8	2	20 linear ft	n/a	1, 2	Some short sections of hot water lines are insulated with suspet ACM TSI*5

Hazard Rank:	**Response Action:**	**Inspector:**	Ed Wilson
1. Limited potential for fiber release	1. Isolate	**Affiliation:**	Sterling Technologies, LLC
2. Potential for damage	2. Remove		317 NE 144th Street
3. Potential for significant damage	3. O&M		Vancouver, WA 98685
4. Damaged	4. Repair	**Certification No:**	IMR-19-7445B
5. Damaged and potential for damage	5. Encapsulate	**Course ID:**	PBS Environmental
6. Damaged and potential for significant damage	6. Enclose	**Course Exp:**	10/2/2020
7. Significantly damaged			
8. New material addition to Management Plan			

AHERA Triennial Asbestos Reinspection
Columbia Valley Gardens Elementary

Response Action Notes

*1. The floor tile surface areas in the main school building and gymnasium building are in good condition overall, and what floor tile damage there is (e.g. gouges, cracks, etc.), is for the most part evenly distributed and well below 10% of the total floor tile surface area. Where floor tile damage is more localized in high traffic areas (e.g. doorways), the extent of damage is less than 25% for each respective localized area[*a]. Continue monthly O&M visual inspection of floor areas containing suspect ACM floor tiles. As needed, encapsulate floor areas with exposed floor tiles with a suitable floor wax at an interval sufficient to protect and maintain the floor tile surface. Pay particular attention to floor tiles that exhibit hair-line cracks; continue O&M of floor tiles where the hair-line cracks do not affect the structural integrity of the floor tile. Promptly isolate and replace severely cracked and/or damaged floor tiles and underlying mastics where the structural integrity of the floor tile(s) is compromised with suitable non-ACM flooring materials.

*a. *The photo log (memory stick) that accompanies this document contains photos of the damaged floor tile areas noted during the inspection of the school that require more immediate repair attention. These areas include the gym vestibule janitor closet doorway, gym sprinkler-riser room doorway, gym main entry doorway, staff break/work room doorway, and kitchen main entry doorway.*

*2. The cement board thermal insulation installed around the kiln located in an alcove off of the kitchen has been identified as ACM, and it has impact damage to its outer edge. This damaged outer edge (cement board) needs to be contained in some manner until suitable repairs to this area can be completed; it is understood that containment may prevent use of the kiln. Assuming the kiln is not relocated to an alternate location in the school, a heavy gauge metal corner guard may server to both contain the damage portion of the cement board and protect it from further impact damage. Following suitable repairs, continue monthly O&M visual inspection of the cement board. Suitable asbestos warning signage also needs to be installed in this area (e.g. "CAUTION: ASBESTOS. HAZARDOUS. DO NOT DISTURB WITHOUT PROPER TRAINING AND EQUIPMENT").

*3. The wall surface areas (composite materials) in the main school building and gymnasium building are in good condition overall; the extent of minor wall damage (e.g. gouges, cracks, damaged or missing cove base baseboards, etc.) is for the most part evenly distributed and well below 10% of the total wall surface area. Where wall damage is more localized in high traffic areas (e.g. doorways), the extent of damage is less than 25% for each respective localized area[*a]. Continue monthly O&M visual inspection of wall areas containing suspect ACM materials (e.g. drywall mudding, cove base baseboard mastics). As needed, encapsulate wall areas with minor damage (e.g. gouges, cracks, etc.) with suitable wall mudding and paint, and/or replace damaged or missing cove base baseboards. Pay particular attention to wall corners in high traffic or high impact areas (e.g. kitchen and gymnasium areas); consider the installation of wall corner guards in these areas.

*a. *The photo log (memory stick) that accompanies this document contains photos of the damaged wall and cove base baseboard areas noted during the inspection of the school that require more immediate repair attention. These areas include the southeast hall near the gym, classroom 1, classroom 7, classroom 10, classroom 17, conference room 15, library, kitchen, storage room by classrooms 8 & 9, and the gym sprinkler-riser room.*

*4. The ceiling tile surface areas in the in the main school building and gymnasium building are in good condition overall; the extent of minor ceiling tile damage (e.g. gouges, cracks, damaged or missing ceiling tiles, etc.) is for the most part evenly distributed and well below

10% of the total ceiling surface area*a. Continue monthly O&M visual inspection of ceiling areas containing suspect ACM materials (e.g. ceiling tiles). As needed, encapsulate ceiling areas with minor damage (e.g. gouges, cracks, etc.) with a suitable ceiling mudding and paint, and/or replace damaged or missing ceiling tiles. Where ceiling tile damage is due to roof leaks, repair the roof leak before making permanent repairs to the impacted ceiling tiles.

*a. *The photo log (memory stick) that accompanies this document contains photos of the damaged and or missing ceiling tile areas noted during the inspection of the school that require more immediate repair attention. These areas include the southeast hall near the gym, and the library.*

*5. Our inspection of the mechanical room revealed fiberglass insulation on all but a small portion of hot water piping. This small portion of hot water piping (and elbows) located at chair level and susceptible to impact damage appeared to be ACM thermal system insulation (TSI). **Priority should be given to testing this material and should it prove to contain asbestos, we recommend its removal by a licensed asbestos abatement contractor in accordance with all applicable local, state, and federal regulations**. In the interim, suitable asbestos warning signage should be considered for all entry points to the mechanical room (e.g. "Danger Asbestos - may cause cancer - causes damage to lungs - Authorized Personnel Only"). Within the hall attic, asbestos warning signage must also be installed immediately adjacent to the suspect ACM TSI insulation of the steam lines (e.g. "CAUTION: ASBESTOS. HAZARDOUS. DO NOT DISTURB WITHOUT PROPER TRAINING AND EQUIPMENT").

Follow-ups

1. The May 1988 AHERA Inspection Summary document for the Columbia Valley Gardens Elementary School makes reference to suspect ACM TSI on the hot water piping in the ceiling and wall cavities related to the 1962-63 additions to the school. The 2016 Triennial Reinspection document makes no mention of these suspect ACM materials. In our inspection of the occupied spaces of the school (e.g. classrooms, hallways, storage and janitorial closets, etc.), it was noted that the insulation on all hot water piping (e.g. straight runs, elbows, and tees) appeared to be fiberglass, other than the aforementioned small portion of hot water lines in the mechanical room. Per the findings of Item 2 below, a more thorough inspection of the ceiling and wall cavities of the school building for TSI ACM on hot water piping may be required.
2. A document search of ACM abatement work completed at the Columbia Valley Gardens Elementary School should be performed to determine if abatement of the above referenced materials not included in the 2016 Triennial Reinspection in the locations indicated has been completed.

Conclusions and Recommendations

Every effort was made to identify all ACM during this inspection of the accessible areas of the Columbia Valley Elementary School. As with any inspection, there is always a chance that additional suspect materials might be encountered by district or school maintenance staff or contractors (e.g. within wall or ceiling cavities) that were not identified during the inspection. Should additional suspect ACMs be identified in the course of the performance of any

maintenance activity at the school that involves disturbing said suspect materials, work must stop until the materials have been tested and properly removed as needed.

Our inspection of the Columbia Valley Elementary School found it to be well maintained and very clean. The occupied areas of the school where ACM or suspect ACMs were located, were noted to not be friable (with the exception of the aforementioned impact damaged kiln cement board heat shield and chair level suspect ACM TSI in the mechanical room) and appear to be well managed via the current operations and maintenance (O&M) program for the school. Presuming a continuation of the current O&M program, the identified ACM and suspect ACM within the occupied areas of the school should pose no health hazard to the student and staff occupants of the school.

Limitations

This report is for the exclusive use of the client, applies only to the specific subject property detailed above, and shall not be relied upon by any other party without the prior written consent of the undersigned.

Sterling Technologies acknowledges that despite thorough inspection during the inspection, hidden suspect materials may be present on site. Care should be taken not to disturb such materials until the actual content of these materials has been confirmed. Suspect materials must be treated as ACM until testing proves otherwise.

Within the limitations of scope, schedule, and budget, our services have been executed in accordance with generally accepted practices in this area at the time this report was prepared. No other hazardous materials/wastes were investigated. No other conditions, expressed or implied, should be understood.

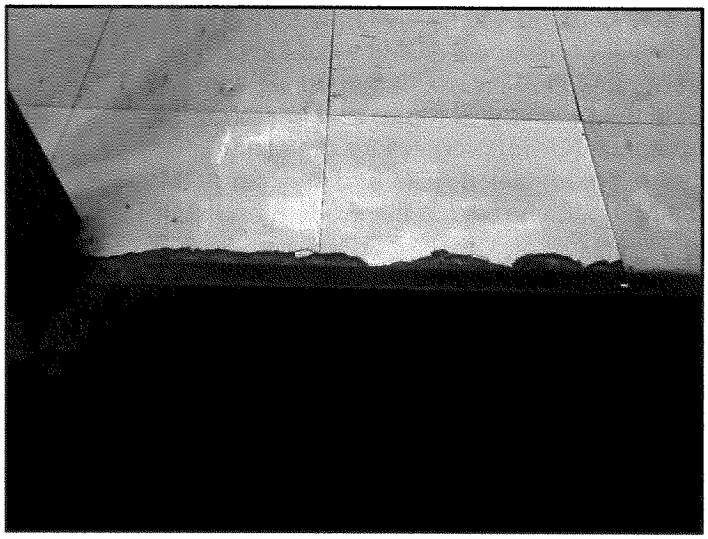
Should there be any questions regarding the methods by which the triennial asbestos inspection of the school was conducted, or how the inspection findings were compiled in this document, please do not hesitate to contact our office. Thank you for allowing us to be of service.

Sincerely,

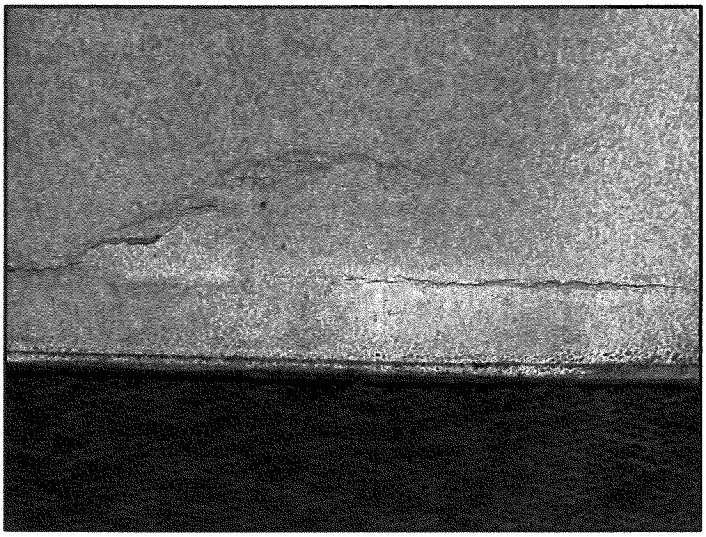
Nadermann

Thomas Nadermann, M.S.
Principal
AHERA Inspector #155212

AHERA Triennial Asbestos Reinspection
Columbia Valley Gardens Elementary
Photo Log

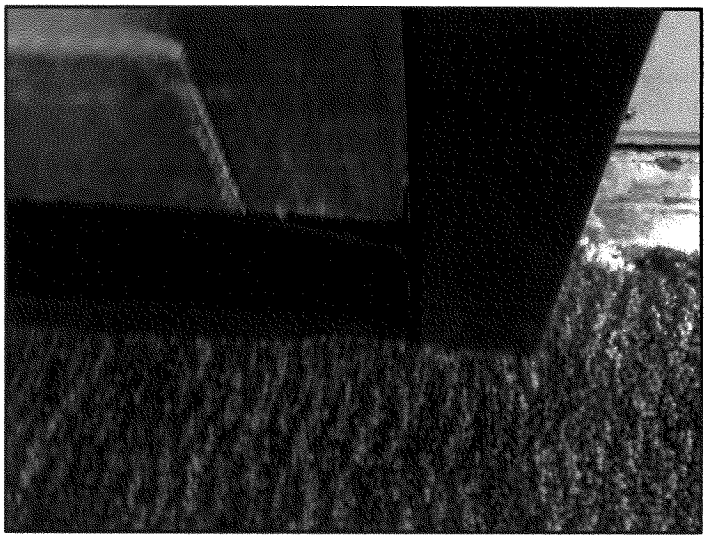


Gym entry doorway



Kitchen entry doorway

Representative photos of cracked and / or damaged floor tiles and sheet vinyl



Classroom 10



Kitchen

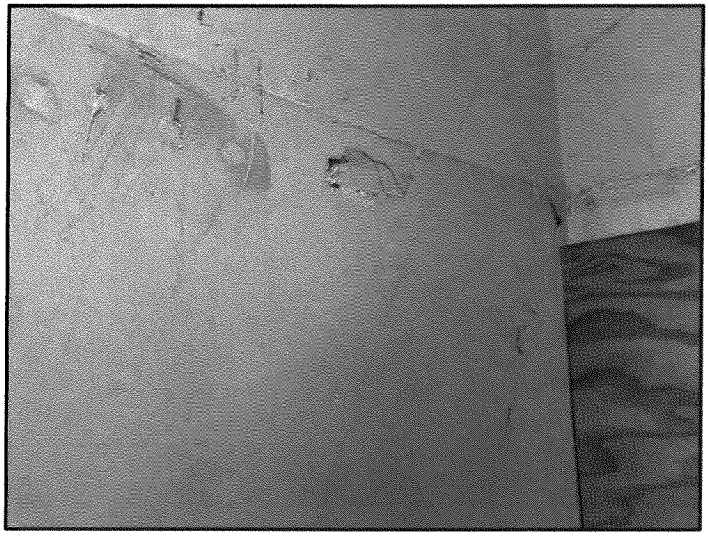
Representative photos of missing and/or damaged cove base baseboards; mastic - suspect ACM

AHERA Triennial Asbestos Reinspection
Columbia Valley Gardens Elementary

Photo Log (continued)



Kitchen

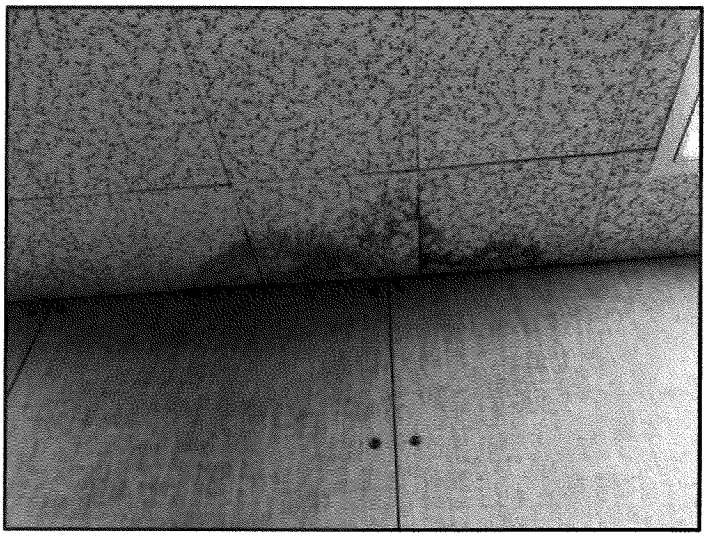


Storage Room by Classrooms 8 & 9

Representative photos of wall damage; plaster-tape-texture-mudding-wallboard - suspect ACM



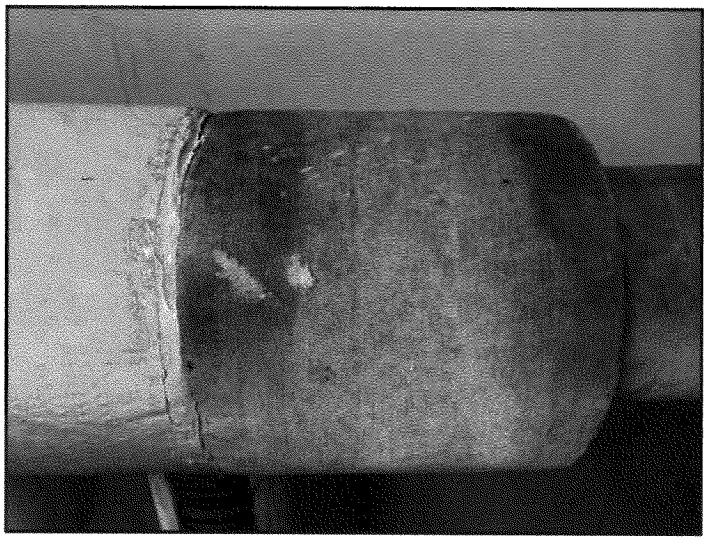
SE Hall toward Gym



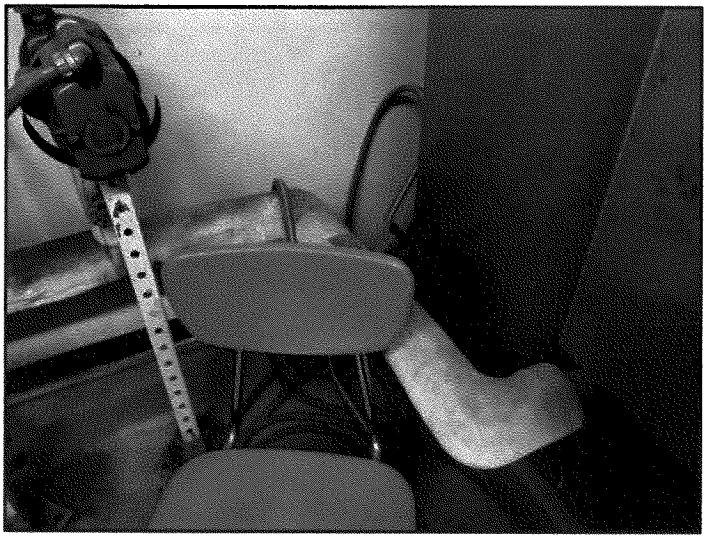
Library

Representative photos of ceiling tile damage/water stains - suspect ACM

AHERA Triennial Asbestos Reinspection
Columbia Valley Gardens Elementary



Mechanical Room steam and/or hot water lines



Mechanical Room steam and/or hot water lines

Representative photos of suspect TSI ACM on steam and/or hot water lines



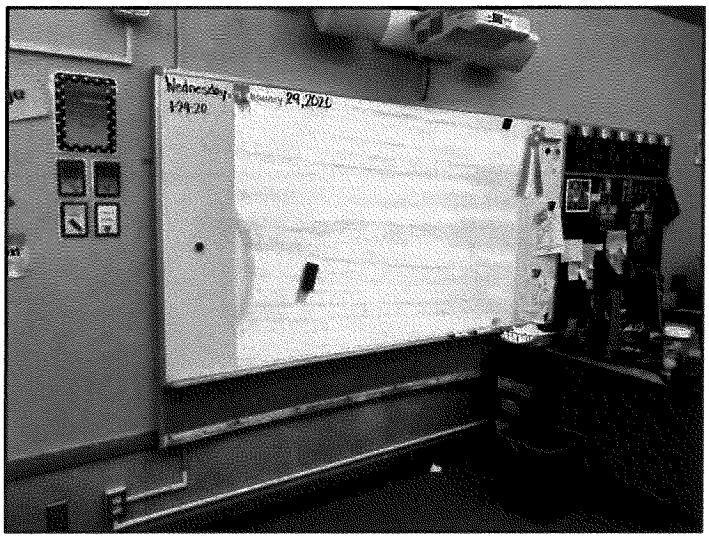
Kiln located adjacent to the Kitchen



Kiln cement board heat shield

Representative photos of abrasion and impact damage to suspect Asbestos containing materials

AHERA Triennial Asbestos Reinspection
Columbia Valley Gardens Elementary



Classroom 11 chalkboard

Chalkboard (suspect ACMI) with some impact/abrasion damage along lower edge

Appendix A

Inspector's Certification

AHERA Triennial Asbestos Reinspection
Columbia Valley Gardens Elementary



THIS IS TO CERTIFY THAT

THOMAS NADERMANN

HAS SUCCESSFULLY COMPLETED THE TRAINING COURSE

for

ASBESTOS INSPECTOR REFRESHER

In accordance with TSCA Title II, Part 763, Subpart E, Appendix C of 40 CFR

Course Date: 03/07/2019

Course Location: Portland, OR

Certificate: IR-19-[illegible]

PBS

4-Hour Online AHERA Asbestos Inspector Refresher

Expiration Date: 03/07/2020

For verification of the authenticity of this certificate contact:
PBS Environmental
4412 SW Corbett Avenue
Portland, OR 97239
(503) 248-1939

Greg Baker, Instructor



THIS IS TO CERTIFY THAT

ED WILSON

HAS SUCCESSFULLY COMPLETED THE TRAINING COURSE

for

ASBESTOS INSPECTOR / MANAGEMENT PLANNER REFRESHER

In accordance with TSCA Title II, Part 763, Subpart E, Appendix C of 40 CFR

Course Date: 10/02/2019

Course Location: Portland, OR

Certificate: IMR-19-74458

PBS

AHERA is the Asbestos Hazard Emergency Response Act enacting Title II of Toxic Substance Control Act (TSCA)

Expiration Date: 10/02/2020

For verification of the authenticity of this certificate contact:
PBS Environmental
4412 SW Corbett Avenue
Portland, OR 97239
(503) 248-1939

Greg Baker, Instructor

DIVISION 01

GENERAL REQUIREMENTS

PART 1 GENERAL

1.1 SUMMARY

A. Section Includes:

1. Description of the Work.
2. Contract description.
3. Project Contacts.
4. Work by Owner or other.
5. Owner-furnished products.
6. Contractor's use of site and premises.
7. Future work.
8. Work sequence.
9. Owner occupancy.
10. Permits.
11. Ecological Requirements.
12. Terms and Definitions.
13. Specification conventions.

1.2 DESCRIPTION OF THE WORK

A. Project locations:

1. Mark Morris High School: 1602 Mark Morris Ct. Longview, WA 98632.
2. Columbia Valley Gardens Elementary School: 2644 30th Ave. Longview, WA 98632.

B. Replace mechanical equipment and associated work at Mark Morris High School and Columbia Valley Gardens Elementary School.

1.3 CONTRACT DESCRIPTION

A. Perform Work of Contract under separate Contract with Owner according to Conditions of Contract.

1.4 PROJECT CONTACTS

A. Owner: Longview Public School District, 2715 Lilac St. Longview, WA 98632.

B. Architect: Integrus Architecture, 117 S Main Street, Seattle, WA 98104, 206.628.3137.

C. Structural Engineer: Integrus Architecture, 117 S Main Street, Seattle, WA 98104, 206.628.3137.

D. Mechanical and Electrical Engineers: Hultz-BHU Engineers, 1111 Fawcett Ave, Tacoma, WA 98402.

1.5 WORK BY OWNER OR OTHERS

A. If Owner-awarded contracts interfere with each other due to work being performed at the same time or at the same Site, Owner will determine the sequence of work under all contracts according to "Work Sequence" and "Contractor's Use of Site and Premises" Articles in this Section.

B. Contractor is responsible for scheduling the work, storing such equipment if requested, and coordinating related work in the Contract with installation of NIC and OFOI equipment.

C. Contractor shall provide all preparatory work necessary for proper installation including blocking and backing, and finish work including caulking, grouting, furring, and painting adjacent surfaces as required for NIC and OFOI equipment. Confirm with Owner work to be done.

D. Coordinate Work with utilities of Owner and public or private agencies.

E. Owner will employ a commissioning agent for this project.

F. The Owner will employ a special inspector to perform the special inspections required as indicated on the drawings.

1.6 OWNER-FURNISHED PRODUCTS

A. Items noted ‘OFOI’ (Owner Furnished, Owner Installed) will be furnished and installed by Owner as is appropriate to the flow of the work, and ‘OFCI’ (Owner Furnished, Contractor Installed) will be furnished to the Contractor by the Owner for the Contractor to install. Items noted ‘NIC’ (Not in Contract) are not in contract and will be provided by others.

B. Owner's Responsibilities:

1. Arrange for and deliver Owner-reviewed Shop Drawings, Product Data, and Samples to Contractor.

2. Arrange and pay for delivery to Site.

3. Upon delivery, inspect products jointly with Contractor.

4. Submit claims for transportation damage and replace damaged, defective, or deficient items.

5. Arrange for manufacturers' warranties, inspections, and service.

6. Installation of Owner furnished equipment.

7. Installation of furnishings and furniture.

8. Stocking of supplies.

C. Contractor's Responsibilities:

1. Review Owner-reviewed Shop Drawings, Product Data, and Samples.

2. Receive and unload products at Site; inspect for completeness or damage jointly with Owner.

3. Handle, store, install, and finish products.

4. Contractor is responsible for scheduling the work, storing such equipment if requested, and coordinating related work in the Contract with installation of NIC and OFOI equipment.

5. Contractor shall provide all preparatory work necessary for proper installation including blocking and backing, and finish work including caulking, grouting, furring, and painting adjacent surfaces as required for NIC and OFOI equipment. Confirm with Owner work to be done.

6. Repair or replace items damaged after receipt.

1.7 CONTRACTOR'S USE OF SITE AND PREMISES

A. Assume full responsibility for the protection and safekeeping of tools, equipment, materials, and products under this Contract, stored on the site.

B. Assume full responsibility for site security and safety.

C. Limit use of Site to allow:

1. Owner occupancy.

D. Construction Operations: Limited to areas indicated on Drawings.

1. On-Site work hours: Work shall be only performed during hours allowed by the locality.

2. Noisy and Disruptive Operations (such as Use of Jack Hammers and Other Noisy Equipment): Not allowed in close proximity to existing building during regular hours of operation. Coordinate and schedule such operations with Owner to minimize disruptions.

3. Provide positive means to prevent air-borne dust from dispersing into atmosphere and surrounding environment. Cover stockpiled material with tarps, wet down, and take other measures appropriate to minimize raising dust from construction operations..

E. Time Restrictions for Performing Work: 7:00 AM - 5:00 PM..

F. Utility Outages and Shutdown:

1. Coordinate and schedule electrical and other utility outages with Owner.

2. Outages: Allowed only at previously agreed upon times.

G. Sound Level Restrictions: Comply with all applicable state and local laws, ordinances, and regulations relative to noise control. Sound pressure level measured at boundary of Site shall not exceed 60 dBA.

H. Construction Plan: Before start of construction, post electronic file to Project website of construction plan regarding access to Work, use of Site, and utility outages for acceptance by Owner. After acceptance of plan, construction operations shall comply with accepted plan unless deviations are accepted by Owner in writing.

I. Keep work and storage areas in a neat, clean and orderly condition at all times. Should it be necessary at any time to move materials or sheds, Contractor shall move same at his expense.

J. Contractor is responsible for damage to existing property adjacent to the project site and at completion of all work, shall restore/return existing property to its original condition as it was prior to start of project work.

K. Tobacco products are not permitted on grounds and construction site during the Work of this Contract

1.8 WORK SEQUENCE

A. Construct Work in order to accommodate Owner's occupancy requirements during construction period. Coordinate construction schedule and operations with Architect/Engineer and Owner.

1.9 OWNER OCCUPANCY

A. Owner will occupy Site during entire period of construction.

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

C. Schedule the Work to accommodate Owner occupancy.

1.10 ECOLOGICAL REQUIREMENTS

A. Conform to Washington State Department of Ecology and with local codes and guidelines regarding pollution control, waste reduction and recycling.

B. Contractor is responsible for securing applicable environmental control permits from all authorities having jurisdiction over construction practices.

1.11 TERMS AND DEFINITIONS

A. The term ‘indicated’ is a cross reference to details, notes or schedules on the drawings, other paragraphs or schedules in the Project Manual, and similar means of recording requirements in the contract documents.

B. Where terms such as ‘shown,’ ‘noted,’ ‘scheduled’ and ‘specified’ are used in lieu of ‘indicated,’ it is for the purpose of helping the readers accomplish the cross reference and no limitation of location is intended except as specifically noted.

C. Where not otherwise explained, terms such as ‘directed,’ ‘requested,’ ‘authorized,’ ‘selected,’ ‘approved,’ ‘required,’ ‘accepted,’ and ‘permitted’ mean ‘directed by the Architect,’ ‘requested by the Architect,’ etc. However, no such implied meaning will be interpreted to extend the Architect’s responsibility into the Contractor’s area of construction supervision.

D. The meaning of the word ‘approve,’ where used in conjunction with Architect’s response to submittals, requests, applications, inquiries, reports and claims by Contractor, will be held to limitations of Architect’s responsibilities and duties as specified in the Conditions of the Contract. In no case will ‘approval’ by Architect be interpreted as a release of Contractor from responsibilities to fulfill requirements of the Contract Documents.

E. The word ‘installer’ is a person or entity engaged by the Contractor or his subcontractor or sub-subcontractor for the performance of a particular unit of work at the project site, including installation, erection, application and similar required operations. It is a general requirement that Installers be recognized experts in the work they are engaged to perform.

F. The word ‘provide’ means to furnish and install.

1.12 SPECIFICATION CONVENTIONS

A. These Specifications are written in imperative mood and streamlined form. This imperative language is directed to Contractor unless specifically noted otherwise. The words "shall be" are included by inference where a colon (:) is used within sentences or phrases.

PART 2 PRODUCTS - NOT USED

PART 3 EXECUTION - NOT USED

END OF SECTION 011000

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Schedule of Values.

B. Application for Payment.

C. Defect assessment.

1.2 SCHEDULE OF VALUES

A. Submit electronic file of schedule on AIA G703 - Continuation Sheet for G702 or other Owner approved form.

B. Submit Schedule of Values as electronic file within 15 calendar days after date established in Notice to Proceed and no less than 30 days prior to submittal of first Application of Payment.

C. Format: Use Table of Contents of this Project Manual. Identify each line item with number and title of major Specification Section. Also identify, Site mobilization, bonds and insurance.

D. Provide at least one line item for each listed specification section beginning with Division 2. Coordinate applicable activities with Section 013216 - Construction Progress Schedule.

E. Round-off line item amounts to nearest whole dollar.

F. Include within each line item, direct proportional amount of retainage and Contractor's overhead and profit.

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

H. List separate line items for General, Mechanical, Electrical closeout (which includes Operation and Maintenance manuals) and include the dollar amount equal to 2% of each portion of the contract.

I. The schedule of values shall allocate at least 1% of the original Contract Sum to Commissioning of Operational Systems.

J. For each unit of work where payment requests will be made on account of materials or equipment purchased/fabricated/delivered but not yet installed, show "separate line items" for "order and receive" and "installation" of that unit of work.

K. List separate line items in schedule for each Allowance amount.

L. List separate line items for material and labor for each specification section.

M. Except as otherwise required, major cost items, which are not directly cost of actual work-in-place, such as distinct temporary facilities, may be either shown as line items in schedule of values or distributed as general overhead expense, at Contractor's option.

1.3 APPLICATION FOR PAYMENT

A. Submit electronic file to Architect of each Application for Payment on AIA G702 - Application and Certificate for Payment and AIA G703 - Continuation Sheet for G702.

B. Application for Initial Payment: Administrative actions and submittals that must precede or coincide with submittal of first Application for Payment include the following:

1. Statement of Intent to Pay Prevailing Wages on Public Works Contract on form issued by the State of Washington, Department of Labor and Industries.

2. List of subcontractors including phone numbers, business address, and contact person.

3. Schedule of Values.

4. Contractor’s Construction Schedule (preliminary if not final).

5. Products list.

6. Schedule of Unit Prices, as applicable.

7. Submittals Schedule (preliminary if not final).

8. Initial progress report.

9. Certificates of insurance and insurance policies.

10. Performance and payment bonds.

11. List of emergency contact information.

12. Other documents as may be required in the Contract Documents.

C. Draft Payment Application:

1. Submit prior to each application of payment.

2. Prepare the actual payment request after the draft amounts are reviewed and agreed to by the Architect and Owner.

D. Application for Monthly Payment: Submit on date each month as agreed between Owner and Contractor.

1. Content and Format: Use Schedule of Values for listing items in Application for Payment.

2. Submit updated construction schedule with each Application for Payment.

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

4. Submit submittals with transmittal letter as specified in Section 013300 - Submittal Procedures.

E. Substantiating Data: When Architect/Engineer requires substantiating information, submit data justifying dollar amounts in question. Include the following with Application for Payment:

1. Current construction photographs specified in Section 013300 - Submittal Procedures.

2. Partial release of liens from major Subcontractors and vendors.

3. Record Documents as specified in Section 017000 - Execution and Closeout Requirements, for review by Owner, which will be returned to Contractor.

4. Affidavits attesting to off-Site stored products.

5. Construction Progress Schedule, revised and current as specified in Section 013300 - Submittal Procedures.

F. Contract Retainage Value: The Owner shall pay 95% of the amount due the Contractor on account of progress payments. The remaining 5% of each payment amount shall be held as retainage until Substantial Completion at which time the retained funds will be paid to the Contractor as referenced in General Conditions Article 9 Payments and Completion for additional information. Any remaining funds will be held until final completion and will be paid to the Contractor with the Final Payment.

G. Application at time of Substantial Completion: Show one hundred percent (100%) completion for portion of the Work claimed as substantially complete.

1. Include documentation supporting claim that the Work is substantially complete and a statement showing an accounting of changes to the Contract Sum.

2. Submit documentation that Waste Management goals (017419) have been met.

H. Application for Final Payment:

1. Complete and submit accepted documents as required by the General Conditions of the Contract for Construction.

1.4 DEFECT ASSESSMENT

A. Replace the Work, or portions of the Work, not conforming to specified requirements.

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

C. The defective Work may remain, but unit sum/price will be adjusted to new sum/price at discretion of Architect/ Engineer.

D. Defective Work will be partially repaired according to instructions of Architect/Engineer and unit sum/price will be adjusted to new sum/price at discretion of Architect/ Engineer.

E. Individual Specification Sections may modify these options or may identify specific formula or percentage sum/price reduction.

F. Authority of Architect/Engineer to assess defects.

G. Nonpayment for Rejected Products: Payment will not be made for rejected products for any of the following reasons:

1. Products wasted or disposed of in a manner that is not acceptable.
2. Products determined as unacceptable before or after placement.
3. Products not completely unloaded from transporting vehicle.
4. Products placed beyond lines and levels of the required Work.
5. Products remaining on hand after completion of the Work.
6. Loading, hauling and disposing of rejected products.

PART 2 PRODUCTS - NOT USED

PART 3 EXECUTION - NOT USED

END OF SECTION 012000

PART 1 GENERAL

1.1 SUMMARY

A. This Section includes administrative and procedural requirements governing Alternates.

B. General:

1. Each bidder shall state in their bid, in the spaces provided on the Bid Form:

a. Their proposal for performing the Base Bid work.

b. Alternate Bid proposals described by Schedule of Alternate Bids.

2. All bid prices shall include adjustments in the work of all trades as may be necessary, and shall be inclusive of all costs affected by the alternate proposal.

3. Identification of Work listed below is general in nature. The Contractor shall provide all materials and associated work necessary to complete the Work of each respective described Alternate.

4. The cost or credit for each Alternate is the net addition to or deduction from the Contract Sum to incorporate the Alternate into the Work. No other adjustments are made to the Contract Sum.

5. Additional Alternates, published by Addenda prior to Bid Opening are subject to provisions of this Section as if included in this Section.

1.2 DEFINITIONS

A. The Base Bid includes all work indicated in the Contract Documents and any issued Addenda for all building and site construction work, EXCEPT the work included in the following Alternate Bids described in this section, which may result in changes to the costs.

B. An Additive Alternate is an amount proposed by bidders and stated on the Bid Form for certain work defined in the Contract Documents that may be added to the Base Bid amount if accepted by the Owner.

C. A Substitute Alternate is an amount proposed by bidders and stated on the Bid Form for certain work defined in the Contract Documents that may be added to or deducted from the Base Bid amount if accepted by the Owner.

D. A Deductive Alternate is an amount proposed by bidders and stated on the Bid Form for certain work defined in the Bidding Requirements that may be deducted from the Base Bid amount if accepted by the Owner.

1.3 PROCEDURES

A. Modify or adjust affected adjacent Work as necessary to completely and fully integrate the Alternate Work into the Project.

B. Include as part of each Alternate, miscellaneous devices, accessory objects, and similar items incidental to or required for a complete installation whether or not mentioned as part of the Alternate.

C. Immediately following the award of the Contract, notify each party involved, in writing, of the status of each Alternate. Indicate whether Alternates have been accepted, rejected, or deferred for later consideration. Include a complete description of any negotiated modifications to Alternates.

D. Execute accepted Alternates under the same conditions as other Work of this Contract.

E. A "Schedule of Alternates" is included at the end of this Section. Specification Sections referenced in the Schedule contain requirements for materials necessary to achieve the Work described under each alternate.

F. Bid will be evaluated on any combination of Base Bid amount and Alternates.. The Owner reserves the right to accept or reject any or all alternate bids regardless of bid prices or order in which the alternates are listed.

1.4 REINSTATEMENT OF ALTERNATES

A. The Owner shall reserve the right to reinstate any or all of listed alternates at any time, up to a time when construction sequence and schedule shall "cover-up" that portion of work involved in any specific alternate.

B. Reinstatement of the alternate shall be at the same figure as that given at the time of the bid opening plus additional construction cost as determined by the Construction Cost Index, as published in the Engineering News Record Magazine, latest index, after the first of the month following reinstatement.

PART 2 PRODUCTS

NOT USED.

PART 3 EXECUTION

3.1 SCHEDULE OF ALTERNATE BIDS

A. Additive Alternate #1 - Exhaust duct in Mark Morris AA Classroom/Cooking Lab.

1. Base Bid: Do not provide exhaust duct in Mark Morris AA Classroom/Cooking Lab.

2. Alternate Bid #1: Provide exhaust duct from existing range hoods up through roof and terminate each into a roof vent.

3. Related Sections: 230500, 230503, 230529, 233100 and 233700.

B. Additive Alternate #2– Brick veneer infill at Mark Morris AA Building.

1. Base Bid: Blank off (E) wall louvers to remain.

2. Alternate Bid #2: Demolish (E) wall louvers, infill openings with brick veneer to match existing. Tooth bricks into (E) brick veneer adjacent to opening.

3. Related Sections: 040514 and 042113.

C. Additive Alternate #3 –Hydronic Unit Heaters in Mark Morris Vocational Building.

1. Base Bid: Do not provide hydronic unit heaters in Mark Morris Vocational Building.

2. Alternate Bid #3: Demo (12) hot water unit heaters, associated valves & controls. Furnish & install (12) hot water unit heaters, associated valves & controls.

3. Related Sections: 230500, 230529, 232113, 230993 and 238240.

END OF SECTION 012300

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Quality assurance.

B. Product options.

C. Product substitution procedures.

D. Substitution Request Form.

1.2 QUALITY ASSURANCE

A. Contract is based on products and standards established in Contract Documents without consideration of proposed substitutions.

B. Products specified define standard of quality, type, function, dimension, appearance, and performance required.

C. Substitution Proposals: Permitted for specified products except where specified otherwise. Do not substitute products unless substitution has been accepted and approved in writing by Owner.

1.3 DEFINITIONS AND OPTIONS

A. Performance, Reference Standard, and Descriptive Specifications:

1. Manufacturer is not specified and requirements are specified purely by descriptive requirements, design requirements, performance requirements, reference standards, or codes.

2. Products and options meeting or exceeding specified provisions are accepted.

B. Open Proprietary Specifications:

1. Products by one or more manufacturers are specified and specification makes provision for substitution requests.

2. Conform to provisions for making substitution request as specified by this Section.

C. Closed Proprietary Specifications:

1. Products by one or more manufacturers are specified and specification Section does include provision for substitution requests.

2. Provide work as specified. No substitution will be accepted.

D. Basis-of-Design Specifications:

1. Where a specific manufacturer's product is named and accompanied by the words "basis of design," including make or model number or other designation, to establish the significant qualities related to type, function, dimension, in-service performance, physical properties, appearance, and other characteristics for purposes of evaluating comparable products of other named manufacturers.

2. Provide either the specified product or a comparable product by one of the other named acceptable manufacturers. Drawings and specifications indicate sizes, profiles, dimensions, and other characteristics that are based on the product named. Comply with Comparable Product definition below. Substitutions will be considered only when Section 012500 Substitution Procedures is referred to.

E. Comparable Product: Product that is demonstrated and approved through submittal process, or where indicated as a product substitution to have the indicated qualities related to type, function, dimension, in-service performance, physical properties, appearance, and other characteristics that equal or exceed those of specified product.

1.4 SUBSTITUTION REQUESTS DURING BIDDING PHASE

A. Submit Substitution Request to reach Architect's office before 5 p.m. at least 10 working days prior to date for receiving Bids.

B. Bidders will be notified of accepted substitutions by Addendum. No other form of acceptance is valid, including as stated verbally, written, emailed, faxed, or implied in other manner and bidders shall not rely upon any approval not incorporated into the Contract Documents in this manner.

1.5 SUBSTITUTION REQUESTS DURING CONSTRUCTION PHASE

A. Submit Substitution Requests directly by or through Contractor to Architect.

B. Substitution Requests following Bid Date will not be considered, except at discretion of Owner and subject to reimbursement for Architect's review. Review fee will apply whether or not substitution request is accepted.

1. Exception: Substitution Requests may be reviewed in the event of special circumstances beyond Contractor's control. Reason for substitution request must be submitted on the attached Substitution Request Form.

C. Reasons for consideration of substitutions include:

1. Unavailability: Specified item has been discontinued; there are no available qualified installers; or lead-time is prohibitive relative to project schedule.

2. Unsuitability: Subsequent information discloses specified item as unsuitable, inappropriate, unable to perform properly, or to fit designated space.

3. Regulatory Requirements: Specified item fails to conform to building code interpretations or insurance regulations.

4. Warranty: Manufacturer or fabricator has declared that specified item is unsuitable for intended use or refuses to certify or warrant performance of specified item for condition of use.

5. Owner Prerogative: As requested by Owner for reduction of Contract Cost or Contract Time.

D. Contractor will be notified by Architect on the form provided by the Contractor within two weeks of receipt of request, of decision to accept or reject Substitution Request.

1.6 PRODUCT SUBSTITUTION PROCEDURES

A. Document each request with complete data, substantiating compliance of proposed substitution with Contract Documents, including:

1. Manufacturer's name and address, product, trade name, model, or catalog number, performance and test data, and reference standards.

2. Itemized point-by-point comparison of proposed substitution with specified product, listing variations in quality, performance, and other pertinent characteristics.

3. Reference to Article and Paragraph numbers in Specification Section.

4. Cost data comparing proposed substitution with specified product and amount of net change to Contract Sum.

5. Changes required in other Work.

6. Availability of maintenance service and source of replacement parts as applicable.

7. Certified test data to show compliance with performance characteristics specified.

8. Samples when applicable or requested.

9. Submit list of at least 3 projects where proposed substitution has been used within past 12 months. Include name, address, and telephone number of Owner and Architect.

10. Other information as necessary to assist Architect/Engineer's evaluation.

B. A request constitutes a representation that Bidder or Contractor:

1. Has investigated proposed product and determined that it meets or exceeds quality level of specified product.

2. Will provide same warranty for substitution as for specified product.

3. Will coordinate installation and make changes to other Work that may be required for the Work to be complete with no additional cost to Owner.

4. Waives claims for additional costs or time extension that may subsequently become apparent.

5. Will coordinate installation of the accepted substitute, making such changes as may be required for the Work to be complete in all respects.

6. Will reimburse Owner and Architect/Engineer for review or redesign services associated with reapproval by authorities having jurisdiction.

C. Substitutions will not be considered when they are indicated or implied on Shop Drawing or Product Data submittals without separate written request or when acceptance will require revision to Contract Documents.

D. Substitution Submittal Procedure:

1. Submit requests for substitutions on form attached to end of this Section (an electronic version of this form is available from the Architect upon request).

2. Submit electronic files to Project website of Request for Substitution for consideration. Limit each request to one proposed substitution.

3. Submit only 1 Substitution Request on each Substitution Request Form. Multiple Substitution Requests on a single form will not be accepted.

4. Submit Shop Drawings, Product Data, and certified test results attesting to proposed product equivalence. Burden of proof is on proposer.

5. Architect/Engineer will notify Contractor in writing of decision to accept or reject request.

1.7 UNACCEPTABLE SUBSTITUTIONS

A. Substitutions not accepted in writing by Architect.

B. Substitutions that are not submitted on Substitution Request Form or facsimile following this Section.

C. Substitution Requests that do not provide complete, adequate, or clearly defined information for a thorough and timely evaluation.

D. Substitutions that, if accepted, will require substantial revisions to Contract Documents.

E. Substitutions that are shown or implied by shop drawings and other submittals.

F. Substitutions not accepted by published Addenda during Bidding Period and not accepted in writing by Architect during Construction Period.

G. Substitutions installed into the Work and not accepted by Architect, constitute non-conforming work and may be rejected by Owner without further discussion or explanation.

PART 2 PRODUCTS - NOT USED

PART 3 EXECUTION - NOT USED

PART 1 GENERAL

1.1 SUMMARY

A. Section Includes:

1. Initial Requirements
2. Initiating and Proposing Changes
3. Architect's Supplemental Instructions
4. Documentation of Change in Contract Sum and Contract Time.
5. Approval or Rejection of Proposal
6. Construction Change Directive
7. Change Order
8. Allowance for Overhead and Profit
9. Correlation of Contractor Submittals

1.2 INITIAL REQUIREMENTS

A. Within 30 days of the Notice to Proceed, the Contractor shall submit a list of all equipment anticipated to be used on the project and whether it is owned or to be rented, using a form acceptable to the Architect and Owner. If during the construction process additional equipment is brought to the Project site, the Contractor shall submit an updated list.

B. Submit name of individual authorized to receive Change Documents, and to be responsible for informing others in Contractor's employ and to applicable subcontractors of changes to the Work.

1.3 INITIATING AND PROPOSING CHANGES

A. Proposal Request: Issued by the Architect to the Contractor on the Owner's behalf including a detailed description of proposed change with supplementary or revised Drawings and specifications, a change in Contract Time for executing the change with stipulation of overtime work required and the period of time during which the requested price will be considered valid. Contractor will prepare and submit estimate within seven days.

1. Proposal Requests are for information only. Do not consider them as an instruction (direction) either to stop work in progress or to execute the proposed change.

B. Contractor Initiated Change Request: Describe proposed change and its full effect on the Work. Include a statement describing reason for the change, and effect on Contract Sum and Contract Time with full documentation and a statement describing effect on Work by separate or other Contractors. Document requested substitutions in accordance with Section 012500 - Substitution Procedures.

1. Contractor is to do no work on the proposed change until the Change Request is formalized by a Construction Change Directive or Change Order.

1.4 ARCHITECT'S SUPPLEMENTAL INSTRUCTIONS (ASI)

A. The Architect will issue supplemental instructions authorizing minor changes in the Work, not involving adjustment to the Contract Sum or Contract Time, on a form prepared by the Architect. If the Contractor believes a cost is associated with the supplemental instructions, the Contractor is to provide written notice to the Architect within 7 days of receipt of the instructions, outlining all associated costs as outlined in Part 1.4 DOCUMENTATION OF CHANGE IN CONTRACT SUM.

1.5 DOCUMENTATION OF CHANGE IN CONTRACT SUM AND CONTRACT TIME

A. Change Order Proposal (COP): Submit electronically information required for Architect's evaluation of proposed changes.

B. Contract Time: No additional funds will be issued or considered payable to the Contractor for time extension claims prior to Substantial Completion; the end of documented Contract Time as specified in the General Conditions AIA A201.

C. Support each lump sum proposal quotation, and each unit price (not previously established) with sufficient substantiating data.

1. On request, provide additional data to support time and cost computations:

a. Labor required.

b. Equipment required.

c. Products required.

1) Recommended source of purchase and unit cost.

2) Quantities required.

d. Taxes, insurance, and bonds.

e. Documented credit for work deleted from Contract.

f. Overhead and profit.

g. Justification for any change in Contract Time.

2. Submit additional substantiating data to support computations, as requested by Architect.

3. Support each proposal for additional costs, and time-and-material work, with documentation, as required for lump-sum proposal. Include additional information:

    a. Name of Architect or Owner's authorized agent who ordered work, and date of order.

    b. Dates and times work was performed, and by whom (firm or individual).

    c. Time record, summary of hours worked, and hourly rates paid.

    d. Receipts and invoices for:

        1) Equipment used, listing dates and times of use.

        2) Products used and listing of quantities.

        3) Subcontracted work.

4. Document Requests for Substitutions.

5. Statement as to whether overtime work is, or is not, necessary.

1.6 APPROVAL OR REJECTION OF PROPOSAL

A. When change is initiated by Architect or Owner:

1. Contractor to submit a detailed proposal in writing. Quotation (cost estimate) must be guaranteed for period specified in Proposal Request beginning from signing of proposal. If no period is specified, guarantee quotation for sixty (60) days from signing.

2. Architect and/or Owner will review the proposal and respond in writing with one of the following:

    a. Request for additional information.

    b. Approval to be issued by CCD for subsequent inclusion in a Change Order.

    c. Rejection of the proposal and direction to continue with contracted work.

3. Contractor may not proceed with the proposed changed work until a signed CCD or Change Order is received from the Owner.

B. When a change proposal is initiated by Contractor:

1. The Architect and/or Owner will review it and respond in writing with one of the following:

a. Approve the Contractor's cost proposal;

b. Request additional information;

c. Reject the proposal.

2. If the Owner responds by approving the Contractor's change proposal, a CCD will be processed.

a. If additional information is requested by Owner, respond in writing within fifteen (15) days of Owner's request.

C. Concurrence of the Building Official:

1. Note that all significant modifications to the Contract Documents reviewed by the AHJ, including Change Orders "approved" by the Architect and Owner, must also be approved by the Building Official.

2. Any significant changes, such as structural changes and life safety modifications, will be submitted for review and approval to the AHJ. Contractor may not proceed with such work until the AHJ has reviewed the change and indicated that it is acceptable.

1.7 CONSTRUCTION CHANGE DIRECTIVE (CCD)

A. Construction Change Directive:

1. May be issued by Architect with Owner's approval, instructing Contractor to proceed with change in the Work, for subsequent inclusion in a Change Order.

2. Will describe changes in work, and will designate method of determining change in Contract Sum or Contract Time.

B. Contractor: Promptly execute change to the Work.

C. Claims for Adjustments to Contract Time or Contract Sum:

1. Burden of proof is upon Contractor to submit data substantiating requested increase of Contract Sum and Contract Time for inclusion into approved Change Order.

2. Submit claims within 30 days after completion of Construction Change Directive. Claims after this time are invalid.

D. Overhead and Profit for Change to Contract Sum: Conform to provisions of Contract Documents, including the General Conditions.

E. Prevailing Wages: Limit direct costs for labor, wages, and fringe benefits to amounts indicated by Conditions of the Contract including the General Conditions and prevailing wage rate requirements.

1.8 CHANGE ORDER (CO)

A. Stipulated Sum Change Order

1. Based on Proposal Request and Contractor's fixed maximum price quotation or Contractor's request for change.

2. Execute Change Order for changes to the Work affecting Contract Sum or Contract Time.

B. Unit Price Change Order

1. Pre-determined Unit Prices and Quantities: Execute Change Order executed on fixed unit price bases.

2. Unit Costs or Quantities of Units of Work Which are not Pre-Determined: Execute Work under a Construction Change Directive.

3. Changes in Contract Sum or Contract Time: Compute as specified for a Time and Materials Change Order.

C. Time and Material Change Order

1. Submit itemized account and supporting data after completion of change, within time limits indicated in Conditions of the Contract.

2. Allowable Change to Contract Sum and Contract Time: As determined by Architect under provisions of Contract Documents, including the General Conditions.

3. Maintain detailed records of work done on Time and Material basis. Provide full information required for evaluation of proposed changes, and to substantiate costs for changes in the Work.

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

1.9 CORRELATION OF CONTRACTOR SUBMITTALS

A. Promptly revise Schedule of Values and Application for Payment forms to record each authorized Change Order as separate line item and adjust Contract Sum/Price.

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

C. Promptly enter changes in Project Record Documents.

PART 2 PRODUCTS

NOT USED

PART 3 EXECUTION

NOT USED

END OF SECTION 012600

PART 1 GENERAL

1.1 SUMMARY

A. Section Includes:

1. Construction Organization.
2. Cooperation and Coordination of Work.
3. Project Coordination and Scheduling Control.
4. Mechanical and Electrical Coordination.
5. Electronic 3-D Coordination.
6. Job Site Field Measurements And Templates.
7. Dimensions.
8. Intent of Drawings.
9. Interferences and Right of Way.
10. Notification and Correction of Defective Work.
11. Coordination Utilities.
12. Closeout Coordination.

1.2 GENERAL COORDINATION REQUIREMENTS

A. Coordinate scheduling, submittals and work identified in the Contract to assure efficient and orderly sequence of installation of construction elements, with provisions for accommodating items to be installed later.

B. Coordinate work between all Sections of Contract Documents to avoid conflicts and omissions. Take special care to coordinate work indicated as Architectural, Mechanical, Electrical and other major Divisions of the Contract Documents.

C. Responsibility

1. The Contractor shall be in charge of this Contract and the site, as well as the directing and scheduling of all Work. Contractor shall be on site at all times work of this Contract is in progress. Do not delegate responsibility for coordination to any subcontractor.
2. Anticipate interrelationship of all subcontractors and their relationship with the total Work.

3. Resolve differences or disputes between subcontractors and materials suppliers concerning coordination, interference, or extent of Work between Sections. Contractor's decisions, if consistent with Contract Document requirements, shall be final.

4. Final responsibility for the performance, interface, and completion of the Work and the Project in accordance with the Contract Documents shall be with the Contractor.

D. Prior to any work beginning on the site, the Contractor shall submit, and receive final approval on:

1. Construction schedule;

2. All required plans, including, but not limited to, safety, demolition, quality control, waste management and indoor air quality.

3. All materials to be used on the project in accordance with Section 013300 - Submittal Procedures.

1.3 SPECIAL COORDINATION

A. There are occupied spaces outside of the limits of construction. These spaces will not be vacated for construction during this contract. Any work in these surrounding areas must be coordinated with the Owner and the occupants of the adjacent areas.

B. Additional special requirements and conditions apply to the work of this contract. Refer to Section 015000 - Temporary Facilities and Controls, for detailed description of these additional requirements and conditions.

C. The Owner may require access to the site to perform work related or unrelated to the project. The Contractor shall coordinate with the Owner to accommodate such work within the contract time.

D. Refer to Section 011000 - Summary for a description of other Contractor work for the Owner that is expected to be occurring within the building or other adjacent location to the construction limits of this Project. Cooperate with the Owner Contractors during the duration of this Project to prevent impact to this or other Owner projects.

E. The Owner's staff will typically be working within the project site during Contractor's normal working hours. Contractor shall coordinate with the Owner to accommodate such work within the contract time.

F. [The Owner's staff will typically be working within the project site during Contractor's normal working hours. Contractor shall coordinate with the Owner to accommodate such work within the contract time, including the use of any existing elevator(s), if the Contractor elects to utilize the elevator(s) as indicated in Section 015000 - Temporary Facilities and Controls.]

1.4 COORDINATION SHOP DRAWINGS

A. Prepare Coordination Drawings if limited space availability necessitates maximum utilization of space for efficient installation of different components or if coordination is required for installation of products and materials fabricated by separate entities.

1. Indicate relationship of components shown on separate Shop Drawings.

2. Indicate required installation sequences.

1.5 CONSTRUCTION ORGANIZATION

A. On-Site Lines Of Authority & Communications: Refer to Section 013115 - Communication.

B. Intra-Project Communications:

1. Submittals.

2. Reports and records.

3. Recommendations.

4. Coordination drawings.

5. Schedules.

6. Resolution of conflicts.

C. Construction Mobilization

1. Cooperate with the Owner’s Representative in allocation of mobilization areas of the site; for field offices and sheds, for access, traffic and parking facilities.

2. Comply with Architect and Owner’s Representative’s procedures for intra-project communications.

3. Coordinate field engineering and layout work under instructions of Owner’s Representative.

D. Coordination of Reports/Activities: Coordinate both the procedural timing and the listing (naming and sequencing) of reports/activities required by provisions of this Section and other sections, to afford consistency and logical coordination between submitted reports or lists. Maintain coordination and correlation between separate reports by updating at monthly or shorter time intervals. Distribute each report and updated report to entities involved in the work, including Architect and Owner’s Representative. In particular, provide close coordination of Progress Schedule, Schedule of Values (see Section 012000 - Price and Payment Procedures), listing of subcontracts, schedule of submittals, progress reports, and payment requests.

E. Coordination of Submittals

1. Schedule and coordinate submittals specified in the Contract Documents.

2. Coordinate work of various Sections having interdependent responsibilities for installing, connecting to and placing equipment in service.

3. Coordinate request for substitutions to assure compatibility of space, operating elements, and effect on work of other Sections.

F. Coordination & Pre-Installation Meetings: Refer to Section 013119 - Project Meetings.

G. Conservation: Coordinate construction activities to ensure that operations are carried out with consideration given to conservation of energy, water, and materials.

1. Salvage materials and equipment involved in performance of, but not actually incorporated into the Work.

PART 2 PRODUCTS

2.1 NOT USED.

PART 3 EXECUTION

3.1 COOPERATION & COORDINATION OF WORK

A. The Contractor is responsible for the coordination of the work of all trades; coordinating the installation of their work and that of all subcontractors to ensure compliance with the Contract Documents and to expedite the progress of the Project. Contractor shall check specifications, addenda, and drawings covering all trades as the work progresses. Contractor shall promptly report to the Architect what they consider omissions, conflicts or points requiring clarification.

B. Contractor shall prepare and distribute to each entity performing work at project site, a written memorandum of instructions on required coordination activities, including required notices, reports and attendance at meetings.

C. Enclosure of the Work: The Contractor shall coordinate enclosure of work with required inspections and tests, so as to avoid the necessity of uncovering work for that purpose.

D. It is the responsibility of the Contractor to ensure that the work of subcontractors complies with Conditions of the Contract, Division 1 - General Requirements, and the work of other Sections related to their own work. No additional payments or time extensions will be authorized for failure on the part of subcontractors to be familiar with and in compliance with the aforementioned specification divisions and sections.

E. Inclusion of portions of the work under particular divisions of the specifications or sections of the drawings does not in every case conform to the categories of work customarily subcontracted to particular crafts or trades. In such cases, the Contractor shall be responsible to inform bidders, subcontractors, crafts and trades, that work assigned to them is contained in sections other than the usual. In every case, the General Contractor shall be responsible to provide at its cost, all work required in the Contract Documents.

1. Provide project interface and coordination as required to properly and accurately bring together the several parts, components, systems, and assemblies and as required to complete the Work and the Project.

2. Provide interface and coordination of all trades, crafts, and subcontracts as required to provide correct and accurate connection of abutting, adjoining, overlapping, and related Work, and provide all anchors, fasteners, accessories, appurtenances, and incidental items as required to complete the Work properly, fully, and correctly in accordance with the Contract Documents.

3. Provide additional structural components, miscellaneous metal, bracing, blocking, backing, clips, anchors, fasteners, and installation accessories as required to properly anchor, fasten, or attach materials, equipment, appliances, hardware, systems, assemblies, cabinets, and architectural features to the structure.

4. Provide excavation and backfill, trenching and drilling for all trades as required for the installation of their Work.

5. Provide concrete foundations, pads, supports, bases, and grouting for all trades as required for the installation of their Work.

6. Provide caulking, sealing, and flashings as required to completely weatherproof the building and as required to insulate the building thermally and acoustically. Include caulking, sealing, flashings, and related work as required to prevent moisture intrusion, air infiltration, and light leakage.

7. Provide equipment, appliances, fixtures, and systems requiring plumbing and mechanical services, rough-in, and connections, or other utilities and services, with such services, rough-in, and final connections.

8. Provide equipment, appliances, fixtures, and systems requiring electrical and cabling services, rough-in, and connections, or other utilities and services, with such services, rough-in, and final connections.

9. Materials, equipment, component parts, accessories, incidental items, connections, and services required to complete the Work which are not provided by subcontractors shall be provided by the Contractor.

3.2 PROJECT COORDINATION AND SCHEDULING CONTROL

A. The Contractor shall schedule and coordinate the work of all subcontractors on the project including their use of the site. Responsibility for coordination and close adherence to time schedules rests solely with the Contractor who shall maintain coordination and scheduling control at all times.

B. Each subcontractor responsible to the Contractor shall cooperate diligently with the Contractor in the execution of their work so as to cause no delay in the completion of the Project. This responsibility includes the completion of all work in a timely manner. All Contractors, Prime Contractor and Subcontractors, shall diligently comply with the following requirements:

1. Cooperate in planning and layout of the work well in advance of operations.

2. Inform other contractors of requirements at proper time to prevent delay or revisions.

3. Be informed on the requirements of other contractors and check own work for conflicts with the work of other contractors.

4. Insure delivery of materials and performance of work on coordinated schedule with other contractors.

5. Contractor shall ensure subcontractors and equipment suppliers are responsible for compatibility and completeness of the installation and operation of the equipment in their respective Specification Sections including conformance with code requirements.

6. Attend Pre-Installation meetings identified in Section 013119.

7. Contractor shall be represented on the job site by his superintendent at all times when there is construction going on, including the work of his subcontractors, as well as his own.

C. Changing Subcontractors: The General Contractor shall be responsible for all the additional expenses incurred by changing subcontractors during the course of this project. These additional expenses include, but are not limited to, A/E expenses for duplicate or redundant submittals, requests for information, or any clarifications or revisions that might occur due to the fact that new subcontractor(s) have assumed responsibility for a portion(s) of the Work.

3.3 MECHANICAL AND ELECTRICAL COORDINATION

A. Refer to Divisions 20 - 23 for Mechanical Coordination and Divisions 26 - 28 for Electrical Coordination.

3.4 ELECTRONIC 3D COORDINATION

A. Provide clash detection software to determne field conflicts by comparing 3D models of building systems.

B. Require attendance of subcontractors working on areas where clash detection is used at coordination meetings to coordinate work on site utilizing visual representation of a 3D model.

3.5 JOB SITE FIELD MEASUREMENTS AND TEMPLATES

A. Obtain field measurements required for accurate fabrication and installation of Work included in this Contract. Exact measurements are the Contractor's responsibility.

B. Contractor shall be responsible for field verifying actual dimensions where "+/-" dimensions are indicated, or the words "field verify."

C. Furnish or obtain templates, patterns, and setting instructions as required for installation of all Work. Verify all dimensions in the field.

3.6 INTENT OF DRAWINGS

A. The work of the Contractor and subcontractors shall conform to the intent of the architectural and engineering drawings as reviewed by the Architect. Drawings are partly diagrammatic and do not intend to show in details all features of work. The Contractor shall carefully review the work to be performed by other trades, compare related drawings and shall thoroughly understand the building conditions affecting their work.

B. All changes required in the work caused by failure to do so shall be at no expense to the Owner.

3.7 INTERFERENCES AND RIGHT-OF-WAY

A. Submit conflicts which cannot be resolved by right-of-way to the Architect for direction.

B. Submit reflected ceiling coordination plans showing work by all applicable trades for review and approval by the Architect.

3.8 NOTIFICATION & CORRECTION OF DEFECTIVE WORK

A. Coordinate the Work of all subcontractors and make certain that, where the work of one trade is dependent upon the work of another trade, the work first installed is properly placed, installed, aligned and finished as specified or required to properly receive subsequent materials applied or attached thereto.

B. Direct subcontractors to correct defects in substrates they install when subcontractors of subsequent materials have a reasonable and justifiable objection to such surfaces. Promptly notify the Owner's Representative and Architect of any defects or imperfections in preparatory work which will in any way affect satisfactory completion of the work.

C. Under no condition shall a section of work proceed prior to preparatory work having been completed, cured, dried or otherwise made satisfactory to receive such related work. Do not force subcontractors to apply or install products to improperly finished product.

D. Correction of defective work shall be the responsibility of the Contractor or subcontractor providing the defective work. Correction of work due to underlying defects shall be the responsibility of the Contractor or subcontractor providing overlying work.

3.9 COORDINATING UTILITIES

A. Contractor shall be responsible for coordination of and shall cooperate with all utilities to be installed for service to the Project. Utilities may include, but are not limited to, natural gas, telephone, electrical, and cable television. The Contractor shall maintain communication with the utilities in order to coordinate time and requirements of the utilities' installation.

B. Contractor shall provide all work necessary to comply with the requirements of the Contract Documents for utility work that does not meet the Contract Document requirements, or for work that is disturbed by the utility installation.

3.10 CLOSEOUT COORDINATION

A. General

1. Coordinate completion and cleanup of work by the various trades in preparation for Substantial Completion.

2. After Owner occupancy of premises, coordinate access to site by the various trades involved for correction of defective work and work not in accordance with Contract Documents, to minimize disruption of Owner’s activities.

3. Assemble and coordinate closeout submittals.

B. At completion of Work of each Subcontract, conduct inspection to assure that:

1. Work is acceptable.

2. Temporary facilities and debris have been removed from site.

C. At Substantial Completion:

1. Conduct inspection and prepare list of work to be completed or corrected.

2. Assist Architect and Owner’s Representative in inspection.

3. Supervise correction and completion of Work as established in Architect’s inspection reports ("punch lists").

4. Obtain Certificate of Occupancy from governing authorities.

D. At Final Completion: Assist Architect and Owner’s Representative in inspection.

END OF SECTION 013100

PART 1 GENERAL

1.1 SUMMARY

A. Section Includes:

1. General Communication.
2. Emergency Communication.
3. Correspondence.
4. Request for Information.
5. Non Compliance Notice.

1.2 GENERAL COMMUNICATION

A. All telephone and electronic communication and other correspondence shall be between Contractor and Architect, unless otherwise noted below.

B. Subcontractors are not to contact members of the design team directly unless explicitly agreed to by Contractor, Architect and Owner's Representative. All such contact and discussions are to be documented in writing by the subcontractor and submitted to the Architect and Owner's Representative through the Contractor.

C. The General Contractor shall transmit problems or questions in writing using a Request for Information (RFI) form.

D. On-Site Lines of Authority and Communications: Establish on-site lines of authority and communications including attendance at Pre-Construction Meeting and Progress Meetings as required by the Architect and Owner's Representative. All on-site lines of authority and communications shall be established through the Architect.

E. The Architect and Owner's Representative, will typically be working during the Contractor's normal working hours as defined in Section 011000 - Summary. The Contractor shall anticipate that all communication and weekly construction meetings with these parties will occur between the hours of 8 a.m. and 5 p.m. Monday through Friday throughout the duration of the Project.

F. No overtime payments will be authorized, or time delays allowed, for the Contractor or subcontractors efforts to communicate with the Architect and Owner's Representative outside of the normal working hours.

1.3 EMERGENCY COMMUNICATION

A. Provide an Emergency Notification list to the Architect and to the Owner.

1. The Contractor shall provide a list of names, pagers, wireless and traditional telephone numbers of staff who are capable of addressing an emergency issue that may occur outside of Contractor's normal working hours. The persons designated on the list shall be available at the project site within 60 minutes of being contacted. Provide two names for each of the following:

    a. General Contractor

    b. Mechanical subcontractor

    c. Electrical subcontractor

    d. Other major subcontractors

2. Submit the list to the Architect 5 working days prior to the Preconstruction Meeting. The Architect will include the same information for design team members and Owner representatives and distribute the list at the Preconstruction Meeting.

1.4 CORRESPONDENCE

A. All correspondence to and from Contractor will be routed through Architect with a copy to the Owner's Representative.

B. Include project title and Architect's project number on all correspondence.

1.5 REQUEST FOR INFORMATION (RFI)

A. It is the Contractor's responsibility to review Contract Documents in a timely manner so that the Architect shall have sufficient time to respond to a Request for Information prior to the start of actual construction of that part of the Work.

B. When field conditions or Contract Document contents require clarification or verification by the Architect or Architect's sub-consultants, a written RFI is to be submitted as follows:

1. Identify the nature and location of each clarification/verification using a RFI form. Provide as a minimum the following information:

    a. Project name and number.

    b. Date.

    c. Date response desired.

    d. RFI number.

    e. Subject.

    f. Initiator of the question (individual and firm).

    g. Indication of costs, if known.

h. Location on site.

i. Contract drawing reference.

j. Contract specification section and paragraph reference.

k. Descriptive text.

l. Signature of Contractor.

m. Attachments, including descriptive drawings, photographs, product data, submittals, dimensions, configurations, and other information needed to clarify request.

n. Space for reply on same page as question.

2. Number each RFI sequentially beginning with number 001 (RFI-001). Only one question per RFI.

a. Indicate subject by designation of GEN, MECH, ELEC, CIV, or other easily identifiable discipline abbreviation.

b. Single subject matter, 1 item each - architectural, civil, structural, mechanical, electrical or general.

3. RFI may be hand-delivered, mailed, e-mailed or faxed, depending upon the urgency.

C. Uses

1. The RFI form shall be used for interpretation or clarification of the Contract Documents only.

2. Do not use the RFI form for the following. The Architect will not reply and the RFI will be returned without action.

a. Product or material substitutions (See Section 012500 - Substitution Procedures).

b. Questions relating to construction means, methods, techniques, sequences, procedures, or safety precautions. These are the Contractor’s responsibilities exclusively.

c. Questions relating to construction schedule, coordination between trades, or division of work among subcontractors. These are Contractor’s responsibilities exclusively.

d. Questions on contract administration procedural matters, unless they require interpretation or clarifications of the Contract Documents.

e. Dimensions or quantities which are shown on the Contract Documents, which can be measured or calculated from the information contained in the Contract Documents where such measurement or calculation is standard construction industry practice.

f. Confirmation of interpretations or clarifications previously provided by the Architect.

g. The Contractor shall not initiate requests for interpretations or clarifications of the Contract Documents which can be reasonably derived from a review of the Contract Documents.

D. Route RFI's in same manner as correspondence.

E. Clarifications may be discussed on-site or by telephone with Architect or Architect's Consultants, with concurrence of the Architect. A summary of these discussions is to be incorporated into a RFI form and submitted as written confirmation, for normal RFI processing.

F. Reply

1. The Architect will endeavor to reply to all RFI's as promptly as his work schedule allows, and generally no later than 7 working days from the day received. The Architect and/or its sub-consultants will attempt to expedite those RFI's indicated by the Contractor as being critical to the construction schedule.

2. When an RFI involves a complex subject, extensive research or governmental agency contact, the Architect will inform the Contractor that additional time is required to prepare a reply. The Contractor shall cooperate and agree to reasonable additional time.

3. The reply shall be a clarification or an interpretation of the Contract Documents; the reply is not an authorization of change in the Contract Sum or Time.

4. Where Architect's action may affect Contract Time or Contract Sum:

a. Notify Architect in writing within 10 days of receipt.

b. Conform to Conditions of the Contract for submittal of Change Order Proposal, Section 012600 - Contract Modification Procedures.

G. On receipt of Architect response to RFI:

1. Update RFI log and promptly distribute RFI response to those affected by response.

2. Review and notify Architect within 7 days if Contractor disagrees with response.

H. RFI Log: Prepare, maintain, and submit a tabular log of RFIs organized by RFI number. Submit log weekly. Include following:

1. Project Name.
2. Name and address of Contractor.
3. Name and address of Architect.
4. RFI number including those that were dropped and not submitted.
5. RFI description.
6. Date RFI was submitted.
7. Date Architect's response was received.
8. Identification of related Minor Changes in the Work, Architect's Supplemental Instructions (ASI), Construction Change Directives (CCD), and Proposal Requests, as applicable.

I. Note: Architect will respond only to requests for interpretation of Contract Documents originating from Contractor. The Contractor shall be deemed to be the author of all RFI's, whether written by him or one of his sub-contractors or suppliers. It is the Contractor's responsibility to ensure that all RFI's are complete and correct in form, and the Contractor shall be the contact for further information or explanation. All replies shall be directed to the Contractor, and it is his responsibility to ensure that the appropriate contractor personnel are copied or informed of the replies.

1.6 NON-COMPLIANCE NOTICE (NCN)

A. Any work that is identified as "not in compliance" with the Contract Documents, either by oral discussion with the Contractor, or written communication to the Contractor, shall be removed and replaced without cost to the Owner, including removal of additional material necessary to confirm non-compliance. At its option, the Owner may accept written alternative solutions offered by the Contractor and recommended by the Architect. The Contractor shall notify the Architect and Owner in writing immediately following oral discussion or receipt of any written communication if the Contractor believes that the Work in question is in compliance with the Contract Documents. The Architect will make a determination based on the Contract Documents. If the Architect finds the work is in noncompliance, the Architect will issue a written Non-Compliance Notice (NCN). Such notice, when delivered to the Contractor at the work site, shall be deemed sufficient for the purpose of notification. Upon receipt of the NCN, the Contractor shall take immediate action to correct work. Review corrections at progress meetings for closure.

B. If the Contractor fails to or refuses to comply promptly after the final determination of the appropriate corrective action, the Owner may:

1. Issue an order stopping all or part of the work until satisfactory corrective action has been taken. The Owner will not pay for non-complying work or follow on work until the non-complying work is corrected or replaced. If it becomes necessary to stop work due to non-correction of non-complying work, no delay claim, time extension, or compensation will be granted.

2. Elect to correct the non-compliant work with his own forces, or those of another contractor, and back charge the Contractor by issuing a deductive Change Order, with appropriate explanation and supporting data, which the Contractor is required to sign. Should the Contractor elect not to sign the deductive Change Order, he will be deemed to be in breech of the contract and the dispute will be subject to the Dispute Resolution Procedures of the General Conditions.

PART 2 PRODUCTS

NOT USED

PART 3 EXECUTION

NOT USED

END OF SECTION 013115

PART 1 GENERAL

1.1 SUMMARY

A. This Section specifies administrative and procedural requirements for project meetings, including, but not limited to, the following:

1. Preconstruction meeting.
2. Progress meetings.
3. Coordination meetings.
4. Pre-installation meetings.
5. Commissioning meetings.
6. Project closeout meetings.
7. Owner training meetings.

1.2 PRECONSTRUCTION MEETING

A. The Owner will schedule a preconstruction conference before starting construction, at a time convenient to the Contractor and the Owner, but no later than 15 days after the Notice to Proceed. The conference will be held at the Project Site or another convenient location as selected by Owner.

B. Attendance is required of the following:

1. Architect and Architect's consultants.
2. Owner's Representatives.
3. Contractor's Superintendent and Project Manager; Contractor's QC Representative if different individual than the Project Manager.
4. Major Subcontractors.
5. Others, as requested.

C. Discussion will cover items of significance, including the following:

1. Communication chain and persons authorized to direct changes.
2. Submission of executed bonds and insurance certificates.
3. Submission of list of Subcontractors and preliminary progress schedule per Section 013216 - Construction Progress Schedule.
4. The Work.

5. Construction Team roles.
6. Work hours, sequence, phasing, and occupancy.
7. Special project procedures.
8. Procedures and processing for Application for Payments; Change Orders (CO);
9. Requests for Information (RFI); Architect Supplemental Instructions (ASI); Field decisions; Submittals; and others as appropriate.
10. Project record documents including review of as-builts on a regular basis during construction.
11. Construction facilities, and controls.
12. Temporary utilities.
13. Safety and security procedures.
14. Environmental and noise controls.
15. Housekeeping and site maintenance procedures.
16. Utility shutdowns / Outage Request Form.
17. Site Access and Parking.
18. Equipment deliveries and priorities.
19. Testing Procedures.
20. Scheduling Progress Meetings.
21. Schedule Review.
22. Contractor’s Quality Control Program
23. Hazardous material abatement procedures, if any.
24. Sustainable Design Requirements (See Section 018113).
25. Draft Waste Management Plan
26. Draft IAQ Plan.
27. Use of site and premises by Owner and Contractor.
28. Requirements for start-up of equipment.
29. Inspection and acceptance of equipment put into service during construction period.

30. Others, as appropriate.

D. The Architect will:

1. Conduct the meeting to review contract administration requirements.

2. Record, produce, and distribute copies of the minutes to the Owner and General Contractor within seven (7) days of the meeting.

1.3 PROGRESS MEETINGS

A. For purposes of coordination and scheduling after start of the work, weekly Progress Meetings will be held to enable an orderly review of the construction progress and to provide for systematic discussion and analysis of concerns that may arise relative to execution of the work.

B. Contractor, and Subcontractors as required, shall incorporate attendance at these meetings as part of the Base Bid of the project – no overtime payments will be authorized for Contractor or Subcontractors to attend weekly Progress Meetings or other special meetings if required.

C. Meeting Locations: ADA accessible Contractor's project field office or Owner provided meeting room, unless otherwise agreed.

D. Attendance: Representatives attending meetings are required to be qualified and authorized to act on behalf of their firms. Attendance shall include:

1. Architect and Architect's consultants, as appropriate.

2. Owner's Representatives.

3. Contractor's Superintendent, Project Manager, and QC Representative.

4. Subcontractors, as appropriate.

5. Suppliers, as appropriate.

6. Others, as appropriate.

E. Agenda: Discussion will pertain to items, such as:

1. Attendees; list of attendees and company they represent.

2. Review and approve minutes of previous meeting; written corrections, additions and/or deletions to previous minutes acknowledged.

3. Review of Work in Progress: Discussion and field review.

4. Review Short Interval Schedule.

5. Review Outages.

6. Review construction schedule.
7. Present corrective measures and procedures to regain project schedule, as applicable.
8. Present field observations, problems, and conflicts; discuss concerns pertaining to:
    a. Mechanical items.
    b. Electrical items.
9. Discuss problems impeding progress schedule.
10. Planned progress during succeeding work period.
11. Review Contractor's quality control system; discuss any concerns and corrective measures.
12. Review submittal schedules and logs, present methods to expedite as required.
13. Review off-site fabrication.
14. Review delivery schedules.
15. Review outstanding RFIs.
16. Review proposed changes for:
    a. Effect on construction schedule and on completion date.
    b. Effect on any other contracts of the project.
17. Review Change Order Proposal log and finalize prices.
18. Review draft of Application for Payment (at end of month).
19. Confirm status of the "as-built" drawings and review required revisions to Project Record Documents; see update requirements specified below.
20. Confirm status of shop drawing submittals and approvals.
21. Review project safety.
22. Review Waste Management Plan.
23. Review any outstanding Non-Compliance Notices.
24. Review any other business.
25. Confirm next meeting date, location and time plus those requested to be in attendance.

F. Architect will:

1. Administer bi-weekly Progress Meetings throughout work progress;

2. Record and distribute the following by e-mail within 3 working days after the meeting: Meeting Minutes, RFI, ASI, Submittal/Shop Drawing and Cost Change logs. Distribution to include all attendees other than those related to the General Contractor's contract. The General Contractor is responsible to distribute copies to all Contractor attendees.

3. Provide paper copies of the minutes, RFI, ASI, Submittal/Shop Drawing and Cost Change logs to attendees at the next meeting.

4. Ascertain that work is prosecuted consistently with contract documents and construction schedules.

G. At Contractor's option, weekly progress meetings can be held integrally with monthly CPM Scheduling meeting specified herein.

H. Contractor shall be responsible to provide the following at each meeting:

1. Current (and updated if necessary) Short Interval Schedule as specified in Section 013216 - Construction Progress Schedule.

2. Current (and updated if necessary) submittal schedule.

1.4 COORDINATION MEETINGS

A. Contractor shall hold weekly coordination meetings with his subcontractors and suppliers as deemed necessary by the Contractor for coordination of the work. Meetings shall be held on site. The Owner and the Architect will be available to attend such meetings upon request. Refer to Section 013100 - Project Management and Coordination for additional information and requirements pertaining to coordination meetings.

B. The superintendent of the Contractor and prime subcontractors shall review the Contractor's schedule for the first three (3) months of work and thoroughly review the work required by the Contract Documents for that period. The Contractor shall submit Design Clarification Requests, Requests for Information, or any other type of information requests the Contractor may use, for the three (3) month work period during the first month after Notice To Proceed to minimize any conflicts that might occur when mobilization begins.

1. This process shall continue for each three (3) months, or increments of 3 month work segments until the completion of the Project.

C. Project coordination meetings are in addition to specific meetings held for other purposes, such as regular progress meetings and special pre-installation meetings.

D. Request representation at each meeting by every trade currently involved in coordination or planning for the construction activities involved.

E. Record meeting results and distribute copies to Architect and Owner and to others affected by decisions or actions resulting from each meeting.].

1.5 PRE-INSTALLATION MEETINGS

A. General: Prior to commencement of work listed below or as otherwise determined by the Architect or Owner, the General Contractor or his general superintendent, the responsible foremen for the subcontractors performing said work, plus all associated sub-subcontractors, suppliers, fabricators, vendors, and others as appropriate, shall attend a meeting for the purpose of establishing a full understanding of the procedures and requirements for the orderly progress of the designated work.

B. All subcontractors and major suppliers are required to attend these pre-installation meetings prior to commencing work of their respective specifications Section, or as required by related work in other specification sections. Contractor may elect to group several Sections or Divisions to minimize the number of these meetings.

C. Require attendance of entities directly affecting, or affected by, work of the Section including Contractor's Project Manager and Superintendent with Lead man performing the work, and/or the appropriate Subcontractors/Suppliers/Fabricators.

D. Contractor shall notify the Architect and Owner of the Contractor's scheduled pre-installation meeting not less than seven (7) days prior to the scheduled start of any of the work listed below so that the Architect and Owner may attend at their option. All applicable submittals as well as the Subcontractor's safety plan and insurance certificates shall have been submitted to and reviewed by the Architect and Owner prior to scheduling this meeting. Refer to individual technical sections for work requiring pre-installation meetings.

E. Contractor will record, reproduce and distribute copies of minutes prior to the next meeting or within seven (7) days of each meeting to all meeting participants.

1.6 COMMISSIONING MEETINGS

A. Refer to respective sections of the various general, mechanical and electrical Divisions of the Project Manual for associated commissioning meeting requirements.

1.7 PROJECT CLOSEOUT MEETINGS

A. For the purpose of attaining project closeout, commencing immediately following established date of Substantial Completion, Contractor's project manager and superintendent and all subcontractors who have outstanding punch list items associated with their work, or as otherwise requested and including all subcontractors involved in the building systems commissioning process, shall attend weekly closeout meetings which shall be held at the jobsite.

B. Such meetings shall be held to review and discuss the resolution of all punch list items in order to attain Final Completion. Closeout meetings shall continue on a weekly basis until all punch list items have been resolved and Final Completion is attained.

1.8 TRAINING MEETINGS FOR OPERATING INSTRUCTIONS OF OWNER'S PERSONNEL

A. Refer to Section 017700 for training requirements related to operating instructions of Owner's personnel.

PART 2 PRODUCTS

NOT USED

PART 3 EXECUTION

NOT USED

END OF SECTION 013119

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Submittals.

B. Quality assurance.

C. Format for network analysis schedules.

D. Bar chart schedules (For projects less than $20 million).

E. Review and evaluation.

F. Updating schedules.

G. Distribution.

1.2 DEFINITIONS

A. “Day,” as used throughout the Contract unless otherwise stated, means “calendar day.”

B. Float: The amount of time between the earliest finish and the latest finish date of an activity or chain of activities on the Critical Path Method (CPM) construction schedule. Float is not for the exclusive use of either the Contractor or the Owner unless otherwise identified in the Contract Documents. Extensions of time for Contract performance will be granted only to the extent that equitable time adjustments to the affected activity or activities exceed the total float time along the affected paths of the currently approved CPM at the time Notice to Proceed was issued for the change.

1.3 SUBMITTALS

A. All schedule submittals, including schedule updates, will be reviewed jointly by the Owner/Architect and the Contractor. Such review of the Contractor’s schedules shall not constitute an approval or acceptance of the Contractor’s construction means, methods, or sequencing or its ability to complete the Work in a timely manner. Neither the Owner’s nor the Architect’s review will relieve the Contractor of the sole responsibility for the accuracy, adequacy, or completeness of the schedule, the logic of the schedule, and/or completion of the Contract requirements in accord with such schedule. Neither Owner’s nor Architect’s review shall constitute acknowledgment that the relationships between various work items or activity durations are reasonable or appropriate.

B. Within 10 days after date of Notice to Proceed, submit proposed preliminary diagram defining planned operations for first 60 days of Work, with general outline for remainder of Work.

C. Participate in review of preliminary and complete diagrams jointly with Architect/Engineer.

D. Within 20 days after joint review of proposed preliminary diagram, submit draft of proposed complete network diagram for review. Include written certification that major, mechanical and electrical Subcontractors have reviewed and accepted the proposed schedule.

E. Submit updated schedules with each Application for Payment.

F. Submit schedules under transmittal letter form specified in Section 013300 - Submittal Procedures. PDF method preferred.

G. Schedule Updates:

1. Overall percent complete, projected and actual.

2. Completion progress by listed activity and sub-activity, to within five working days prior to submittal.

3. Changes in Work scope and activities modified since submittal.

4. Delays in submittals or resubmittals, deliveries, or Work.

5. Adjusted or modified sequences of Work.

6. Other identifiable changes.

7. Revised projections of progress and completion.

H. Narrative Progress Report:

1. Submit with each monthly submission of Progress Schedule.

2. Summary of Work completed during the past period between reports.

3. Work planned during the next period.

4. Explanation of differences between summary of Work completed and Work planned in previously submitted report.

5. Current and anticipated delaying factors and estimated impact on other activities and completion milestones.

6. Corrective action taken or proposed.

1.4 QUALITY ASSURANCE

A. Scheduler: Contractor's personnel specializing in CPM scheduling with professional experience in scheduling construction work of complexity comparable to the Project and having use of computer facilities capable of delivering detailed graphic printout within 48 hours of request.

B. Contractor's Administrative Personnel: one year minimum experience in using and monitoring CPM schedules on comparable Projects.

C. Coordination with Subcontractors and Suppliers:

1. The scheduler shall prepare the Project Schedules and their updates in cooperation with major subcontractors and suppliers.

2. In scheduling work of subcontractors and deliveries by suppliers, the Contractor represents that he has agreement regarding the schedule with those supplying materials and performing the work.

D. Reliance Upon the Reviewed Schedule:

1. The Progress Schedule, as reviewed by the Architect, will be an integral part of the Contract and will establish interim completion dates for the various activities under the Contract.

2. Should any activity on the critical path not be completed within 15 calendar days after the stated scheduled date, the Owner shall have the right to require the Contractor to expedite completion of the activity by whatever means appropriate and necessary, without additional compensation to the Contractor. In addition, Contractor shall submit a “Recovery Schedule” which shall logically demonstrate method or methods Contractor proposes to get back on schedule within thirty (30) days of said date; i.e., additional tradespersons, shifts, work days, or crews.

3. In addition to above, should any activity be 15 days or more behind schedule, the Owner shall have the right to perform the activity or have the activity performed by whatever method the Owner deems appropriate.

4. Costs incurred by the Owner and the Architect in connection with expediting construction activity under this Article shall be the responsibility of the Contractor.

5. It is expressly understood and agreed that failure by the Owner to exercise the option either to order the Contractor to expedite an activity or to expedite the activity by other means shall not be considered to set a precedent for any other activities.

1.5 FORMAT FOR NETWORK ANALYSIS SCHEDULE

A. Listings: Reading from left to right, in ascending order for each activity. Identify each activity with applicable Specification Section number.

B. Diagram Sheet Size: minimum 11 x 17 inches.

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

1.6 BAR CHART SCHEDULES (FOR PROJECTS LESS THAN $20 MILLION)

A. Format (Microsoft Project or approved software): Bar chart Schedule, to include at least:

1. Identification and listing in chronological order of those activities reasonably required to complete the Work, including:
    a. Subcontract Work.
    b. Major equipment design, fabrication, factory testing, and delivery dates including required lead times.
    c. Preconstruction conferences.
    d. Move-in and other preliminary activities.
    e. Equipment and equipment system test and startup activities.
    f. Project closeout and cleanup.
    g. Work sequences, constraints, and milestones.
2. Listings identified by Specification Section number.
3. Identification of the following:
    a. Horizontal time frame by year, month, and week.
    b. Duration, early start, and completion for each activity and subactivity.
    c. Critical activities and Project float.
    d. Subschedules to further define critical portions of Work.

1.7 REVIEW AND EVALUATION

A. Baseline Schedule: The initial Schedule when reviewed by the Architect and Owner shall be identified as the Baseline Schedule and shall be known as Revision 0. Each subsequent reviewed change to the Schedule shall be as a Revision numbered in sequence (Revision 1, 2, 3, etc.). The Baseline Schedule shall be submitted with no progress percentages applied to activities. The first update shall include the preliminary schedule activities and remaining activities updated as of the second monthly pay request.

B. Participate in joint review and evaluation of schedules with Architect/Engineer at each submittal.

C. Evaluate Project status to determine Work behind schedule and Work ahead of schedule.

D. After review, revise schedules incorporating results of review and resubmit within 10 days.

PART 2 PRODUCTS - NOT USED

PART 3 EXECUTION

3.1 PRELIMINARY CONSTRUCTION SCHEDULE

A. Scope of Preliminary Construction Schedule: The Preliminary Progress Schedule shall detail, at a minimum, all work which will be accomplished in the first 60 calendar days following the Notice to Proceed. The general approach of the balance of the work shall be indicated.

B. Limitation on Construction:

1. Mobilization and submittals can be in process during the review period.

2. No construction work shall be permitted until the Preliminary Construction Schedule is submitted and reviewed.

C. Initial Progress Payment: The first pay request will be based on the update of the preliminary schedule. This submittal shall be in the form of three (3) copies of a computer plotted timescaled logic diagram.

3.2 COMPLETE CONSTRUCTION SCHEDULE

A. Progress Payments:

1. Shall be withheld in the absence of a reviewed Construction Schedule.

2. No adjustment or extension of time shall be granted for failure to meet the activity dates as shown. Failure to comply with these requirements shall be cause for rejection of any progress payments presented thereafter, until such time as these requirements are met.

3.3 DISTRIBUTION

A. Copies of reviewed preliminary Construction Schedule and every reviewed revision thereof shall be submitted to the project web site for review by the: Architect, Owner and everyone whose time performance is essential to achieving the progress shown on the schedule. Notification of these updates shall be emailed to all participants with directions to access web site.

3.4 SHORT INTERVAL SCHEDULE

A. Prepare a 3-week Short Interval (“look-ahead”) Schedule for each progress meeting. Show one (1) prior week of actual progress (planned vs actual performance). Forecast two (2) weeks of start and completion dates for each activity, task or event in comparison to the prepared schedule.

1. Activities in the Short Interval Schedule shall relate directly to activities in the Construction Schedule. Each activity shall be coded with the same ID number, specification number, or other reference the contractor uses on the Construction Schedule. The Short Interval Schedule will have more detail, but each of the details must be related to the Construction Schedule coding.

2. Indicate start, on-going, intermittent and completion for each activity, task, or event.

3. The schedule shall show critical path work, as defined by the Construction Schedule that has been affected by any changed conditions authorized through a change order or field order.

B. Distribute paper copies of the Short Interval Schedule to all attendees at each Progress Meeting.

3.5 UPDATES

A. General:

1. The scheduler shall attend all meetings concerning project progress, alleged delays, or time impact.

2. The schedule shall be modified to reflect the original Contract completion date, subject to review by the Owner. Prior to submittal of the schedule update, the Contractor shall submit an advanced worksheet indicating the intended report status. The Owner, Architect and Contractor shall then meet and agree upon the completion status of the work in progress, and any major logic changes proposed by the Contractor.

3. Maintain the Construction Schedule at the project meeting location and update weekly by drawing a line vertically through the corresponding progress of each task on the schedule as of the date of that project meeting. The line shall be in varying colors so that differentiation between weeks is readily apparent.

B. Progress Meetings:

1. Update the reviewed Construction Schedule at each Progress Meeting.

2. Indicate "actual" progress in percent complete for each activity.

3. At each progress meeting discuss the Short Interval Schedule. Any deviation from the planned schedule shall be explained by Contractor, with corrective measures, if necessary, to bring progress of Work back in line with the Contract Completion date.

C. Monthly Update:

1. Contractor shall submit an updated schedule at progress meeting following either one of the following two occurrences:

a. Upon completion of a major milestone; or,

b. When the actual work completed is more than two (2) weeks behind schedule. Should the schedule show the project completion to be more than two weeks behind, the Contractor shall submit a written explanation and recovery schedule outlining corrective action taken or proposed to bring events back on schedule within a 30 day period.

2. Show changes occurring since previous schedule submission, such as:

    a. Any major changes in scope, including authorized or Change Orders;

    b. Contractor reorganization of his work sequence unrelated to changes in scope;

    c. Activities modified since previous submission;

    d. Revised projections for progress and completion, as applicable; and

    e. Any other identifiable changes.

3. Provide narrative report as needed to define:

    a. Problem areas, anticipated delay, and impact of these on schedule; and

    b. Corrective action recommended and its effect.

D. Subcontractor Participation:

1. Involve all major subcontractors in preparation of the Periodic Updates of the Construction Schedule.

2. Obtain approval of the schedule from each major subcontractor and submit in writing together with the Periodic Updates of the Construction Schedule.

E. Change Orders:

1. Authorized changes to the work shall be included in the schedule network as they occur in the same format and level of detail as contained in the current updated schedule. Enough activities shall be included to adequately describe the work. Code the activities in such a way that they can be identified to the specific Change Order. Insert the Change Order Activities in the network with appropriate logic ties to original network activities.

2. Utilize the time impact analysis submitted with the change order to demonstrate the effect of delays on the overall project schedule.

3.6 TIME EXTENSIONS

A. The Contractor shall notify the Owner and Architect in writing within seven (7) days of the event of any event which could delay performance or supplying of any item of the work affecting the critical path. Contractor shall indicate the expected duration of the delay, the anticipated effect of the delay on the Contractor’s Construction Schedule, and the action being taken to correct the delay situation.

B. Extensions of time to the Contractor's Contract may be granted only for delays to activities on the critical path that actually delay the Project Completion beyond the date of Substantial Completion, or for delays to activities that transform that activity onto the critical path, and as a result cause a final completion date beyond the contracted final completion date.

C. Following receipt of an executed Change Order extending the Contract Time, the activity data and logic relationships shall be incorporated into the current detailed CPM schedule during the next scheduled progress update, as outlined above in Paragraph E "Change Orders" above. In the event the Contractor is entitled to a change in the Contract Time, the adjustment to the contract Time shall be as defined in the General Conditions.

3.7 ABNORMAL INCLEMENT WEATHER

A. Abnormal Inclement Weather or Unusually Severe Weather: Weather which hinders or prevents work is not a basis for a time extension unless it surpasses in severity the weather reasonably to be expected in the locality at the particular time of year. If a timely notice is filed that a delay was caused by weather sufficiently severe as to entitle additional time, the Contractor is to furnish as promptly as possible thereafter a statement of the portions of the work affected, an explanation as to the reasons work was prevented or hindered by the weather if not readily apparent, the dates on which such portions of work were affected, the total number of days by which the job in its entirety was delayed and any other information which would be of assistance to support the time extension claim such as official weather bureau climatological (www.weather.gov) data for several prior years.

B. Except for site work which may critically affect the Contract Time, no extension of time will be made for abnormal inclement weather after the principle portions of the Work are sufficiently closed-in (exterior walls up and roof in place) so as to permit any structure, or major portion thereof which is part of the Work, to be adequately heated so as to allow the various trades to perform their work.

C. If the total calendar days lost due to abnormal inclement weather, from the start of the Work at the Project site by the Contractor until the principle portions of the Work are enclosed, exceeds the total number of days to be expected for the same period, a time extension, if granted, shall only be the number of calendar days needed to equal the excess number of calendar days lost due to such abnormal inclement weather.

END OF SECTION 013216

PART 1 GENERAL

1.1 SECTION INCLUDES

A. This Section includes administrative and procedural requirements for submittals required for performance of the Work, including the following

1. Submittal procedures.
2. Construction progress schedules.
3. Proposed product list.
4. Product data.
5. Use of electronic CAD files of Project Drawings.
6. Shop Drawings.
7. Samples.
8. Other submittals.
9. Test reports.
10. Certificates.
11. Manufacturer's instructions.
12. Manufacturer's field reports.
13. Erection Drawings.
14. Construction photographs.
15. Special job-site submittals

B. Contractor review.

C. Architect/Engineer review.

D. Consent for release of electronic media.

1.2 DEFINITIONS

A. Action Submittals: Written and graphic information and physical samples that require Architect/Engineer's and Construction Manager's responsive action.

B. Informational Submittals: Written and graphic information and physical Samples that do not require Architect/Engineer's and Construction Manager's responsive action. Submittals may be rejected for not complying with requirements.

1.3 SUBMITTAL PROCEDURES

A. Before submittal of shop drawings, brochures, and lists, Contractor shall carefully review same for proper identification, completeness, correctness, dimensions, and technical applicability to the Contract Document requirements and note all corrections, items needing clarification, additional comments, and the like. Upon thorough review and subsequent acceptance by the Contractor, if so accepted, Contractor is to note its approval together with said notes or amendments thereto for compliance with the Contract Documents by suitable stamp, date and the signature of the Contractor or its authorized representative. Submittals will be returned to the Contractor without action by the Architect if the items submitted are not stamped, signed, and identified as approved or approved as noted or other similar language indicating approval by the Contractor, or if the submittal is obviously not thoroughly reviewed.

B. Submission of shop drawings and samples shall be accompanied by a transmittal letter containing Project name, Contractor's name, number of drawings and samples, titles and other pertinent data.

C. Many products are specified by one or more named products/manufacturers. In those circumstances where Contractor submits an unnamed, non-prior approved product/manufacturer during this ‘shop drawing’ phase, said submittal shall be submitted in conformance with Section 012500 - Substitution Procedures.

D. Coordinate preparation and processing of submittals with performance of construction activities. Transmit each submittal sufficiently in advance of performance of related construction activities to avoid delay.

1. Coordinate each submittal with fabrication, purchasing, testing, delivery, other submittals, and related activities that require sequential activity.

2. Coordinate transmittal of different types of submittals for related elements of the Work so processing will not be delayed by the need to review submittals concurrently for coordination.

    a. The Contractor shall provide submittals requiring coordination with other submittals to the Architect at one time. The Architect will review submittals as received, provide comments, and return them to the Contractor. If the Contractor did not submit all submittals requiring coordination at the same time, and a later submittal identifies conflicts, the Contractor will be responsible for all costs associated with changes necessary to properly coordinate the installation of the materials.

3. To avoid the need to delay installation as a result of the time required to process submittals, the Contractor shall anticipate the review times noted in this section and anticipate the possibility of a resubmittal or rejected submittal and the effect that action would have on the Project schedule.

a. All required submittals shall be initially received by the Architect within 60 days following the Notice to Proceed date, or sooner as required by the following submittal review times, to meet the Construction Schedule need for materials related to the submittals. Submittals received after these time periods shall not be a cause for delay claims to the Project. Architect will not accelerate review time for submittals received after the indicated time periods, regardless of any potential impact to the Contractor's schedule.

b. Submittals requiring color selection and material selection are interdependent on receiving all submittals at the same time that have such selection requirements. Allow 20 working days from the date of receipt of the last such submittal by the Contractor for the Architect to complete color selections and mail out from the Architect's office.

c. Allow additional 5 working days for submittals requiring Architect consultant review.

d. For all other submittals allow 10 working days, after receipt by the Architect, to complete the initial review and mail out from the Architect's office.

e. If the Architect must delay processing a submittal to permit coordination with subsequent submittals, the 10 working days will begin upon receipt of the last such coordination submittal from the Contractor.

f. If several submittals are provided by the Contractor at the same time, allow 20 working days after receipt by the Architect to complete the initial review and respond. Provide an "Order of Priority List" to the Architect with the submittal.

g. If an intermediate submittal is necessary, process the same as the initial submittal.

h. Allow 10 working days for reprocessing each submittal after receipt unless noted otherwise.

E. Place a permanent label or title block on each submittal for identification. Indicate the name of the entity that prepared each submittal on the label or title block. Consecutively number each submittal beginning with the number 001.

1. Provide adequate space for the Contractor's stamp and approval, plus a space approximately 4 by 5 inches each on the label or beside the title block on Shop Drawings to record the Architect's review and approval markings and the action taken.

2. Include the following information on the label or title block for processing and recording action taken.

a. Project name and job number.

b. Date.

c. Name and address of the Architect.

d. Name and address of the Contractor, subcontractor, supplier and manufacturer as appropriate.

e. Number and title of appropriate Specification Section.

f. Drawing number and detail references, as appropriate.

F. Package each submittal appropriately for transmittal and handling. Transmit each submittal from the Contractor to the Architect using a transmittal form. Submittals received from sources other than the Contractor will be returned through the Contractor without action. Submittals not requested will be returned unprocessed.

1. Address no more than one topic or related topics on a single transmittal (i.e. mechanical items shall not be submitted under same transmittal with electrical items, even though the same Contractor/subcontractor may be responsible for both).

2. Record relevant information, deviations, and requests for data, including minor variations and limitations from the Contract Documents.

3. Shop drawings, product data, samples, and mock-up as required for submissions by the technical specification sections are to be submitted for Architect's review/approval until "No Exception Taken" or "Make Corrections Noted" is obtained. The number of submittals required is noted in parenthesis.

a. Shop Drawings: (2) sets; plus one (1) additional set for Structural, Mechanical and Electrical submittals. Or one PDF if transmitted electronically (PDF method preferred).

b. Product Data: (2) copies; plus one (1) additional copy for Structural, Mechanical and Electrical submittals. Or one PDF if transmitted electronically (PDF method preferred).

c. Samples: (3) each.

d. Mock-ups: As required by any technical specification section.

e. Reference applicable mechanical and electrical technical specifications' sections for additional submittal requirements.

4. Material and Color Submittal: Submit samples of actual colors of materials.

5. Number submittals as follows: Numerical Order, Spec Section and Revision.

6. In the event of the need to "Revise and Resubmit" a submittal, resubmit same in acceptable form/content, clearly identifying deviations from previous submittal content.

G. Do not transmit submittals directly to Architect's consultants. Architect will review and transmit submittals to consultants for their review.

H. Prior to submitting transmittals required by Building Code to building code officials and other Authorities Having Jurisdiction (AHJ), transmit submittals to Architect for review and approval.

I. Maintain copy in project Field Office of each submittal, regardless of status, along with a current Submittal Log,

1.4 CONSTRUCTION PROGRESS SCHEDULE SUBMITTALS

A. Comply with Section 013216 - Construction Progress Schedule

1.5 PROPOSED PRODUCT LIST

A. Within 15 days after date of Notice to Proceed, submit list of major products proposed for use, with name of manufacturer, trade name and model number of each product.

B. For products specified only by reference standards, indicate manufacturer, trade name, model or catalog designation and reference standards.

1.6 PRODUCT DATA

A. Product Data: Submit to Architect/Engineer for review for assessing conformance with information given and design concept expressed in Contract Documents.

B. Submit electronic submittals via email as PDF electronic files.

C. Mark each copy to identify applicable products, models, options and other data. Supplement manufacturers' standard data to provide information specific to this Project.

D. Indicate product utility and electrical characteristics, utility connection requirements and location of utility outlets for service for functional equipment and appliances.

E. After review, distribute according to "Submittal Procedures" Article and for record documents described in Section 017000 - Execution and Closeout Requirements.

1.7 ELECTRONIC CAD FILES OF PROJECT DRAWINGS

A. Electronic CAD Files of Project Drawings: May only be used to expedite production of Shop Drawings for the Project. Use for other Projects or purposes is not allowed.

B. Electronic CAD Files of Project Drawings: Distributed only under the following conditions:

1. Use of files is solely at receiver's risk. Architect/Engineer does not warrant accuracy of files. Receiving files in electronic form does not relieve receiver of responsibilities for measurements, dimensions and quantities set forth in Contract Documents. In the event of ambiguity, discrepancy or conflict between information on electronic media and that in Contract Documents, notify Architect/Engineer of discrepancy and use information in hard-copy Drawings and Specifications.

2. CAD files do not necessarily represent the latest Contract Documents, existing conditions, and as-built conditions. Receiver is responsible for determining and complying with these conditions and for incorporating addenda and modifications.

3. User is responsible for removing information not normally provided on Shop Drawings and removing references to Contract Documents. Shop Drawings submitted with information associated with other trades or with references to Contract Documents will not be reviewed and will be immediately returned.

4. Receiver shall not hold Architect/Engineer responsible for data or file clean-up required to make files usable, nor for error or malfunction in translation, interpretation or use of this electronic information.

5. Receiver shall understand that even though Architect/Engineer has computer virus scanning software to detect presence of computer viruses, there is no guarantee that computer viruses are not present in files or in electronic media.

6. Receiver shall not hold Architect/Engineer responsible for such viruses or their consequences and shall hold Architect/Engineer harmless against costs, losses or damage caused by presence of computer virus in files or media.

7. The Contractor is to obtain a Consent for Release of Electronic Media per attached form (an electronic version of this form is available upon request). Subcontractors are to obtain this information from the Contractor and their use of the electronic files is subject to the same conditions.

1.8 SHOP DRAWINGS

A. Shop Drawings: Submit to Architect/Engineer for assessing conformance with information given and design concept expressed in Contract Documents.

B. Submit drawings drawn to accurate scale. Shop drawings are not intended to change the design. Do not reproduce Contract documents or copy standard information for use as Shop Drawings. Standard information prepared without specific references to the project is not a Shop Drawing.

C. Provide fabrication and installation drawings, setting diagrams, schedules, patterns, templates, and similar drawings. Include the following information:

1. Dimensions.

2. Identification of products and materials included.

3. Compliance with specified standards.

4. Notation of coordination requirements.

5. Notation of dimensions established by field measurements.

6. Any deviation from contract drawings or specifications.

7. Date when review has to be finalized to meet schedule.

D. Indicate special utility and electrical characteristics, utility connection requirements, and location of utility outlets for service for functional equipment and appliances.

E. When required by individual Specification Sections, provide Shop Drawings signed and sealed by a professional Engineer responsible for designing components shown on Shop Drawings.

1. Include signed and sealed calculations to support design.

2. Submit Shop Drawings and calculations in form suitable for submission to and approval by authorities having jurisdiction.

3. Make revisions and provide additional information when required by authorities having jurisdiction.

F. All items shown on shop drawings that do not conform to plans and specifications shall be specifically noted as such (flagged) and brought to the Architect's attention. In any case, the Architect's stamp of review shall not include approval of unauthorized changes in the Contract Documents, except where specific written approval is given.

G. Contractor is responsible for obtaining and distributing required shop drawings to its subcontractors and material suppliers after, as well as before, final review by the Architect. Prints or PDF’s of reviewed shop drawings shall be made from approved submittals which carry the Contractor's and Architect's appropriate stamps. Architect/Owner and applicable consultants and AHJ shall retain copies of each shop drawing submittal.

H. Submit electronic submittals via email as PDF electronic files.

1.9 SAMPLES

A. Samples: Submit to Architect/Engineer for assessing conformance with information given and design concept expressed in Contract Documents.

B. Samples for Selection as Specified in Product Sections:

1. Submit to Architect/Engineer for aesthetic, color and finish selection.

2. Submit Samples of finishes, textures and patterns for Architect/Engineer selection.

C. Submit Samples to illustrate functional and aesthetic characteristics of products, with integral parts and attachment devices. Coordinate Sample submittals for interfacing work.

1. Where variation in color, pattern, texture or other characteristics are inherent in the material, submit not less than four (4) units to show approximate limits of the variations.

D. Include identification on each Sample, with full Project information.

E. Submit number of samples specified in individual Specification Sections; Architect/Engineer may retain one sample.

F. Reviewed Samples, which may be used in the Work, are indicated in individual Specification Sections.

G. Samples will not be used for testing purposes unless specifically stated in Specification Section.

H. Unless noted otherwise in the relevant technical section of these specifications, remove all samples and mock-ups from the project site, after review and approval by the Owner and Architect.

1.10 OTHER SUBMITTALS

A. Closeout Submittals: Comply with Section 017000 - Execution and Closeout Requirements.

1.11 TEST REPORTS

A. Informational Submittal: Submit reports for Architect/Engineer's knowledge as Contract administrator or for Owner.

B. Submit test reports for information for assessing conformance with information given and design concept expressed in Contract Documents.

1.12 CERTIFICATES

A. Informational Submittal: Submit certification by manufacturer, installation/application Subcontractor, or Contractor to Architect/Engineer, in quantities specified for Product Data.

B. Indicate material or product conforms to or exceeds specified requirements. Submit supporting reference data, affidavits, and certifications as appropriate.

C. Certificates may be recent or previous test results on material or product but must be acceptable to Architect/Engineer.

1.13 MANUFACTURER'S INSTRUCTIONS

A. Informational Submittal: Submit manufacturer's installation instructions for Architect/Engineer's knowledge as Contract administrator or for Owner.

B. Submit printed instructions for delivery, storage, assembly, installation, startup, adjusting, and finishing, to Architect/Engineer in quantities specified for Product Data.

C. Indicate special procedures, perimeter conditions requiring special attention, and special environmental criteria required for application or installation.

1.14 MANUFACTURER'S FIELD REPORTS

A. Informational Submittal: Submit reports for Architect/Engineer's knowledge as Contract administrator or for Owner.

B. Submit a PDF report within 5 days of observation to Architect/Engineer for information unless it is needed sooner.

C. Submit reports for information for assessing conformance with information given and design concept expressed in Contract Documents.

1.15 ERECTION DRAWINGS

A. Informational Submittal: Submit Drawings for Architect/Engineer's knowledge as Contract administrator or for Owner.

B. Submit Drawings for information assessing conformance with information given and design concept expressed in Contract Documents.

C. Data indicating inappropriate or unacceptable Work may be subject to action by Architect/Engineer or Owner.

1.16 CONSTRUCTION PHOTOGRAPHS

A. Provide photographs of Site and construction throughout progress of Work produced by an experienced photographer acceptable to Architect/Engineer.

B. Submit photographs with Application for Payment.

C. Take sufficient Site photographs from different directions and sufficient interior photographs indicating relative progress of the Work, 5 days maximum before submitting pay request, to confirm progress.

D. Identify each print on back, identify digital prints with file name. Identify name of Project, contract number, orientation of view, date and time of view and photographer's numbered identification of exposure.

E. Digital Images: Deliver complete set of digital image electronic files on CD-ROM or other approved media to Architect with project record documents. Identify electronic media with date photographs were taken (not necessary on digital prints). Submit images that have same aspect ratio as sensor, uncropped.

1. Digital Images: Uncompressed JPG or other approved format, produced by a digital camera with minimum sensor size of 4.0 megapixels, and image resolution of not less than 1024 by 768 pixels.

1.17 SPECIAL JOB-SITE SUBMITTALS

A. Hazardous Chemical Inventory:

1. In order to comply with the State of Washington's Hazard Communication Standard (Chapter 296-800-170 WAC), the Owner requires the Contractor to provide a complete inventory of all potentially hazardous chemicals which the Contractor (including subcontractors) will bring into or produce at the work site. This inventory shall be submitted to the Architect no later than three days prior to the chemicals arrival on site. Specific information for each chemical, in the form of Material Safety Data Sheets (MSDS), and the personal protective equipment required for working with the materials (respirators, special clothing, etc.) shall be included in the submittal.

2. The Contractor shall revise this information as necessary (i.e. when new chemicals are brought onto or produced at the worksite), with updates forwarded to the Architect. A complete and accurate copy of this information shall be immediately available at the Contractor's worksite office for reference by Owner representatives and the Contractor's employees during the Contractor's working hours.

B. Submit revised inventory monthly or whenever changes are made.

1.18 CONTRACTOR REVIEW

A. Review for compliance with Contract Documents and approve submittals before transmitting to Architect/Engineer.

B. Contractor: Responsible for:

1. Determination and verification of materials including manufacturer's catalog numbers.

2. Determination and verification of field measurements and field construction criteria.

3. Checking and coordinating information in submittal with requirements of Work and of Contract Documents.

4. Determination of accuracy and completeness of dimensions and quantities.

5. Confirmation and coordination of dimensions and field conditions at Site.

6. Construction means, techniques, sequences and procedures.

7. Safety precautions.

8. Coordination and performance of Work of all trades.

C. Stamp, sign or initial and date each submittal to certify compliance with requirements of Contract Documents.

D. Do not fabricate products or begin Work for which submittals are required until approved submittals have been received from Architect/Engineer.

1.19 ARCHITECT/ENGINEER REVIEW

A. Do not make "mass submittals" to Architect/Engineer. "Mass submittals" are defined as six or more submittals or items in one day or 20 or more submittals or items in one week. If "mass submittals" are received, Architect/Engineer's review time stated above will be extended as necessary to perform proper review. Architect/Engineer will review "mass submittals" based on priority determined by Architect/Engineer after consultation with Owner and Contractor.

B. Informational submittals and other similar data are for Architect/Engineer's information, do not require Architect/Engineer's responsive action and will not be reviewed or returned with comment.

C. Submittals made by Contractor, which are not required by Contract Documents, may be returned without action.

D. Architect review of submittals does not relieve the Contractor from his responsibilities for conformance with the Contract Documents, proper installation, compliance with applicable codes, or coordination of the Work.

E. Submittal approval does not authorize changes to Contract requirements unless accompanied by: Change Order, Architect's Supplemental Instruction, Field Order, Substitution Request or Construction Change Directive.

F. Owner may withhold monies due to Contractor to cover additional costs beyond the second submittal review.

G. The Architect will stamp each submittal with a uniform, self-explanatory action stamp. The stamp will be marked to indicate the action to be taken.

H. The Architect will distribute the reviewed submittals to:

1. Architect project file and/or Owner.

2. AHJ (as required)

3. Architect sub-consultants.

4. Contractor.

PART 2 PRODUCTS - NOT USED

PART 3 EXECUTION - NOT USED

END OF SECTION 013300

integrus ARCHITECTURE

CONSENT FOR THE RELEASE OF ELECTRONIC MEDIA

Project:	Longview School District Heat Pump Replacement and Indoor Air Quality Improvements	Recipient:	
Architect's Project No.:	22220.00	Date:	

The Recipient and the Architect hereby approve the release of electronic media as follows:

1. The Recipient agrees, to the fullest extent permitted by law, to indemnify and hold the Architect and its Consultants harmless from any damage, liability, or cost, including reasonable attorney's fees and cost of defense arising from any reuse or modifications of the electronic media by the Recipient or any person or entity which acquires or obtains the electronic media from or through the Recipient. In no event shall the Architect or its Consultants be liable for any loss of profit or any damages.

2. The Architect and Consultants make no warranties, either express or implied, of merchantability and fitness for any particular purpose.

3. Files are recognized to be subject to alteration, degradation, erosion and erasure. The Recipient is advised to check all electronic media for computer viruses before loading the files. The Recipient agrees to indemnify and hold harmless the Architect and its Consultants from and against all claims of any kind put forth by the Recipient or others as a result of inadvertent viruses transmitted with the electronic files.

4. The electronic files are provided as a convenience to the Recipient and are not considered the Contractual Instruments of Service nor considered "Contract Documents" or "Drawings of Record" or "Construction Documents" or "As-Built Drawings."

5. The Architect and Consultants shall be deemed the authors of the transferred media, and will retain all common law, statutory and other reserved rights, in addition to the copyright. Each party shall have the right to alter, modify or delete materials without consequence to the other party, as long as the changes are not attributed to the other party.

6. The information is for use on this project only and not to be used for other purposes.

7. Recipient agrees to compensate Architect and Consultant reasonable costs for preparation of the electronic files as agreed upon.

Approved by Owner:			
Name:		By:	
Date:		Title:	
Approved by Architect:		**Accepted by Recipient:**	
Name:	Integrus Architecture, P.S.	Name:	
By:		By:	
Title:		Title:	
Date:		Date:	

10 South Cedar P.O. Box 1482 Spokane, WA 99201 509-838-8681 FAX 509-838-2194

A Professional Service Corporation

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PART 1 GENERAL

1.1 SUMMARY

A. Section Includes:

1. Construction Indoor Air Quality (IAQ) Management Plan.
2. HVAC air filters.
3. Building flush-out.
4. Indoor air quality testing.

B. Related Sections:

1. Section 018113 - Sustainable Design Requirements: General LEED requirements.
2. Section 019100 - Commissioning: General commissioning requirements.
3. Section 234000 - HVAC Air Cleaning Devices: Permanent air filters.

1.2 REFERENCES

A. American Society of Heating, Refrigerating & Air Conditioning Engineers (ASHRAE):

1. ASHRAE 52.2 - Method of Testing General Ventilation Air Cleaning Devices for Removal Efficiency by Particle Size.

B. Sheet Metal and Air Conditioning National Contractors Association (SMACNA):

1. SMACNA IAQ 2nd Edition 2007 - Guideline for Occupied Buildings under Construction, Chapter 3: Control Measures.

C. U.S. Environmental Protection Agency (EPA):

1. EPA IAQ Testing - Compendium of Methods for the Determination of Air Pollutants in Indoor Air.

1.3 PLAN REQUIREMENTS

A. Intent:

1. Prevent indoor air quality problems resulting from construction [and renovation] process.
2. Protect HVAC system during construction [and renovation], control pollutant sources, and interrupt contamination pathways.

PART 2 PRODUCTS

2.1 HVAC AIR FILTERS

A. Return Filters: Filtration media rated for minimum efficiency reporting value (MERV) when tested according to ASHRAE 52.2.

1. Construction Return Filters: MERV of 8.

2. Flush-Out Return Filters: MERV of 13.

3. Permanent Filters: As specified in Section 234000 - HVAC Air Cleaning Devices.

B. Supply Filters: As specified in Section 234000 - HVAC Air Cleaning Devices.

PART 3 EXECUTION

3.1 CONSTRUCTION PROCEDURES - GENERAL

A. Prevent the absorption of moisture and humidity by absorptive materials by:

1. Sequencing the delivery of such materials so that they are not present in the building until wet work is completed and dry.

2. Delivery and storage of such materials in fully sealed moisture-impermeable packaging.

3. Provide sufficient ventilation for drying within reasonable time frame.

B. Begin construction ventilation when building is substantially enclosed.

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

D. When working in a portion of an occupied building, prevent movement of air from construction area to occupied area or into building HVAC system.

E. All tools and equipment used within a building return air space shall be equipped with a filter system to reduce the introduction of particulate and odor into the return air.

F. Fabricated products shall be pre-finished off-site wherever practical and to the greatest extent possible. The use of spray equipment for applying finishes in buildings shall be used only upon approval of Owner.

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

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

I. During installation of carpet, resilient flooring, paints, furnishings, and other VOC emitting products, provide supplemental (spot) ventilation for at least 72 hours after work is completed and describe these activities in the weekly reports.

J. Operate HVAC with supply air system only and use exhaust fans to remove air outside of ducted system to avoid contaminating return air ducts.

K. Conduct regular inspection and maintenance of indoor air quality measures, including ventilation system protection and ventilation rate.

L. Require VOC safe masks for workers installing VOC emitting products (interior and exterior) defined as products that emit 150 g/L or more.

M. Use low-toxic cleaning supplies for surfaces, equipment, and worker's personal use.

N. When dry sanding for gypsum board assemblies, provide the following protection:

1. Isolate the space.

2. Provide plastic sheet separation during sanding.

3. Close and seal all air system devices and ductwork.

4. Sequence construction to avoid contamination of other spaces with gypsum dust.

5. Provide worker protection.

3.2 FILTER INSTALLATION AND REPLACEMENT

A. Install construction return filter at each return grille before operating permanent air handlers during construction.

B. Replace filters after completing construction and before conducting building flush-out.

1. Replace construction return filters with flush-out return filters.

2. Replace supply filters.

C. Replace filters after conducting building flush-out and before occupancy.

1. Replace flush-out return filters with permanent filters.

2. Replace supply filters.

3.3 BUILDING FLUSH-OUT

A. The Contractor shall include a separate milestone date on the CPM Schedule, which indicates the targeted date(s) for start of building flush out process.

B. Conduct building flush-out after construction ends and before occupancy.

1. Operate HVAC air systems using 100 percent outside air for two weeks, minimum.

2. Operate HVAC air system to supply 14,000-cu ft/sq ft floor area (4,274-cu m/sq m floor area) total outdoor air volume while maintaining 60 degrees F (15.5 degrees C) minimum indoor temperature and 60 percent maximum indoor relative humidity.

3. Operate HVAC air system to supply minimum of 3,500-cu ft/sq ft floor area (1,068-cu m/sq m floor area) total outdoor air volume to spaces before occupancy is permitted.

3.4 IAQ MANAGEMENT PLAN IMPLEMENTATION

A. The Contractor is required to implement and maintain the approved IAQ Management Plan for the duration of the Project, and to update procedures at any time due to unanticipated building conditions.

B. Provide reports and photographs of construction IAQ management measures such as protection of ducts and on-site stored or installed absorptive materials. In each report describe and illustrate IAQ measures (installation, effectiveness, upkeep, etc.) during construction along with a description of the SMACNA approach employed.

1. Provide data sheets of filtration media used during construction and installed immediately prior to building flush out and prior to building occupancy.

3.5 CONSTRUCTION PHOTOGRAPHS

A. Section 013300 - Submittal Procedures: Requirements for construction photographs.

B. Photograph construction operations to show compliance with SMACNA IAQ and Construction IAQ Management Plan.

1. Take minimum of six photographs on minimum of three different occasions during construction to show consistent adherence with specified requirements.

2. Identify photographs as required in Section 013300 - Submittal Procedures and identify SMACNA IAQ approach illustrated in each photograph.

3.6 FIELD QUALITY CONTROL

A. Section 017000 - Execution and Closeout Requirements: Field inspecting, testing, adjusting, and balancing.

B. Conduct baseline indoor air quality testing procedure according to EPA IAQ Testing.

1. Verify indoor air contaminants do not exceed the following limits:

CONTAMINANT	MAXIMUM CONCENTRATION
Formaldehyde	27 parts per billion
Particulates (PM10)	50 micrograms per cubic meter
Total Volatile Organic Compounds (TVOC)	500 micrograms per cubic meter

4-Phenylcyclohexene (4-PCH)	6.5 micrograms per cubic meter
Carbon Monoxide (CO)	9 parts per million and no greater than 2 parts per million above outdoor levels

C. Conduct air sample testing according to the following:

1. Verify interior finishes, including but not limited to millwork, doors, paint, carpet and acoustic tiles, are installed. [Verify movable furnishings such as workstations and partitions are installed.]

2. Test air quality before occupancy, during normal occupied hours, with building ventilation system starting at normal daily start time and operated at minimum outside air flow rate for occupied mode for duration of air testing.

3. Test air quality for each portion of building served by separate ventilation system, using minimum one sampling point for each 25,000 sq ft (2,323 sq m), or one sampling point for each contiguous floor area, whichever is larger. Include sampling points in areas with least ventilation and greatest presumed contaminant source strength as directed by [Architect/Engineer] [Owner].

4. Collect air samples between 3 and 6 feet (900 and 1800 mm) above finished floor. Collect samples over minimum 4-hour period.

D. When tests indicate contaminants exceed maximum concentration limit, flush affected building area with outside air and retest.

1. Repeat flushing and retesting until measured contaminant concentrations are less than specified maximum limits.

2. Take air samples for retests at same location as initial tests.

3.7 REMOVAL

A. Remove all IAQ measures as well as signs, framing, and supports at completion of project. If an IAQ measure may, in the Contractor's opinion, remain confirm this in advance with the Owner's Representative before leaving it in place.

B. All testing, adjusting and balancing of systems, including training of Owner's designated personnel, shall be completed after the flush out period. All flush out filtration media must be replaced with required filtration media prior to testing and adjusting of systems.

C. Actual procedures which are followed during building flush out must receive prior approval from Owner and Architect.

D. Punch list items which do not affect the mechanical systems may be conducted during this flush out period upon approval of the Owner and Architect.

E. Upon completion of building flush out, replace all filtration media with MERV 13 filters as determined by ASHRAE 52.2-1999, except the filters solely processing outside air.

F. Submit a report upon completion of building flush out stating that all procedures stated in the approved IAQ Management Plan have been complied with. This report shall contain all [weekly] reports and photographs, as well as any IAQ management plan activities which occurred during the project. Submit in one (1) 3-ring binder with compact disk (CD) copy in MS Word.

END OF SECTION 013536

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Quality control.

B. Tolerances.

C. References.

D. Labeling.

E. Mockup requirements.

F. Testing and inspection services.

G. Manufacturers' field services.

1.2 QUALITY CONTROL

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

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

C. Testing and inspecting services are required to verify compliance with requirements specified or indicated. These services do not relieve Contractor of responsibility for compliance with the Contract Document requirements.

1. Specific quality-control requirements for individual construction activities are specified in the Sections that specify those activities. Requirements in those Sections may also cover production of standard products.

D. Perform Work using persons qualified to produce required and specified quality.

E. Products, materials, and equipment may be subject to inspection by Architect/Engineer and Owner at place of manufacture or fabrication. Such inspections shall not relieve Contractor of complying with requirements of Contract Documents.

F. Supervise performance of Work in such manner and by such means to ensure that Work, whether completed or in progress, will not be subjected to harmful, dangerous, damaging, or otherwise deleterious exposure during construction period.

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

1. Should manufacturers' instructions conflict with Contract Documents; request clarification from Architect before proceeding.

H. Schedule of Tests and Inspections: Prepare a schedule of tests, inspections, and similar quality-control services required by the Contract Documents. Submit schedule within thirty (30) days of date established for the Notice to Proceed.

1. Distribution: Distribute schedule to Owner, Architect testing agencies, and each party involved in performance of portions of the Work where tests and inspections are required.

1.3 TOLERANCES

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

B. Comply with manufacturers' recommended tolerances and tolerance requirements in reference standards. When such tolerances conflict with Contract Documents, request clarification from Architect/Engineer before proceeding.

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

D. Allow tolerances for thermal expansion and effects of mechanical vibration.

1.4 REFERENCES

A. For products or workmanship specified by association, trade, or other consensus standards, comply with requirements of standard except when more rigid requirements are specified or are required by applicable codes.

B. Conform to reference standard by date of issue current as of date of Contract Documents except where specific date is established by code.

C. Obtain copies of standards and maintain on Site when required by product Specification Sections.

D. When requirements of indicated reference standards conflict with Contract Documents, request clarification from Architect/Engineer before proceeding.

E. Neither contractual relationships, duties, or responsibilities of parties in Contract nor those of Architect/Engineer shall be altered from Contract Documents by mention or inference in reference documents.

F. Abbreviations and Names: Abbreviations and acronyms are frequently used in the Specifications and other Contract Documents to represent the name of a trade association, standards developing organization, authorities having jurisdiction, or other entity in the context of referencing a standard or publication. Where abbreviations and acronyms are used in the Specifications or other Contract Documents, they mean the recognized name of the entities. Refer to Gale Research's "Encyclopedia of Associations" or Columbia Books' "National Trade and Professional Associations of the U.S.," which are available in most libraries or a search engine dedicated to construction industry data such as http://www.4specs.com or http://www.arcat.com.

1.5 LABELING

A. Attach label from agency approved by authorities having jurisdiction for products, assemblies, and systems required to be labeled by applicable code.

B. Label Information: Include manufacturer's or fabricator's identification, approved agency identification, and the following information, as applicable, on each label:

1. Model number.

2. Serial number.

3. Performance characteristics.

C. Manufacturer's Nameplates, Trademarks, Logos, and Other Identifying Marks on Products: Not allowed on surfaces exposed to view in public areas, interior or exterior.

1.6 MOCK-UP REQUIREMENTS

A. Tests will be performed under provisions identified in this Section and identified in individual product Specification Sections.

B. Assemble and erect specified or indicated items with specified or indicated attachment and anchorage devices, flashings, seals, and finishes.

C. Accepted mockups shall be comparison standard for remaining Work.

D. Where mockup has been accepted by Architect/Engineer and is specified in product Specification Sections to be removed, remove mockup and clear area when directed to do so by Architect/Engineer.

1.7 TESTING AND INSPECTION SERVICES

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

B. Independent firm will perform tests, inspections, and other services specified in individual Specification Sections and as required by Architect/Engineer, Owner or authorities having jurisdiction.

1. Laboratory: Authorized to operate at Project location.

2. Laboratory Staff: Maintain full-time specialist on staff to review services.

3. Testing Equipment: Calibrated at reasonable intervals with devices of an accuracy traceable to National Bureau of Standards or accepted values of natural physical constants.

C. Reports shall be submitted by independent firm to Architect/Engineer, Contractor and authorities having jurisdiction, in PDF format indicating observations and results of tests and compliance or noncompliance with Contract Documents.

1. Submit final report indicating correction of Work previously reported as noncompliant.

D. Employment of testing agency or laboratory shall not relieve Contractor of obligation to perform Work according to requirements of Contract Documents.

E. The Contractor shall arrange and pay for all inspection and testing required by the Contract Documents except for tests specifically indicated herein as the responsibility of the Owner. The Contractor shall also be responsible for all costs of all inspections and testing including, but not limited to, the following:

1. Re-inspection and/or retesting of Owner provided inspections or testing due to failure.

a. Retesting or re-inspection required because of nonconformance with specified or indicated requirements shall be performed by same independent firm on instructions from Architect/Engineer. Payment for retesting or re-inspection will be charged to Contractor by deducting testing charges from Contract Sum/Price.

2. Testing required because of changes in materials or proportions at the request of the Contractor.

3. Contractor’s duties for owner provided inspections and tests, as specified.

F. Agency Responsibilities:

1. Test Samples of mixes submitted by Contractor.

2. Provide qualified personnel at Site. Cooperate with Architect/Engineer and Contractor in performance of services.

3. Perform indicated sampling and testing of products according to specified standards.

4. Ascertain compliance of materials and mixes with requirements of Contract Documents.

5. Promptly notify Architect/Engineer and Contractor of observed irregularities or nonconformance of Work or products.

6. Perform additional tests required by Architect/Engineer.

7. Attend preconstruction meetings and progress meetings.

G. Agency Reports: After each test, promptly submit PDF copies of report to Architect/Engineer, Contractor, and authorities having jurisdiction. When requested by Architect/Engineer, provide interpretation of test results. Include the following:

1. Date issued.

2. Project title and number.

3. Name of inspector.

4. Date and time of sampling or inspection.

5. Identification of product and Specification Section.

6. Location in Project.

7. Type of inspection or test.

8. Date of test.

9. Results of tests.

10. Conformance with Contract Documents.

H. Limits on Testing Authority:

1. Agency or laboratory may not release, revoke, alter, or enlarge on requirements of Contract Documents.

2. Agency or laboratory may not approve or accept any portion of the Work.

3. Agency or laboratory may not assume duties of Contractor.

4. Agency or laboratory has no authority to stop the Work.

1.8 MANUFACTURER'S FIELD SERVICES

A. When specified in individual Specification Sections, require material or product suppliers or manufacturers to provide qualified staff personnel to observe Site conditions, conditions of surfaces and installation, quality of workmanship, startup of equipment, testing, adjusting, and balancing of equipment and commissioning as applicable, and to initiate instructions when necessary.

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

C. Report observations and Site decisions or instructions given to applicators or installers that are supplemental or contrary to manufacturer's written instructions.

D. Refer to Section 013300 - Submittal Procedures, "Manufacturer's Field Reports" Article.

PART 2 PRODUCTS - NOT USED

PART 3 EXECUTION

3.1 TEST AND INSPECTION LOG

A. Prepare a record of tests and inspections. Include the following:

1. Date test or inspection was conducted.

2. Description of the Work tested or inspected.

3. Date test or inspection results were transmitted to Architect.

4. Identification of testing agency or special inspector conducting test or inspection.

B. Maintain log at Project Site. Post changes and modifications as they occur. Provide access to test and inspection log for Architect’s reference during normal working hours.

3.2 ACCEPTABLE TESTING AGENCIES

A. Testing Agency used to be approved by Owner and Architect.

3.3 REPAIR AND PROTECTION

A. General: On completion of testing, inspecting, sample taking, and similar services, repair damaged construction and restore substrates and finishes.

1. Comply with the Contract Document requirements. See Section 017000 – Execution and Closeout Requirements.

B. Protect construction exposed by or for quality-control service activities.

C. Repair and protection are Contractor's responsibility, regardless of the assignment of responsibility for quality-control services.

END OF SECTION 014000

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Temporary Utilities:

1. Protection of Existing Utilities.
2. Temporary Utility Installation.
3. Temporary power
4. Temporary lighting for construction purposes.
5. Temporary heating.
6. Temporary cooling.
7. Temporary ventilation.
8. Communication services.
9. Temporary water service.
10. Temporary sanitary facilities.

B. Construction Facilities:

1. Field offices and sheds.
2. Vehicular access.
3. Parking.
4. Progress cleaning and waste removal.
5. Project identification.
6. Traffic regulation.
7. Fire-prevention facilities.

C. Temporary Controls:

1. Barriers.
2. Traffic and Pedestrian Obstructions.
3. Enclosures and fencing.
4. Security.

5. Water control.

6. Dust control.

7. Erosion and sediment control.

8. Noise control.

9. Pest and rodent control.

10. Pollution control.

11. Hazardous Material Spills

D. Removal of utilities, facilities, and controls.

E. Covid Protocols and Procedures.

1.2 PROJECT CONDITIONS

A. Temporary Utilities: Within 15 calendar days of the Notice to Proceed, the Contractor shall submit to the Architect and Owner a schedule and a location sketch indicating dates for implementation and termination of each temporary utility. At the earliest feasible time, when acceptable to the Owner, change over from use of temporary service to use of permanent service.

B. Conditions of Use: Keep temporary services and facilities clean and neat in appearance. Operate in a safe and efficient manner. Relocate temporary services and facilities as the Work progresses. Do not overload facilities or permit them to interfere with progress. Take necessary fire-prevention measures. Do not allow hazardous, dangerous, or unsanitary conditions, or public nuisances to develop or persist on site.

1.3 PROTECTION OF EXISTING UTILITIES

A. Concealed utilities of record are shown on Drawings. These are not necessarily exact with respect to location or completeness. Contractor to coordinate utility locates prior to excavation.

B. Notify Owner in writing, on each occasion, of intent to work near or on existing underground utility services or structures that may affect Owner occupied portions of Project Site. Submit procedure for safe and continuous operation of services. Do not proceed prior to approval.

C. Proceed with sufficient caution to preclude damaging utilities known or unknown. In event unidentified utilities are encountered, promptly notify Owner.

D. In the event Owner’s utilities are damaged during construction, promptly provide temporary services and make repairs to maintain continuity of services at the Contractor's expense.

1.4 TEMPORARY POWER

A. Temporary power can come from the existing building and the Contractor will not be charged.

B. Complement existing power service capacity and characteristics as required for construction operations.

C. Provide power outlets with branch wiring and distribution boxes located as required for construction operations. Provide suitable, flexible power cords as required for portable construction tools and equipment.

D. Provide main service disconnect and overcurrent protection at convenient location.

E. Permanent convenience receptacles may be used during construction. Replace any damaged receptacles caused by this use.

1.5 TEMPORARY VENTILATION

A. Ventilate enclosed areas to achieve curing of materials, to dissipate humidity and to prevent accumulation of dust, fumes, vapors or gases.

B. When hazardous chemicals, mineral-spirit based paints, adhesives, or other similar materials are used, the Contractor shall exhaust toxic, noxious, or odor producing fumes from the building. Method of exhaust shall ensure safety of building occupants and pedestrians in and around the project site. All existing building supply and return air ductwork within the construction area shall be capped air-tight to prevent distribution of fumes throughout the building.

C. Replace filters, clean and lubricate system prior to acceptance by Owner.

1.6 COMMUNICATION SERVICES

A. Post in field office a list of important telephone numbers.

1. Police and fire departments.

2. Ambulance service.

3. Contractor’s home office.

4. Architect’s office.

5. Owner’s Office.

6. Principal subcontractors’ field and home offices.

B. Provide mobile telephone for superintendent’s use, to be operational and kept on his/her person at all times during working hours under this contract.

1.7 TEMPORARY SANITARY FACILITIES

A. Provide and maintain required facilities and enclosures. Existing facility use is not permitted. Provide facilities at time of Project mobilization.

1.8 VEHICULAR ACCESS

A. Locate as approved by Architect/Engineer.

B. Provide unimpeded access for emergency vehicles. Maintain 20 foot wide driveways with turning space between and around combustible materials.

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

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

E. Use designated existing on-Site roads for construction traffic.

1.9 PARKING

A. Locate as approved by Architect/Engineer.

B. If Site space is not adequate, provide additional off-Site parking.

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

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

E. Designate one parking space for Architect/Engineer/Owner’s Representative.

F. Permanent Pavements and Parking Facilities:

1. Bases for permanent roads and parking areas may be used for construction traffic.

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

G. Maintenance:

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

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

H. Removal, Repair:

1. Remove temporary materials and construction at Substantial Completion.

2. Remove underground Work and compacted materials to depth of 2 feet; fill and grade Site as indicated.

3. Repair facilities damaged by use, to original condition.

1.10 PROGRESS CLEANING AND WASTE REMOVAL

A. Maintain areas free of waste materials, debris, and rubbish. Maintain Site in clean and orderly condition.

B. Remove debris and rubbish from pipe chases, plenums, attics, crawl spaces and other closed or remote spaces, before enclosing spaces.

C. Broom and vacuum clean interior areas before starting surface finishing and continue cleaning to eliminate dust.

D. Collect and remove waste materials, debris, and rubbish from Site weekly and dispose of off-Site.

E. Provide adequate storage for all items, awaiting removal from the job site, observing all requirements for fire prevention and protection of the ecology

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

G. Dispose of flammable, hazardous and toxic waste materials on daily bases. Do not permit storage inside buildings.

H. Provide vehicles to haul materials off site that are constructed and loaded so as to prevent any leaking of materials from the vehicle (RCW 46.61.655). Keep sidewalks, lawns, parking areas and streets clear of all construction materials, debris, gravel, rock and dirt attributed to the General Contractor or the sub-contractors. Clean up these areas on a daily and/or "upon request" basis as determined by the Architect's representative.

1.11 TRAFFIC REGULATION

A. Signs, Signals, and Devices:

1. Post-Mounted and Wall-Mounted Traffic Control and Informational Signs: As approved by authorities having jurisdiction.

2. Traffic Control Signals: As approved by local jurisdiction.

3. Traffic Cones, Drums, Flares, and Lights: As approved by authorities having jurisdiction.

4. Flag Person Equipment: As required by authorities having jurisdiction.

B. Flag Persons: Provide trained and equipped flag persons to regulate traffic when construction operations or traffic encroach on public traffic lanes.

C. Flares and Lights: Use flares and lights during hours of low visibility to delineate traffic lanes and to guide traffic.

D. Haul Routes:

1. Consult with authorities having jurisdiction and establish public thoroughfares to be used for haul routes and Site access.

2. Confine construction traffic to designated haul routes.

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

E. Traffic Signs and Signals:

1. Provide signs at approaches to Site and on Site, at crossroads, detours, parking areas, and elsewhere as needed to direct construction and affected public traffic.

2. Provide, operate, and maintain traffic control signals to direct and maintain orderly flow of traffic in areas under Contractor's control and areas affected by Contractor's operations.

3. Relocate signs and signals as Work progresses, to maintain effective traffic control.

F. Removal:

1. Remove equipment and devices when no longer required.

2. Repair damage caused by installation.

3. Remove post settings to depth of 2 feet, compact and finish to match adjacent grade.

1.12 FIRE-PREVENTION FACILITIES

A. Prohibit smoking within buildings under construction and demolition. Tobacco products are not permitted on grounds and construction site during the Work of this Contract.

B. Establish fire watch for cutting, welding, and other hazardous operations capable of starting fires. Maintain fire watch before, during, and after hazardous operations until threat of fire does not exist.

C. Standpipes: Install minimum of one standpipe for use during construction before building reaches 40 feet in height.

D. Portable Fire Extinguishers: NFPA 10; 10-pound capacity, 4A-60B: C UL rating.

1. Provide one fire extinguisher at each stairway on each floor of buildings under construction and demolition.

2. Provide minimum of one fire extinguisher in every construction trailer and storage shed.

3. Provide minimum of one fire extinguisher on roof during roofing operations using heat-producing equipment.

1.13 BARRIERS

A. Provide barriers to prevent unauthorized entry to construction areas and to protect existing facilities and adjacent properties from damage from construction operations and demolition.

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

C. Protect non-owned vehicular traffic, stored materials, Site, and structures from damage.

1.14 TRAFFIC AND PEDESTRIAN OBSTRUCTIONS

A. Provide signs and/or flag-persons in accordance with WAC 296-155-305 and RCW 47.36.200 for deliveries or operations which obstruct traffic in the street.

B. Contractor's equipment located on sidewalks or other pedestrian ways shall be suitably barricaded for cane detection as a warning for sight impaired persons. Barricade shall include a horizontal member at a maximum of two feet above the walking surface. Pedestrian traffic will be diverted with appropriate signs, barricades, fences, etc., from any area where contractor equipment or operations may pose a threat to the safety and health of passing pedestrians.

1.15 ENCLOSURES AND FENCING

A. Construction: approved Contractor's option.

B. Provide 6-foot-high fence around construction Site; equip with vehicular gates with locks.

1. Post fence with "Danger Hard Hat Area" signs at maximum 50 foot centers.

C. Exterior Enclosures:

1. Provide temporary insulated, weathertight closure of exterior openings to accommodate acceptable working conditions and protection for products, to allow for temporary heating and maintenance of required ambient temperatures identified in individual Specification Sections, and to prevent entry of unauthorized persons. Provide access doors with self-closing hardware and locks.

D. Interior Enclosures:

1. Provide temporary partitions and ceilings as required to prevent damage to existing materials and equipment.

1.16 SECURITY

A. Security Program:

1. Protect Work on existing premises and Owner's operations from theft, vandalism, and unauthorized entry.

2. Initiate program at Project mobilization.

3. Maintain program throughout construction period until directed by Architect/Engineer.

1.17 DUST CONTROL

A. Execute Work by methods that minimize raising dust from construction operations.

B. Provide positive means to prevent airborne dust from dispersing into atmosphere.

1.18 EROSION AND SEDIMENT CONTROL

A. Plan and execute construction by methods to control surface drainage from cuts and fills from borrow and waste disposal areas. Prevent erosion and sedimentation.

B. Minimize surface area of bare soil exposed at one time.

C. Provide temporary measures including berms, dikes, drains, and other devices to prevent water flow.

D. Construct fill and waste areas by selective placement to avoid erosive surface silts and clays.

E. Periodically inspect earthwork to detect evidence of erosion and sedimentation. Promptly apply corrective measures.

1.19 NOISE CONTROL

A. Provide methods, means and facilities to minimize noise produced by construction operations to level required by AHJ.

1.20 PEST AND RODENT CONTROL

A. Provide methods, means, and facilities to prevent rodents from accessing or invading premises.

1.21 POLLUTION CONTROL

A. Comply with pollution and environmental control requirements of authorities having jurisdiction.

B. The Contractor shall exercise every reasonable precaution to protect channels, storm drains, and bodies of water from pollution and shall conduct and schedule its operations so as to minimize or avoid muddying and silting of said channels, drains, and waters. Water pollution control work shall consist of constructing those facilities which may be required to provide prevention, control, and abatement of water pollution. Provide a Stormwater Pollution Prevention Plan (SPPP) as required by the Washington State Department of Ecology. Submit for approval to DOE and make corrections required. Pay the permit fee required by DOE.

1.22 HAZARDOUS MATERIALS SPILLS

A. If hazardous materials are released on the construction premises, a record of type of materials spilled, quantity, containment, cleanup, decontamination and disposal mechanisms used, reports made to regulatory agencies, and records of regulatory agency activity, if any, shall be kept by the Contractor and provided to Architect.

B. Contractor and all subcontractors shall immediately report all spills of hazardous materials to Architect.

C. The Contractor shall be responsible for spill containment, regulatory reporting, cleanup, decontamination, and waste disposal which meets WAC 173-340 and 173-303. See Section 017419 - Construction Waste Management, “Dangerous Waste Management,” for additional information regarding disposal of hazardous materials.

1.23 REMOVAL OF UTILITIES, FACILITIES, AND CONTROLS

A. Remove temporary utilities, equipment, facilities and materials before Substantial Completion inspection.

B. Remove underground installations to minimum depth of 2 feet. Grade Site as indicated on Drawings.

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

D. Restore facilities used during construction to original condition. Restore permanent facilities used during construction to specified condition.

1.24 COVID PROTOCOLS AND PROCEDURES

A. Contractors shall comply with all federal, state, and local mandated Covid protocols and requirements for worker and job site safety as identified by Washington State governing agencies.

PART 2 PRODUCTS (NOT USED)

PART 3 EXECUTION (NOT USED)

END OF SECTION 015000

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Products.

B. Product delivery requirements.

C. Product storage and handling requirements.

D. Product options.

E. Damaged Products.

F. General Product Requirements

G. Equipment electrical characteristics and components.

1.2 PRODUCTS

A. At minimum, comply with specified requirements and reference standards.

B. Specified products define standard of quality, type, function, dimension, appearance and performance required.

C. Furnish products of qualified manufacturers that are suitable for intended use. Furnish products of each type by single manufacturer unless specified otherwise. Confirm that manufacturer's production capacity can provide sufficient product, on time, to meet Project requirements.

D. Where Specifications include the phrase “as selected from manufacturer’s colors, patterns, textures” or a similar phrase, select a product (and manufacturer) that complies with other specified requirements.

1. Standard Range: Where Specifications include the phrase “standard range of colors, patterns, textures” or similar phrase, Architect will select color, pattern, or texture from manufacturer’s product line that does not include premium items.

2. Full Range: Where Specifications include the phrase “full range of colors, patterns, textures” or similar phrase, Architect will select color, pattern, or texture from manufacturer’s product line that includes both standard and premium items.

1.3 PRODUCT DELIVERY REQUIREMENTS

A. Comply with delivery requirements in Section 017419 - Construction Waste Management and Disposal.

B. Schedule delivery of products affecting Progress Schedule critical path to complete project within time of completion stated in the Agreement. Associated cost increases due to failure to meet accelerated delivery schedules and deliveries of long lead time products are responsibility of Contractor.

C. Coordinate to avoid conflict with work and site conditions. Limit long term site storage, overcrowding of limited storage space, and conflict with available equipment and personnel for handling Products.

D. Coordinate delivery to limit storage time for Products that are flammable, hazardous, easily damaged, subject to deterioration, or liable for theft or loss.

E. Transport and handle products according to manufacturer's instructions.

F. Promptly inspect shipments to ensure products comply with requirements, quantities are correct, and products are undamaged.

G. Provide equipment and personnel to handle products; use methods to prevent soiling, disfigurement, or damage.

1.4 PRODUCT STORAGE REQUIREMENTS

A. Store and protect products according to manufacturer's instructions.

B. Store products with seals and labels intact and legible.

C. Store sensitive products in weathertight, climate-controlled enclosures in an environment suitable to product.

D. For exterior storage of fabricated products, place products on sloped supports aboveground.

E. Provide bonded off-Site storage and protection when Site does not permit on-Site storage or protection.

F. Cover products subject to deterioration with impervious sheet covering. Provide ventilation to prevent condensation and degradation of products.

G. Store loose granular materials on solid flat surfaces in well-drained area. Prevent mixing with foreign matter.

H. Provide equipment and personnel to store products; use methods to prevent soiling, disfigurement, or damage.

I. Arrange storage of products to permit access for inspection. Periodically inspect to verify products are undamaged and are maintained in acceptable condition.

1.5 PRODUCT HANDLING REQUIREMENTS

A. Provide equipment and personnel necessary to handle Products, including those furnished by Owner, by methods to prevent soiling, damage, or loss of Products and protective packaging.

B. Provide additional protection during handling as necessary to prevent scraping, marring, and other damage to Products and surrounding surfaces.

C. Handle Products by methods to prevent bending or overstressing.

D. Lift heavy components only at designated lifting points.

1.6 DAMAGED PRODUCTS

A. Promptly remove damaged and deteriorated Products from premises. Replace with new undamaged materials conforming to Contract Documents.

1.7 PRODUCT OPTIONS

A. Products Specified by Naming One or More Manufacturers with Provision for Substitutions: Submit Request for Substitution for any manufacturer not named, according to Section 012500 - Substitution Procedures.

PART 2 PRODUCTS

2.1 GENERAL PRODUCT REQUIREMENTS

A. Provide products that comply with the Contract Documents, that are undamaged and, unless otherwise indicated, new at the time of installation.

1. Provide products complete with accessories, trim, finish, safety guards, and other devices and details needed for a complete installation and the intended use and effect.

2. Standard Products: Where available, provide standard products of types which have been produced and used previously and successfully on other projects and in similar application.

3. Color and Appearance Consistency of Finish Materials: All finish materials of their respective kinds, in regards to construction phasing, shall be consistent in color and appearance throughout the total Project and shall be purchased out of one dye lot, production run, batch, etc., as applicable, for the total Project for each respective material.

B. Additional Requirements: Material and equipment incorporated in to the work:

1. Shall conform to applicable specifications and standards.

2. Shall comply with size, make, type and quality specified or as specifically approved in writing by Architect.

3. Shall be free of ASBESTOS, FORMALDEHYDE and LEAD.

4. Manufactured and Fabricated Products:

    a. Manufacture like parts of duplicate units to standard sizes and gauges; parts to be interchangeable.

    b. Two or more items of the same kind to be identical and by same manufacturer (whether furnished under one Section or more).

    c. Products shall be suitable for service conditions. Adhere to indicated equipment capacities, sizes, and dimensions unless variations are specifically approved in writing.

    d. Except where field finishing is specified or otherwise required, products and fabricated items shall be pre-finished off-site.

    e. Do not use materials and equipment for other than designed or specified purposes and uses.

2.2 EQUIPMENT ELECTRICAL CHARACTERISTICS AND COMPONENTS

A. Wiring Terminations: Furnish terminal lugs to match branch circuit conductor quantities, sizes, and materials indicated. Include lugs for terminal box.

B. Cord and Plug: Furnish minimum 6-foot long cord and plug including grounding connector for connection to electric wiring system. Cord of longer length may be specified in individual Specification Sections or required for actual connection.

PART 3 EXECUTION - NOT USED

END OF SECTION 016000

SUBSTITUTION REQUEST FORM

TO: Integrus Architecture

PROJECT: Longview School District Heat Pump Replacement and Indoor Air Quality Improvements

SPECIFIED ITEM:

Section	Page	Paragraph	Description

The undersigned requests consideration of the following:

PROPOSED SUBSTITUTION: _____

Attached data includes product description, specifications, drawings, photographs, performance and test data adequate for evaluation of the request; applicable portions of the data are clearly identified.

Attached data also includes description of changes to Contract Documents that the proposed substitution will require for its proper installation.

Attach list of at least 3 projects where proposed substitution has been used within past 12 months. Include name, address, and telephone number of Owner and Architect.

The undersigned certifies that the following paragraphs, unless modified by attachments, are correct:

1. The proposed substitution does not affect dimensions shown on Drawings.
2. The undersigned will pay for changes to the building design, including engineering design, detailing and construction costs caused by the requested substitution.
3. The proposed substitution will have no adverse affect on other trades, the construction schedule, or specified warranty requirements.
4. Maintenance and service parts will be locally available for the proposed substitution.

The undersigned further states that the function, appearance and quality of the proposed substitution are equivalent or superior to the specified item.

Submitted by:

_____
Name (Printed)

_____
Signature

_____
Firm Name

_____
Address

_____
City, State, Zip

_____
Date

_____
Telephone

For use by the A/E:

☐ Accepted ☐ Accepted as noted

☐ Not Accepted ☐ Received too late

_____
By

_____
Date

_____
Remarks

Attachments:

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Starting of systems.

B. Testing, adjusting, and balancing.

C. Project record documents.

D. Execution Cutting and patching.

E. Special Procedures

F. Protecting installed construction.

1.2 STARTING OF SYSTEMS

A. Coordinate schedule for startup of various equipment and systems.

B. Notify Architect/Engineer seven days prior to startup of each item.

C. Verify that each piece of equipment or system has been checked for proper lubrication, drive rotation, belt tension, control sequence, and for conditions which may cause damage.

D. Verify that tests, meter readings, and electrical characteristics agree with those required by equipment or system manufacturer.

E. Verify that wiring and support components for equipment are complete and tested.

F. Execute startup under supervision of manufacturer's representative or Contractors' personnel according to manufacturer's instructions.

G. When specified in individual Specification Sections, require manufacturer to provide authorized representative who will be present at Site to inspect, check, and approve equipment or system installation prior to startup and will supervise placing equipment or system in operation.

H. For equipment or systems requiring seasonal operation, perform demonstration for other season within six months.

I. Starting Systems: The Commissioning Agent shall witness all Startups of equipment required to be commissioned.

J. Submit a report, PDF format preferred according to Section 013300 - Submittal Procedures that equipment or system has been properly installed and is functioning correctly.

1.3 TESTING, ADJUSTING, AND BALANCING

A. Owner will appoint, employ, and pay for services of independent firm to perform testing, adjusting, and balancing.

B. Reports will be submitted by independent firm to Architect/Engineer indicating observations and results of tests and indicating compliance or noncompliance with requirements of Contract Documents.

1.4 PROJECT RECORD DOCUMENTS

A. Maintain on Site one set of the following record documents; record actual revisions to the Work:

1. Drawings.

2. Specifications.

3. Addenda.

4. Change Orders and other modifications to the Contract.

5. Reviewed Shop Drawings, product data, and Samples.

6. Manufacturer's instruction for assembly, installation, and adjusting.

B. Ensure entries are complete and accurate, enabling future reference by Owner.

C. Store record documents separate from documents used for construction.

D. Record information concurrent with construction progress, not less than weekly.

E. Specifications: Legibly mark and record, at each product Section, description of actual products installed, including the following:

1. Manufacturer's name and product model and number.

2. Product substitutions or alternates used.

3. Changes made by Addenda and modifications.

F. Record Drawings and Shop Drawings: Legibly mark each item to record actual construction as follows:

1. Include Contract modifications such as Addenda, supplementary instructions, change directives, field orders, minor changes in the Work, and change orders.

2. Include locations of concealed elements of the Work.

3. Identify depth of buried utility lines and provide dimensions showing distances from permanent facility components that are parallel to utilities.

4. Dimension ends, corners, and junctions of buried utilities to permanent facility components using triangulation.

5. Identify and locate existing buried or concealed items encountered during Project.

6. Measured depths of foundations in relation to finish floor datum.

7. Measured horizontal and vertical locations of underground utilities and appurtenances, referenced to permanent surface improvements.

8. Measured locations of internal utilities and appurtenances concealed in construction, referenced to visible and accessible features of the Work.

9. Field changes of dimension and detail.

10. Details not on original Drawings.

11. Provide photographs of congested areas before closed in by Gyp or finishes.

G. Submit PDF electronic files of marked-up documents to Architect/Engineer before Substantial Completion.

PART 2 PRODUCTS - NOT USED

PART 3 EXECUTION

3.1 EXAMINATION

A. Verify that existing Site conditions and substrate surfaces are acceptable for subsequent Work. Beginning new Work means acceptance of existing conditions.

B. Verify that existing substrate is capable of structural support or attachment of new Work being applied or attached.

C. Examine and verify specific conditions described in individual Specification Sections.

D. Verify that utility services are available with correct characteristics and in correct locations.

E. Installer's Inspection of Conditions

1. Require Installer of each major unit of work to inspect substrate to receive the work, and conditions under which the work will be performed, and to report (in writing to Contractor) unsatisfactory conditions.

2. Do not proceed with the work until unsatisfactory conditions have been corrected in a manner acceptable to Installer.

F. Contractor's Inspection. Inspect each item of material or equipment immediately prior to installation, and reject damaged and defective items.

3.2 PREPARATION

A. Clean substrate surfaces prior to applying next material or substance according to manufacturer's instructions.

B. Seal cracks or openings of substrate prior to applying next material or substance.

C. Apply manufacturer-required or -recommended substrate primer, sealer, or conditioner prior to applying new material or substance in contact or bond.

3.3 EXECUTION

A. Comply with manufacturer's installation instructions, performing each step in sequence. Maintain one set of manufacturer's installation instructions at Project Site during installation and until completion of construction.

B. When manufacturer's installation instructions conflict with Contract Documents, request clarification from Architect/Engineer before proceeding.

1. Do not omit any preparatory step or installation procedure unless it is:

a. Verified with and accepted by Architect in writing.

b. Specifically modified or exempted by Contract Documents.

C. Perform additional requirements that are specified which are greater than the manufacturer’s requirements and do not have a deleterious effect on the product being installed.

D. Verify that field measurements are as indicated on approved Shop Drawings or as instructed by manufacturer.

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

1. Secure Work true to line and level and within specified tolerances, or if not specified, industry-recognized tolerances.

2. Physically separate products in place, provide electrical insulation, or provide protective coatings to prevent galvanic action or corrosion between dissimilar metals.

3. Exposed Joints: Provide uniform joint width and arrange to obtain best visual effect. Refer questionable visual-effect choices to Architect/Engineer for final decision.

F. Allow for expansion of materials and building movement.

G. Climatic Conditions and Project Status: Install each unit of Work under conditions to ensure best possible results in coordination with entire Project.

1. Isolate each unit of Work from incompatible Work as necessary to prevent deterioration.

2. Coordinate enclosure of Work with required inspections, photographs and tests to minimize necessity of uncovering Work for those purposes.

H. Mounting Heights: Where not indicated, mount individual units of Work at industry recognized standard mounting heights for particular application indicated.

1. Refer questionable mounting heights choices to Architect/Engineer for final decision.

2. Elements Identified as Accessible to Handicapped: Comply with applicable codes and regulations.

I. Adjust operating products and equipment to ensure smooth and unhindered operation.

J. Clean and perform maintenance on installed Work as frequently as necessary through remainder of construction period. Lubricate operable components as recommended by manufacturer.

3.4 CUTTING AND PATCHING

A. Employ skilled and experienced installers to perform cutting and patching.

B. Submit request in advance of cutting or altering elements affecting:

1. Structural integrity of element.

2. Integrity of weather-exposed or moisture-resistant elements.

3. Efficiency, maintenance or safety of element.

4. Visual qualities of sight-exposed elements.

5. Work of Owner or separate contractor.

C. Execute cutting, fitting, and patching, including excavation and fill to complete Work and to:

1. Fit the several parts together, to integrate with other Work.

2. Uncover Work to install or correct ill-timed Work.

3. Remove and replace defective and nonconforming Work.

4. Remove samples of installed Work for testing.

5. Provide openings in elements of Work for penetrations of mechanical and electrical Work.

D. Structural Work: Conform to Structural requirements for cutting of structural members. Do no cutting of structural elements that could reduce structural load capacity, deflection ratio, or integrity of structural systems without prior direction from Structural Engineer.

E. Plumbing, Heating, Ventilating and Air Conditioning, and Electrical Work: Refer to Division 22, Division 23, and Division 26.

F. Execute Work by methods to avoid damage to other Work and to provide proper surfaces to receive patching and finishing.

G. Cut masonry and concrete materials using masonry saw or core drill.

H. Restore Work with new products according to requirements of Contract Documents.

I. Fit Work tight to pipes, sleeves, ducts, conduits and other penetrations through surfaces.

J. Maintain integrity of wall, ceiling, or floor construction; completely seal voids.

K. Refinish surfaces to match adjacent finishes. For continuous surfaces, refinish to nearest intersection; for assembly, refinish entire unit.

L. Identify hazardous substances or conditions exposed during the Work to Architect/Engineer for decision or remedy.

M. Leave areas clean and free from debris. Remove spillage, soiling, sealants and overspray from finished surfaces.

3.5 PROTECTING INSTALLED CONSTRUCTION

A. In-Place Protection

1. General

a. During handling and installation of work at project site, clean and protect work in progress and adjoining work on a basis of perpetual maintenance.

b. Clean and perform maintenance on newly installed work as frequently as necessary through remainder of construction period.

c. Adjust and lubricate moving components to ensure operability without damaging effects. Contractor is responsible for function, condition and unblemished appearance of all work on Project, and any item or work judged defective by Architect shall be subject to replacement at no additional cost to Owner.

B. To extent possible through reasonable control and protection methods, supervise performance of work in a manner and by means which will ensure that none of the work, whether completed or in progress, will be subjected to harmful, dangerous, damaging, or otherwise deleterious exposures during construction period.

C. Protect installed Work and provide special protection where specified in individual Specification Sections.

D. Provide temporary and removable protection for installed products. Control activity in immediate Work area to prevent damage.

E. Provide protective coverings at walls, projections, jambs, sills, and soffits of openings.

F. Use durable sheet materials to protect finished floors, stairs, and other surfaces from traffic, dirt, wear, damage, or movement of heavy objects.

G. Prohibit traffic or storage upon waterproofed or roofed surfaces. When traffic or activity is necessary, obtain recommendations for protection from waterproofing or roofing material manufacturer.

H. Prohibit traffic from landscaped areas.

I. Remove protective devices when no longer needed, prior to completion of work

3.6 SPECIAL PROCEDURES

A. Materials: As specified in product sections; match existing with new products and salvaged products for patching and extending work.

B. Employ skilled and experienced installer to perform alteration work.

C. Cut, move, or remove items as necessary for access to alterations and renovation Work. Replace and restore at completion.

D. Remove unsuitable material not marked for salvage, including rotted wood, corroded metals, and deteriorated masonry and concrete. Replace materials as specified for finished Work.

E. Remove debris and abandoned items from area and from concealed spaces.

F. Prepare surface and remove surface finishes to permit installation of new work and finishes.

G. Close openings in exterior surfaces to protect existing work from weather and extremes of temperature and humidity.

H. Remove, cut, and patch Work in manner to minimize damage and to permit restoring products and finishes to original condition.

I. Refinish existing visible surfaces to remain in renovated rooms and spaces, to specified condition for each material, with neat transition to adjacent finishes.

J. Where new Work abuts or aligns with existing, provide smooth and even transition. Patch Work to match existing adjacent Work in texture and appearance.

K. When finished surfaces are cut so that smooth transition with new Work is not possible, terminate existing surface along straight line at natural line of division and submit recommendation to Architect for review.

L. Where change of plane of 1/4 inch or more occurs, submit recommendation for providing smooth transition to Architect for review.

M. Trim existing doors to clear new floor finish. Refinish trim to original condition.

N. Patch or replace portions of existing surfaces which are damaged, lifted, discolored, or showing other imperfections.

O. Finish surfaces as specified in individual product sections.

END OF SECTION 017005

PART 1 GENERAL

1.1 SUMMARY

A. Section Includes:

1. General Requirement for Recycling and Adaptive Reuse.

2. Construction waste management plan.

B. Related Sections:

1.2 WASTE MANAGEMENT GOALS

A. The Owner desires that this project generate the least amount of waste possible and that the Contractor employ processes to minimize the generation of waste due to error, poor planning, breakage, mishandling, contamination, or other factors.

B. Of the waste material that is generated, as much as economically feasible shall be reused, salvaged, or recycled.

1. Recycle and/or salvage at least 50 % of the non-hazardous construction and demolition debris.

1.3 GENERAL REQUIREMENTS FOR RECYCLING

A. The General Contractor shall be responsible for:

1. Sorting, segregating, recycling, and placing designated waste materials into containers, and for disposing of all unacceptable and dangerous wastes as defined below.

2. Furnish waste and recycle collection containers, service those containers, and dispose of solid waste from the project, including unacceptable and dangerous waste.

3. Maintain recycling and adaptive reuse storage and collection area in orderly arrangement with materials clearly separated to eliminate co-mingling of unsuitable materials.

B. Waste which is disposed of by the General Contractor shall be in accordance with all applicable local, state and federal regulations, including WAC 173-350, Solid Waste Handling Standards, and WAC 173-303, Dangerous Waste Regulations.

1. Onsite recycling bins shall be well marked and easily distinguishable from waste bins. Each recycle bin shall be marked according to its contents.

1.4 PLAN REQUIREMENTS

A. Develop and implement construction waste management plan as approved by Architect/Engineer.

B. Intent:

1. Divert construction, demolition, and land-clearing debris from landfill disposal.

2. Redirect recyclable material back to manufacturing process.

3. Generate cost savings or increase minimal additional cost to Project for waste disposal.

1.5 SUBMITTALS

A. Section 013300 - Submittal Procedures contains requirements for submittals.

B. Construction Waste Management Plan: Submit construction waste management plan describing methods and procedures for implementation and monitoring compliance including the following:

1. Transportation company hauling construction waste to waste processing facilities.

2. Recycling and adaptive reuse processing facilities and waste type each facility will accept.

3. Construction waste materials anticipated for recycling and adaptive reuse.

4. On-Site sorting and Site storage methods.

C. Submit documentation prior to Substantial Completion substantiating construction waste management plan was maintained and goals were achieved.

1. Trash: Quantity by weight deposited in landfills. Include associated fees, transportation costs, container rentals, and taxes for total cost of disposal.

2. Salvaged Material: Quantity by weight with destination for each type of material salvaged for resale, recycling, or adaptive reuse. Include associated fees, transportation costs, container rentals, taxes for total cost of disposal, and reimbursements due to salvage resale.

3. Total Cost: Indicate total cost or savings for implementation of construction waste management plan.

1.6 CONSTRUCTION WASTE MANAGEMENT PLAN

A. Construction Waste Landfill Diversion: Minimum 50 percent by weight of construction waste materials for duration of Project through resale, recycling, or adaptive reuse.

B. Implement construction waste management plan at start of construction.

C. Distribute approved construction waste management plan to Subcontractors and others affected by plan requirements.

D. Oversee plan implementation, instruct construction personnel for plan compliance, and document plan results.

E. Dangerous Waste Management:

1. Dangerous waste generated during the project shall be identified, accumulated and disposed in accordance with WAC 173-303. General Contractor generated dangerous waste must be shipped for disposal within 90 days of generation.

2. General Contractor may accumulate dangerous waste in accordance with WAC 173-303 and Washington Department of Ecology Technical Information Memorandum 94-120, Satellite Accumulation (http://www.ecy.wa.gov/pubs/94120.pdf). If General Contractor accumulates dangerous waste in greater volume than 55 gal or acutely hazardous waste in greater volume than one quart, General Contractor shall establish and operate a "90-day" accumulation area in accordance with WAC 173-303.

3. General Contractor shall dispose dangerous waste only through vendor(s) approved by owner. General Contractor shall arrange all dangerous waste shipments. Utilization of the vendor and facilities included in the State of Washington Hazardous Waste Disposal contract is authorized. Any other proposed vendor(s) and/or facilities are subject to audit by owner, prior to utilization. General Contractor shall pay for said audits.

F. Purchase products to prevent waste by:

1. Ensuring correct quantity of each material is delivered to Site.

2. Choosing products with minimal or no packaging.

3. Requiring suppliers to use returnable pallets or containers.

4. Requiring suppliers to take or buy back rejected or unused items.

G. Resources for Development of a Waste Management Plan: The following resource is available to assist in developing a waste management plan.

1. http://your.kingcounty.gov/solidwaste/greenbuilding/specifications-plans.asp

1.7 CONSTRUCTION WASTE RECYCLING

A. Use source separation method or comingling method suitable to sorting and processing method of selected recycling center. Dispose nonrecyclable trash separately into landfill.

B. Source Separation Method: Recyclable materials separated from trash and sorted into separate bins or containers, identified by waste type, prior to transportation to recycling center.

C. Comingling Method: Recyclable materials separated from trash and placed in unsorted bins or container for sorting at recycling center.

PART 2 PRODUCTS - NOT USED

PART 3 EXECUTION

3.1 WASTE MANAGEMENT PLAN IMPLEMENTATION

A. Manager: Designate an on-site person or persons responsible for instructing workers and overseeing and documenting results of the Waste Management Plan.

B. Communication: Distribute copies of the Waste Management Plan to job site foreman, each subcontractor, Owner, and Architect.

C. Instruction: Provide on-site instruction of appropriate separation, handling, and recycling, salvage, reuse, and return methods to be used by all parties at the appropriate stages of the project.

D. Meetings: Discuss trash/waste management goals and issues at project meetings.

1. Pre-bid meeting.

2. Pre-construction meeting.

3. Regular job-site meetings.

3.2 CONSTRUCTION WASTE COLLECTION

A. Collect construction waste materials in marked bins or containers and arrange for transportation to recycling centers or adaptive salvage and reuse processing facilities.

B. Maintain recycling and adaptive reuse storage and collection area in orderly arrangement with materials separated to eliminate co-mingling of materials required to be delivered separately to waste processing facility.

C. Store construction waste materials to prevent environmental pollution, fire hazards, hazards to persons and property, and contamination of stored materials.

D. Cover construction waste materials subject to disintegration, evaporation, settling, or runoff to prevent polluting air, water, and soil.

3.3 CONSTRUCTION WASTE DISPOSAL

A. Deliver construction waste to waste processing facilities. Obtain receipt for deliveries.

B. Dispose of construction waste not capable of being recycled or adaptively reused by delivery to landfill, incinerator, or other legal disposal facility. Obtain receipt for deliveries.

3.4 SITE MAINTENANCE

A. Do not use the Owner's waste containers for construction waste.

B. Dispose daily of flammable, hazardous and toxic waste materials. Dispose of trash and debris in compliance with governing codes, ordinances, regulations and anti-pollution laws.

C. Locate dumpster(s) at a site designated by the Owner.

END OF SECTION 017419

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Closeout procedures.

B. Demonstration and instructions.

C. Operation and maintenance data.

D. Manual for equipment and systems.

E. Spare parts and maintenance products.

F. Product warranties and product bonds.

G. Final cleaning.

1.2 CLOSEOUT PROCEDURES

A. Prerequisites to Substantial Completion: Complete following items before requesting Certification of Substantial Completion, either for entire Work or for portions of Work:

1. Submit maintenance manuals, Project record documents, digital images of construction photographs and other similar final record data in compliance with this Section.

2. Complete facility startup, testing, adjusting, balancing of systems and equipment, demonstrations and instructions to Owner's operating and maintenance personnel as specified in compliance Contract Documents.

3. Conduct inspection to establish basis for request that Work is substantially complete. Create comprehensive list (initial punch list) indicating items to be completed or corrected, value of incomplete or nonconforming Work, reason for being incomplete, and date of anticipated completion for each item. Include copy of list with request for Certificate of Substantial Completion.

4. Obtain and submit releases enabling Owner's full, unrestricted use of Project and access to services and utilities. Include certificate of occupancy, operating certificates, and similar releases from authorities having jurisdiction and utility companies.

5. Insurance: Advise Owner of insurance change-over requirements.

6. Deliver tools, spare parts, extra stocks of material, and similar physical items to Owner.

7. Make final change-over of locks and transmit keys directly to Owner. Advise Owner's personnel of change-over in security provisions.

8. Discontinue or change over and remove temporary facilities and services from Project Site, along with construction tools, mockups, and similar elements.

9. Perform final cleaning according to this Section.

B. Substantial Completion Inspection:

1. When Contractor considers Work to be substantially complete, submit to Architect/Engineer:

   a. Written certificate that Work, or designated portion, is substantially complete.

   b. List of items to be completed or corrected (initial punch list).

2. Within seven days after receipt of request for Substantial Completion, Architect/Engineer will make inspection to determine whether Work or designated portion is substantially complete.

3. Should Architect/Engineer determine that Work is not substantially complete:

   a. Architect/Engineer will promptly notify Contractor in writing, stating reasons for its opinion.

   b. Contractor shall remedy deficiencies in Work and send second written request for Substantial Completion to Architect/Engineer.

   c. Architect/Engineer will re-inspect Work.

   d. Redo and Inspection of Deficient Work: Repeated until Work passes Architect/Engineer's inspection.

4. When Architect/Engineer finds that Work is substantially complete, Architect/Engineer will:

   a. Prepare Certificate of Substantial Completion on AIA G704 - Certificate of Substantial Completion, accompanied by Contractor's list of items to be completed or corrected as verified and amended by Architect/Engineer and Owner (final punch list).

   b. Submit Certificate to Owner and Contractor for their written acceptance of responsibilities assigned to them in Certificate.

5. After Work is substantially complete, Contractor shall:

   a. Allow Owner occupancy of Project under provisions stated in Certificate of Substantial Completion.

   b. Complete Work listed for completion or correction within time period stipulated.

6. Owner will occupy portions of building as specified in Section 011000 - Summary.

C. Prerequisites for Final Completion: Complete following items before requesting final acceptance and final payment.

1. When Contractor considers Work to be complete, submit certification that:

a. Contract Documents have been reviewed.

b. Work has been examined for compliance with Contract Documents.

c. Work has been completed according to Contract Documents.

d. Work is completed and ready for final inspection.

2. Submittals: Submit following:

a. Final punch list indicating all items have been completed or corrected.

b. Final payment request with final releases and supporting documentation not previously submitted and accepted. Include certificates of insurance for products and completed operations where required.

c. Specified warranties, workmanship/maintenance bonds, maintenance agreements, and other similar documents.

d. Accounting statement for final changes to Contract Sum.

e. Contractor's affidavit of payment of debts and claims on AIA G706 - Contractor's Affidavit of Payment of Debts and Claims.

f. Contractor affidavit of release of liens on AIA G706A - Contractor's Affidavit of Release of Liens.

g. Consent of surety to final payment on AIA G707 - Consent of Surety to Final Payment Form.

h. Other Submittals Not Listed: Submit as required by State and Local agencies, Agreement, and Contracting Requirements.

3. Perform final cleaning for Contractor-soiled areas according to this Section.

D. Final Completion Inspection:

1. Within seven days after receipt of request for final inspection, Architect/Engineer will make inspection to determine whether Work or designated portion is complete.

2. Should Architect/Engineer consider Work to be incomplete or defective:

a. Architect/Engineer will promptly notify Contractor in writing, listing incomplete or defective Work.

b. Contractor shall remedy stated deficiencies and send second written request to Architect/Engineer that Work is complete.

c. Architect/Engineer will re-inspect Work.

d. Redo and Inspection of Deficient Work: Repeated until Work passes Architect/Engineer's inspection.

E. Following determination that Work is complete, [Owner's Representative and] Architect will make recommendation to Owner for acceptance of Final Acceptance of Work.

F. [Owner] Owner's Representative will issue Final Acceptance letter after determination that requirements for Final Completion have been fulfilled.

G. Should [Owner's Representative and] Architect be required to perform more than two reviews for Substantial Completion or Final Completion, due to failure of the Work to conform to completion status claimed by Contractor:

1. Contractor will compensate [Owner's Representative and] Architect on a time and expense basis at customary hourly rate for each additional review.

2. Compensation will be deducted from Contractor's Final Progress Payment.

1.3 DEMONSTRATION AND INSTRUCTIONS

A. The Contractor must train Owner maintenance personnel in the operation and maintenance of mechanical and electrical equipment and other products identified in Contract Documents. Coordination must be maintained with systems designers for developing the hours of instruction and scope of material to be covered. Training of Owner personnel must not begin until the Architect has approved the final submittal copy of the Operation and Maintenance Manual.

B. Demonstrate Project equipment instructed by qualified representative who is knowledgeable about the Project.

C. Video Recordings: Provide high-quality color video recordings of demonstration and instructional sessions. Engage approved videographer to record sessions. Include classroom instructions, demonstrations, board diagrams, and other visual aids.

D. For equipment or systems requiring seasonal operation, perform demonstration for other season within six months.

E. Use operation and maintenance manuals as basis for instruction. Review contents of manual with Owner's personnel in detail to explain all aspects of operation and maintenance.

F. Demonstrate startup, operation, control, adjustment, troubleshooting, servicing, maintenance, and shutdown of each item of equipment at agreed time, at designated location.

G. Prepare and insert additional data in operations and maintenance manuals when need for additional data becomes apparent during instruction.

H. Required instruction time for each item of equipment and system is specified in individual Specification Sections.

I. At each training session, provide a sign-in sheet for signature of all Owner staff in attendance. Identify the sign-in sheet with the training being provided and the date of the training. Submit the sign-in sheet(s) before Final Acceptance.

1.4 OPERATION AND MAINTENANCE DATA

A. Submit PDF copy of preliminary draft prior to Substantial Completion. Architect/Engineer will review draft and return one copy with comments. Revise content of document sets as required prior to final submission.

B. Submit final copy in PDF composite electronic indexed file at Substantial Completion.

C. Prepare media cover with printed title "OPERATION AND MAINTENANCE INSTRUCTIONS," title of Project.

D. Internally subdivide media contents with permanent page dividers, logically organized as described below.

E. Drawings: Provide scalable PDF copies in media requested.

F. Contents: Prepare table of contents for media, with each product or system description identified, in three parts as follows:

1. Part 1: Directory, listing names, addresses, and telephone numbers of Architect/Engineer, Contractor, Subcontractors, and major equipment suppliers.

2. Part 2: Operation and maintenance instructions, arranged by Section. For each category, identify names, addresses, and telephone numbers of Subcontractors and suppliers. Include the following:

a. Significant design criteria.

b. List of equipment.

c. Parts list for each component.

d. Operating instructions.

e. Maintenance instructions for equipment and systems.

f. Maintenance instructions for finishes, including recommended cleaning methods and materials, and special precautions identifying detrimental agents.

g. Safety precautions to be taken when operating and maintaining or working near equipment.

3. Part 3: Project documents and certificates, including the following:

a. Shop Drawings and product data.

1) Air and water balance reports.

b. Certificates.

c. PDF copies of warranties and bonds. Deliver original to Owner in separate bound folder in CSI format.

1.5 SPARE PARTS AND MAINTENANCE PRODUCTS

A. Furnish spare parts, maintenance, and extra products in quantities specified in individual Specification Sections.

B. Deliver to place in location as directed by Owner; obtain receipt prior to final payment.

1.6 PRODUCT WARRANTIES AND PRODUCT BONDS

A. Obtain warranties and bonds executed by responsible Subcontractors, suppliers and manufacturers within ten days after completion of applicable item of Work.

B. Execute and assemble transferable warranty documents and bonds from Subcontractors, suppliers, and manufacturers.

C. Verify documents are in proper form, contain full information and are notarized.

D. Co-execute submittals when required.

E. Include table of contents and assemble in three D side ring binder with durable plastic cover. Maintain a PDF copy for O&M manual at project closeout.

F. Submit prior to final Application for Payment.

G. Warranties shall be dated for length of time specified from date of Substantial Completion and will be rejected if dated otherwise.

H. Time of Submittals:

1. For equipment or component parts of equipment put into service during construction with Owner's permission, submit documents within ten days after acceptance.

2. Make other submittals within ten days after date of Substantial Completion, prior to final Application for Payment.

3. For items of Work for which acceptance is delayed beyond Substantial Completion, submit within ten days after acceptance, listing date of acceptance as beginning of warranty or bond period.

PART 2 PRODUCTS - NOT USED

PART 3 EXECUTION

3.1 FINAL CLEANING

A. Execute final cleaning prior to final Project assessment.

1. Employ experienced personnel or professional cleaning firm.

B. Clean interior and exterior glass and surfaces exposed to view; remove temporary labels, stains, and foreign substances; polish transparent and glossy surfaces; and vacuum carpeted and soft surfaces.

C. Clean equipment and fixtures to sanitary condition with appropriate cleaning materials.

D. Replace filters of operating equipment.

E. Clean debris from roofs, gutters, downspouts and drainage systems.

F. Clean Site; sweep paved areas, rake clean landscaped surfaces.

G. Remove waste and surplus materials, rubbish, and construction facilities from Site.

3.2 FINAL ADJUSTMENT OF ACCOUNTS

A. Submit final accounting statement to Architect making final adjustments to original Contract Sum.

B. Indicate Original Contract Sum and determine Total Adjusted Contract Sum from additions and deductions resulting from previous Change Orders, Alternates, Unit prices, and other adjustments.

C. Deduct previous payments from adjusted Contract Sum to determine Total Contract Sum remaining due.

D. Architect will prepare final Change Order reflecting approved adjustments to Contract Sum not previously made by other Change Orders.

3.3 FINAL APPLICATION FOR PAYMENT

A. Submit final Application for Payment in accordance with the Contracting Requirements, and procedures and requirements of Owner, identifying total adjusted Contract Sum, previous payments, and sum remaining due.

END OF SECTION 017700

DIVISION 02

EXISTING CONDITIONS

PART 1 GENERAL

1.1 SUMMARY

A. Section Includes:

1. Demolition of designated construction and finishes
2. Cutting and alterations to accommodate new Work.
3. Disconnecting and capping designated utilities.
4. Salvaging designated items for reuse or Owner's retention.
5. Protection of items designated to remain.
6. Removal and disposal of demolished materials.

B. Related Sections:

1. Section 017419 - Construction Waste Managment and Disposal.
2. Section 070150 - Maintenance of Roofing.
3. Section 033000 - Cast in Place Concrete.

1.2 SUBMITTALS

A. Refer to Section 013300 - Submittal Procedures, for submittal requirements and procedures.

B. Demolition Plan: Submit a Demolition Plan that generally describes the sequence of demolition work and a brief description of activities. Revise as necessary after review by A/E and Owner. Do not proceed until approved plan is received.

C. Project Record Documents: Accurately record actual locations of capped utilities, surface obstructions and abandoned items. Submit this information with the project record documents (as-builts) per Section 017800.

D. Shop Drawings:

1. Phasing of demolition work.
2. Indicate location and construction of barricades, fences, and temporary work.

E. Existing Building Documentation: Submit a photographic survey indicating conditions before, during, and after demolition work.

F. When existing conditions are discovered that differ from what is shown on the construction documents, a description and/or detailed drawings of the actual existing conditions need to be submitted to the Architect/Engineer immediately in a form that clearly shows the differences and locations. Approval will be required to continue work on these areas.

1.3 SITE CONDITIONS

A. Maintenance of Services: Locate, protect, support, and maintain uninterrupted all utilities, equipment, services, and Owner's property within the limits of the Work.

1.4 QUALITY ASSURANCE

A. Conform to applicable code for demolition work, dust control, products requiring electrical disconnection and re-connection.

B. Use trained, qualified workers for demolition work, dust control, electrical disconnection and re-connection, and removal of items to be salvaged.

C. Conform to all State and local regulations for notification and handling procedures when hazardous or contaminated materials are discovered. Notify A/E and Owner and obtain direction to proceed.

D. Perform Work in accordance with State and local ordinances.

1.5 LIFE SAFETY PROVISIONS

A. No enclosure, shield or protective covering shall interfere with the use of an existing emergency exit at any time, unless a temporary exit is substituted and approved by the local Authority Having Jurisdiction (AHJ).

B. Maintain fully charged, certified (inspected and approved), compliant fire extinguishers and hose racks, as required by the AHJ, readily available during demolition operations.

C. Post "NO SMOKING" signs and enforce this precaution within the structure and within the AHJ required distance from the structure.

D. Instruct demolition personnel in fire safety and fire drill policies appropriate for the areas where demolition operations occur.

E. Deployment, disposition, administration and implementation of any and all safety measures are the sole responsibility of the Contractor.

1.6 SCHEDULING

A. Section 013216 - Construction Progress Schedule.

B. Schedule Work to precede new construction whenever possible.

C. Cooperate with Owner in scheduling noisy operations and waste removal that may impact Owners operation and activities in adjoining spaces.

D. Perform noisy, malodorous, or dusty work:

1. Between hours of 7:00 a.m. and 6:00 p.m.

2. On following days: Monday through Friday.

E. Coordinate utility and building service interruptions with Owner.

1. Do not disable or disrupt building fire or life safety systems without three days prior written notice to Owner and AHJ.

2. Schedule tie-ins to existing systems to minimize disruption.

3. Coordinate Work to ensure fire sprinklers, fire alarms, smoke detectors, emergency lighting, exit signs and other life safety systems remain in full operation in occupied areas.

1.7 QUALIFICATIONS

A. Demolition Firm: Company specializing in performing work of this section with minimum five years documented experience on projects of similar size, complexity and scope.

1.8 PRE-DEMOLITION MEETINGS

A. Section 013119 - Project Meetings.

B. Convene minimum one week prior to commencing work of this section.

C. Review with Owner's Representative the Demolition Schedule. Discuss closures, shutdowns and operational impacts.

1.9 PROJECT CONDITIONS

A. The Contractor is responsible for the safety of his workmen and shall follow all WISHA rules and regulations. The Contractor shall provide respirators when recommended or required.

B. Conduct demolition to minimize interference with occupied building areas and adjacent buildings that are to remain in operation.

C. Notify Architect/Engineer immediately if existing conditions differ from shown on construction documents.

PART 2 PRODUCTS

2.1 NOT USED

PART 3 EXECUTION

3.1 EXAMINATION

A. Examine existing portions of work indicated to be demolished before demolition.

B. Verify hazardous material abatement is complete before beginning demolition.

3.2 PREPARATION

A. Call Local Utility Line Information service not less than three working days before performing Work.

1. Request underground utilities to be located and marked within and surrounding construction areas.

B. Before beginning selective demolition activities: Provide, erect, and maintain temporary barriers, safety and security devices, including warning signs and lights, and similar measures, for protection of the public, Owner and existing improvements indicated to remain. Erect temporary fences, overhead covers, temporary walkways, enclosed passageways, guard rails, chutes, etc. to protect personnel, construction, equipment and furnishings.

C. Erect and maintain weatherproof closures for exterior openings.

D. Protect existing items indicated to remain. Any collateral damage to or destruction of portions of the existing: structure, materials, equipment or systems shall be repaired and/or replaced by the Contractor at his expense.

E. Provide appropriate temporary signage including signage for exit or building egress.

3.3 DEMOLITION REQUIREMENTS

A. Remove all existing structure, materials, equipment and systems as necessary to obtain access for installation of new materials and systems scheduled or indicated on the drawings, whether specifically intended or not. Remove such existing ceilings, floors (flooring), walls, finish materials or equipment as required as part of the demolition work. Restore such surfaces, if indicated to remain, after demolition work is completed.

B. Perform demolition in an orderly and careful manner. Protect existing supporting structural members and finishes.

C. Disconnect and remove designated utilities within demolition areas.

D. Cap and identify abandoned utilities at termination points when utility is not completely removed. Annotate Record Drawings indicating location and type of service for capped utilities remaining after demolition.

E. Concrete Demolition:

1. Concrete flatwork shall be cut at its limits in a straight line full depth of the slab or wall with a saw. All concrete pieces shall be removed and disposed off site in a legal manner at an approved dumpsite.

F. Holes required through existing stud walls, concrete or masonry construction, to accommodate new electrical conduits, shall be considered to be “cutting and patching” and shall be provided as specified in Section 017329 and Division 26 - Electrical.

G. Holes required through concrete or masonry work, required for structural purposes, shall be neatly core drilled at sizes and location as approved by the A/E and in accordance with the details on the Drawings.

H. Burning:

1. The use of burning at the project site for the disposal of refuse and debris shall not be permitted. Remove demolished materials from the site except where specifically noted otherwise.

I. Adjacent Structures and occupants:

1. Conduct demolition to minimize interference with adjacent structures and occupancies.

2. Conduct operations with minimum interference to public or private accesses to occupied adjacent structures. Maintain protected egress and access from adjacent structures at all times.

J. Use of Explosives:

1. Use of explosives shall not be permitted.

3.4 OWNER HAS "FIRST RIGHT OF REFUSAL" OF ALL ITEMS.

A. Owner reserves right to salvage items. Coordinate with Owner. Remaining unused demolition from building and site is Contractor's property. Remove from site and dispose of in legal manner.

B. Coordinate with Owner to identify building components and equipment required to be removed and delivered to Owner’s local storage location.

C. Protect designated salvage items from demolition operations until items can be removed.

D. Carefully remove building components and equipment indicated to be salvaged. Remove materials, to be reinstalled or retained, in a manner to prevent damage. Store and protect until reinstallation.

E. Deliver salvaged items to Owner and obtain signed receipt.

3.5 CLEANING

A. Continuous clean-up and remove demolished materials from site. Do not allow demolished materials not indicated to be salvaged or incorporated into the work to accumulate on the site.

B. Refer to Section 017419 - Cleaning and Waste Management for segregation of materials and recycling requirements. Haul away all remaining materials and dispose of legally. Upon completion of Work, leave areas in clean condition.

3.6 SALVAGE SCHEDULE

A. Owner reserves right to salvage items. Coordinate with Owner. Remaining unused demolition from building and site is Contractor's property. Remove from site and dispose of in legal manner.

B. Protect the materials and equipment remaining:

1. For the continued occupation for the rest of the Library throughout the duration of constructionas indicated in 011000 - Summary.

2. That are indicated for contiuned use in the construction of the renovation spece.

3. As indicated on drawings.

C. Demolish the following materials and equipment:

1. The items indicatied on drawings.

2. Unused items with no apparent purpose as approved by the Architect or Owner.

D. List of salvaged items:

1. Glass marker boards.

2. Casework.

END OF SECTION 024119

DIVISION 03

CONCRETE

PART 1 GENERAL

1.1 SUMMARY

A. Section Includes:

1. Concrete reinforcement repair.
2. Concrete surface repair.
3. Concrete crack repair.

B. Related Sections:

1. Section 032000 - Concrete Reinforcing.
2. Section 033000 - Cast-In-Place Concrete.
3. Section 033500 - Concrete Curing and finishing.
4. Section 035400 - Cast Underlayment.

1.2 REFERENCES

A. ASTM International:

1. ASTM A1064/A1064M - Standard Specification for Carbon Steel Wire and Welded Wire Reinforcement, Plain and Deformed, for Concrete.
2. ASTM A615/A615M - Standard Specification for Deformed and Plain-Steel Bars for Concrete Reinforcement.
3. ASTM C33/C33M - Standard Specification for Concrete Aggregates.
4. ASTM C109/C109M - Standard Test Method for Compressive strength of Hydraulic Cement Mortars (Using 2 in. (50 mm) Cube Specimens).
5. ASTM C150/C150M - Standard Specification for Portland Cement.
6. ASTM C293/C293M - Standard Test Method for Flexural Strength of Concrete (Using Simple Beam With Center-Point Loading).
7. ASTM C882/C882M - Standard Test Method for Bond Strength of Epoxy-Resin Systems Used With Concrete By Slant Shear.
8. ASTM D570 - Standard Test Method for Water Absorption of Plastics
9. ASTM D638 - Standard Test Method for Tensile Properties of Plastics.
10. ASTM D695 - Standard Test Method for Compressive Properties of Rigid Plastics.

11. ASTM D790 - Standard Test Methods for Flexural Properties of Unreinforced and Reinforced Plastics and Electrical Insulating Materials.

B. American Welding Society:

1. AWS D1.4 - Structural Welding Code - Reinforcing Steel.

1.3 SUBMITTALS

A. Section 013300 - Submittal Procedures: Submittal procedures.

B. Product Data: Submit product standards, physical and chemical characteristics, technical specifications, limitations, maintenance instructions, and general recommendations regarding each material.

C. Samples: Submit two color samples for patches exposed to view in finished construction and required to match existing.

D. Manufacturer’s Instructions: Submit mixing instructions.

E. Manufacturer's Certificate: Certify Products meet or exceed specified requirements.

F. Sustainable Design Submittals:

1. Sustainability Submittal Requirements: Refer to Section 018113 - Sustainable Project Requirements for submittals required by this Section to meet the sustainability goals for this Project.

G. Closeout Submittals

1. Section 017000 - Execution and Closeout Requirements: Closeout procedures.

2. Project Record Documents: Accurately record actual locations of structural reinforcement repairs and type of repair.

3. Operation and Maintenance Data: Procedures for submittals.

1.4 QUALITY ASSURANCE

A. Perform Work in accordance with ACI 301.

B. Perform welding work in accordance with AWS D1.4.

C. Qualifications

1. Manufacturer: Company specializing in manufacturing products specified in this section with minimum three years documented experience.

2. Design reinforcement splices under direct supervision of Professional Engineer experienced in design of this Work and licensed at Project location.

3. Applicator: Company specializing in concrete repair with minimum 3 years documented experience approved by manufacturer.

D. Mock-Up

1. Section 014000 - Quality Requirements: Requirements for mockup.

2. Construct mockup panel illustrating patching method, color and texture of repair surface.

3. Prepare one mockup of each type of injection and patching procedure.

4. Locate where directed by Architect/Engineer or indicated on Drawings.

5. Incorporate accepted mockup as part of Work.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Section 016000 - Product Requirements: Product storage and handling requirements.

B. Comply with instructions for storage, shelf life limitations and handling.

PART 2 PRODUCTS

2.1 EPOXY MATERIALS

A. Acceptable Manufacturers:

1. MBCC Group, Master Builders Solutions.

2. Dayton Superior Corporation.

3. The Euclid Chemical Company.

4. Sika Construction Products.

5. Laticrete L&M Construction Chemical.

6. Simpson Strong Tie.

7. Hilti.

8. GCP Applied Technologies.

9. Substitutions: Section 012500 - Substitution Procedures.

B. Concrete Repair Epoxy Adhesive: Two-part epoxy adhesive containing 100 percent solids, 100 percent reactive compound suitable for use on dry or damp surfaces, meeting the following minimum characteristics:

Characteristic	Test Method	Results

Bond Strength	ASTM C882	2,500 psi
Tensile Strength	ASTM D638	4,400 psi
Elongation	ASTM D638	2 percent at 7 days 70 degrees F
Flexural Strength	ASTM D790	6,700 psi
Compressive Strength	ASTM D695	6,500 psi
Water Absorption	ASTM D570	2% maximum

C. Concrete Repair Epoxy Bonding Resin: Two-part epoxy resin containing 100 percent solids, meeting the following minimum characteristics:

D. Aggregate: Type recommended by mortar manufacturer.

2.2 CEMENTITIOUS MORTAR MATERIALS

A. Acceptable Manufacturers:

1. MBCC Group, Master Builders Solutions.
2. Dayton Superior Corporation.
3. The Euclid Chemical Company.
4. Sika Construction Products.
5. Laticrete L&M Construction Chemical.
6. Simpson Strong Tie.
7. GCP Applied Technologies.
8. Hilti.
9. Substitutions: Section 012500 - Substitution Procedures

B. Cementitious Mortar: Packaged latex modified silica fume enhanced Portland cement patching mortar with the following properties:

1. Compressive Strength: ASTM C109/C109M; minimum 2,000 psi (13.8 MPa) after one day and 4,000 psi (27.6 MPa) after 28 days.
2. Bond Strength: ASTM C882; minimum 2,200 psi (15.2 MPa) after 28 days.
3. Flexural Strength; ASTM C293; minimum 1,500 psi (10.3 MPa) after 28 days.

C. Aggregate: Type recommended by mortar manufacturer.

2.3 RELATED MATERIALS

A. Cast Underlayment: Refer to Section 035400.

B. Bonding Agent: As recommended by topping product manufacturer.

C. Bonding Agent for Concrete-to-Concrete: Refer to Section 033000 - Cast-in-Place Concrete.

D. Refer to Section 033000 - Cast-in-Place Concrete for additional related materials.

E. Portland Cement: ASTM C150.

F. Sand: ASTM C33; uniformly graded, clean.

G. Water: Clean and potable.

H. Calcium Chloride: Not permitted.

2.4 REINFORCEMENT MATERIALS

A. Refer to Section 032000 - Concrete Reinforcing.

PART 3 EXECUTION

3.1 EXAMINATION

A. Section 013100 - Project Management and Coordination.

B. Verify surfaces are ready to receive work.

C. Beginning of installation means acceptance of substrate.

3.2 PREPARATION

A. Clean concrete surfaces of dirt, laitance, corrosion, or other contamination; wire brush using cleaning agent recommended by product manufacturer rinse surface and allow to dry.

B. Flush out cracks and voids with agent recommended by product manufacturer to remove laitance and dirt. Chemically neutralize by rinsing with water.

C. For areas repaired using the injection method: Provide temporary entry ports spaced to accomplish movement of fluids between ports; no deeper than depth of crack to be filled or port size diameter no greater than thickness of crack. Provide temporary seal at concrete surface to prevent leakage of adhesive.

D. For areas patched with epoxy mortar: Remove broken and soft concrete as recommended by product manufacturer. Remove corrosion from steel. Clean surfaces mechanically; wash with agent recommended by product manufacturer; rinse with water.

E. Sandblast clean exposed reinforcement steel surfaces. Mechanically cut away damaged portions of bar.

3.3 REPAIR WORK

A. Repair reinforcement by welding new bar reinforcement to existing reinforcement with sleeve splices. Strength of welded splices and reinforcement to exceed original stress values.

B. Repair exposed structural, shrinkage, and settlement cracks of concrete by epoxy injection, epoxy application or bonding agent and cementitious paste method.

C. Repair spalling. Fill voids flush with surface. Apply surface finish.

3.4 MIXING EPOXY MORTAR

A. Mix epoxy mortars to consistency for purpose intended, as recommended by the manufacturer.

B. Mix components in clean equipment or containers. Conform to pot life and workability limits.

3.5 MIXING CEMENTITIOUS MORTAR

A. Mix cementitious mortar to consistency required for purpose intended, as recommended by the manufacturer.

B. Provide bonding agent as additive to mix as recommended by the mortar manufacturer. Use manufacturers approved bonding agent.

3.6 INJECTION - EPOXY RESIN

A. Inject epoxy resin adhesive into prepared ports under pressure using equipment appropriate for particular application per manufacturer’s written instructions.

B. Begin injection at lower entry port and continue until adhesive appears in adjacent entry port. Continue from port to port until entire crack is filled.

C. Remove temporary seal and excess adhesive.

D. Clean surfaces adjacent to repair and blend finish.

3.7 APPLICATION - EPOXY MORTAR

A. Apply product per manufacturer’s written instructions.

B. Trowel apply mortar mix to average thickness not to exceed mortar manufacturer’s recommendations. Tamp into place filling voids at spalled areas.

C. For patching honeycomb, trowel mortar onto surface, work mortar into honeycomb to bring surface flush with surrounding area. Finish trowel surface to match surrounding area.

D. Cover exposed steel reinforcement with epoxy mortar, feather edges to flush surface.

3.8 APPLICATION - CEMENTITIOUS MORTAR

A. Apply product per manufacturer's written instructions.

B. Apply coating of bonding agent to concrete surfaces as recommended by manufacturer. Provide full surface coverage.

C. Apply cementitious mortar by steel trowel to average thickness not to exceed mortar manufacturer's recommendations. Tamp into place filling voids at spalled areas. Work mix into honeycomb.

D. Damp cure cementitious mortar as recommended by mortar manufacturer.

3.9 FIELD QUALITY CONTROL

A. Section 014000 - Quality Requirements: Testing, inspection and analysis requirements.

END OF SECTION 030100

PART 1 GENERAL

1.1 SUMMARY

A. Section Includes:

1. Formwork for cast-in place concrete.
2. Shoring, bracing, and anchorage.
3. Form accessories.
4. Form stripping.
5. Waterstops.
6. Bolts and anchors.

B. Related Sections:

1. Section 030100 - Concrete Repair.
2. Section 032000 - Concrete Reinforcing.
3. Section 033000 - Cast-In-Place Concrete.
4. Section 033500 - Concrete Curing and Finishing.
5. Section 055000 - Metal Fabrications: Product requirements for metal fabrications for placement by this Section.
6. Section 072600 - Vapor Retarders
7. Section 076200 - Sheet Metal Flashing and Trim: Product requirements for flashing reglets for placement by this Section.
8. Division 22- Product requirements for mechanical items for placement by this Section.
9. Division 26- Product requirements for electrical items for placement by this Section.

1.2 REFERENCES

A. American Concrete Institute:

1. ACI 117 - Standard Specifications for Tolerances for Concrete Construction and Materials.
2. ACI 301 - Specifications for Structural Concrete.
3. ACI 318 - Building Code Requirements for Structural Concrete.

4. ACI 347 - Guide to Formwork for Concrete.

B. American Forest and Paper Association:

1. AF&PA - National Design Specifications for Wood Construction.

C. The Engineered Wood Association:

1. APA/EWA PS 1 - Voluntary Product Standard for Construction and Industrial Plywood.

D. American Society of Mechanical Engineers:

1. ASME A17.1 - Safety Code for Elevators and Escalators.

E. ASTM International:

1. ASTM D1751 - Standard Specification for Preformed Expansion Joint Filler for Concrete Paving and Structural Construction (Non-extruding and Resilient Bituminous Types).

2. ASTM E96/E96M - Standard Test Methods for Water Vapor Transmission of Materials.

F. West Coast Lumber Inspection Bureau:

1. WCLIB - Standard Grading Rules for West Coast Lumber.

1.3 SUBMITTALS

A. Section 013300 - Submittal Procedures: Requirements for submittals.

B. Product data for proprietary materials and items, including forming accessories, waterstops, and other as requested Architect.

C. Submit ICC reports for each product where ICC approval is required.

D. Delegated Design Submittals Data: Signed and sealed by professional engineer.

1. Indicate design data for formwork, shoring, and re-shores.

2. Indicate loads transferred to structure during process of concreting, shoring and reshoring.

3. Include structural calculations to support design.

E. Adhesive Anchor Installer certification by the ACI-CRSI Adhesive Anchor Installation Certification Program when installation by certified installer is required, refer to part 3 below.

1.4 QUALITY ASSURANCE

A. Perform Work in accordance with ACI 301.

B. For wood products furnished for work of this Section, comply with APA/EWA or AF&PA.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Section 016000 - Product Requirements: Products storage and handling requirements.

B. Store off ground in ventilated and protected manner to prevent deterioration from moisture.

1.6 COORDINATION

A. Section 01310 - Project Management and Coordination: Coordination and project conditions.

B. Coordinate this Section with other sections of work, requiring attachment of components to formwork.

PART 2 PRODUCTS

2.1 PERFORMANCE AND DESIGN CRITERIA

A. Design, engineer, and construct formwork, shoring, and bracing according to ACI 318 to conform to design and applicable code requirements to achieve concrete shape, line, and dimension as indicated on Drawings.

2.2 FORM MATERIALS

A. Form Materials for Unexposed Surfaces: At discretion of Contractor. Where waterproofing is required, surface roughness must be compatible with waterproofing manufacture's requirements.

B. Form Material for Exposed Surfaces: Overlay Plywood.

1. Forms: Conform to PS 1; AC or BB high density overlaid concrete form, Class 1; full size 4 x 8 feet panels; each panel labeled with grade trademark of APA/EWA.

2. Plywood for Surfaces to Receive Membrane Waterproofing: Minimum of 5/8 inch thick; APA/EWA "B-B Plyform Structural I Exterior" grade.

3. Plywood where "Smooth Finish" is required, as indicated on Drawings: APA/EWA "HD Overlay Plyform Structural I Exterior" grade, minimum of 3/4 inch thick.

C. Forms for Cylindrical Columns and Supports: Metal, fiberglass reinforced plastic, or paper or fiber tubes. Construct paper or fiber tubes of laminated plies using water-resistant adhesive with wax-impregnated exterior for weather and moisture protection. Provide units with sufficient wall thickness to resist loads imposed by wet concrete without deformation. Columns exposed to view to have smooth surface, (no barber pole).

D. Material for formwork and shoring which is to be left in place: Non-organic material only. At the discretion of the Architect. Void cannot be filled.

2.3 PREFABRICATED FORMS

A. Preformed Steel Forms: Minimum 16 gauge matched, tight fitting, stiffened to support weight of concrete without deflection detrimental to tolerances and appearance of finished surfaces.

B. Glass Fiber Fabric Reinforced Plastic Forms: Matched, tight fitting, stiffened to support weight of concrete without deflection detrimental to tolerances and appearance of finished concrete surfaces.

C. Pan Type: Steel or Glass fiber of size and profile required.

D. Tubular Column Type: Round, surface treated with release agent, non-reusable, sizes as indicated on Drawings Metal, fiberglass reinforced plastic, or paper or fiber tubes. Construct paper or fiber tubes of laminated plies using water-resistant adhesive with wax-impregnated exterior for weather and moisture protection. Provide units with sufficient wall thickness to resist loads imposed by wet concrete without deformation. Columns exposed to view to have smooth surface, (no barber pole).

E. Steel Forms: Sheet steel, suitably reinforced and designed for particular use indicated on Drawings.

1. Framing, Studding and Bracing: Stud or No. 3 structural light framing grade.

2.4 FORMWORK ACCESSORIES

A. Form Ties:

1. Not Exposed Condition: Carbon steel wire snap-off type, adjustable length, 1" x 1" plastic cone type, 1" break back dimension, free of defects that could leave holes larger than 1 1/4" in concrete surface.

B. Spreaders: Standard, non-corrosive metal form clamp assembly, of type acting as spreaders and leaving no metal within 1 inch (25 mm) of concrete face. Wire ties, wood spreaders or through bolts are not permitted.

C. Form Anchors and Hangers:

1. Do not use anchors and hangers exposed concrete leaving exposed metal at concrete surface.

2. Symmetrically arrange hangers supporting forms from structural steel members to minimize twisting or rotation of member.

3. Penetration of structural steel members is not permitted.

D. Form Release Agent: Compound that will not stain concrete, or absorb moisture or impair natural bonding or color characteristics of coating intended for use on concrete. Meets maximum VOC content of 100 g/L for Form Release Compounds as required by the SCAQMD 1113.

E. Corners: Chamfer, 3/4 inch x 3/4 inch (19 mm x 19 mm) unless noted otherwise; maximum possible lengths.

F. Flashing Reglets: Galvanized steel, 22 gauge thick, longest possible lengths, with alignment splines for joints, release tape sealed slots, anchors for securing to concrete formwork. Surface applied reglets are not allowed.

1. Acceptable Manufacturers:

a. Fry Reglet “CO” concrete reglet, 26 gauge galvanized steel.

b. Substitutions: Section 012500 - Substitution Procedures.

G. Vapor Retarder: Refer to Section 072600.

H. Bituminous Joint Filler: ASTM D1751.

I. Nails, Spikes, Lag Bolts, Through Bolts, Anchorages: Size, strength and character to maintain formwork in place while placing concrete.

J. Keyways shall be formed using wood or removable plastic or metal preformed units to sizes indicated.

2.5 CONCRETE ACCESSORIES

A. Waterstops:

1. Type 1: Self expanding waterstop embedded in concrete and spanning control, expansion, and/or construction joints with sealant recommended by waterstop manufacturer.

a. Acceptable Manufacturers:

1) Sika Greenstreak; Hydrotite CJ.

2) GCP Applied Technologies; Adcor ES.

3) Substitutions under provisions of Section 012500 - Substitution Procedures.

2. Type 2: Self expanding waterstop used in non moving joints with sealant recommended by waterstop manufacturer.

a. Acceptable Manufacturers:

1) Sika Greenstreak Swellstop.

2) Cetco; Waterstop - RX.

3) Substitutions under provisions of Section 012500 - Substitution Procedures.

B. Grout Anchor Sleeves: Galvanized P.T. duct with .05 inch wall thickness to sizes indicated.

C. Bearing Pads: Reinforced rubber elastomer pad per:

1. Acceptable Manufacturers:

a. JVI, Inc.; Masticord

b. Fabreeka Product Co.; Fabreeka Bearings

c. Substitutions under provisions of Section 012500 - Substitution Procedures.

D. Sliding Bearing Pads: Assembly consisting of upper and lower sliding element of PTFE bonded to steel plates. Lower element to be bonded to reinforced rubber elastomer pad.

1. Acceptable Manufacturers:

a. JVI, Inc.; Dynalon.

b. Fabreeka Product Co.; Fabreeka Bearings

c. Substitutions under provisions of Section 012500 - Substitution Procedures.

E. Adhesive Anchor: Two-part, self-mixing, cartridge type epoxy adhesive for anchoring thread rebar and all thread rod.

1. Acceptable Manufacturers:

a. DeWalt, “Pure110+”

b. Hilti; "Hit-RE 500-V3" or "Hit HY-200V3"

c. Use subject to approval by ICC

d. For applications in temperatures below what is set by the Manufacturer use Cold Weather Adhesive Anchor per manufacturers requirements.

e. Substitutions under provisions of Section 012500 - Substitution Procedures.

F. Cold Weather Adhesive Anchor

1. Acceptable Manufacturers:

a. Hilti; Hit-Ice.

b. DeWalt; AC100+Gold (CMU)

c. DeWalt “AC200+”

d. Use subject to approval by ICC

e. Substitutions under provisions of Section 012500 - Substitution Procedures.

G. Expansion Bolts:

1. Acceptable Manufacturers:

a. Simpson Strong Tie Co.; Strong-Bolt 2

b. DeWalt - Power-Stud + SD2

c. Hilti; Kwik Bolts KH-EZ.

d. Use subject to approval by ICC

e. Substitutions under provisions of Section 012500 - Substitution Procedures.

H. Screw Anchors (1 piece carbon steel threaded bolt for concrete):

1. Acceptable Manufacturers:

a. Simpson Strong Tie-Co.; Titen HD.

b. DeWalt Screw Bolt+.

c. DeWalt, Snake+.

d. Hilti, Inc.; HUS-HR.

e. Substitutions under provisions of Section 012500 - Substitution Procedures.

PART 3 EXECUTION

3.1 EXAMINATION

A. Verify site conditions under provisions of Section 013100 - Project Management and Coordination. Ensure that dimensions agree with drawings.

B. Verify lines, levels, and centers before proceeding with formwork. Verify dimensions agree with Drawings.

C. When formwork is placed after reinforcement resulting in insufficient concrete cover over reinforcement before proceeding, request instructions from Architect/Engineer.

3.2 INSTALLATION

A. Earth Forms:

1. Earth forms are permitted at bottom of sloped footings at change of level only and only if soil on sides is firm.

2. Hand trim sides and bottom of earth forms. Remove loose soil prior to placing concrete.

3. Verify locations with Structural Engineer and Geotechnical Engineer.

B. Provide bracing to ensure stability of formwork. Shore or strengthen formwork subject to overstressing by construction loads.

C. Do not reuse formwork that will perform less well than new. Do not patch formwork.

D. Arrange and assemble formwork to permit dismantling and stripping. Do not damage concrete during stripping. Permit removal of remaining principal shores.

E. Align joints and make watertight. Keep form joints to a minimum.

F. Obtain approval from Architect before framing openings in structural members which are not indicated on Drawings.

G. Provide chamfer strips on external corners of all exposed to view concrete.

H. Inspect erected formwork, shoring, and bracing to ensure that work is in accordance with formwork design, and that supports, fastenings, wedges, ties, and items are secure.

I. Formwork - General:

1. Provide top form for sloped surfaces steeper than 1.5 horizontal to 1 vertical to hold shape of concrete during placement, unless it can be demonstrated that top forms can be omitted.

2. Construct forms to correct shape and dimensions, mortar-tight, braced, and of sufficient strength to maintain shape and position under imposed loads from construction operations.

3. Camber forms where necessary to produce level finished soffits unless otherwise shown on Drawings.

4. Carefully verify horizontal and vertical positions of forms. Correct misaligned or misplaced forms before placing concrete.

5. Complete wedging and bracing before placing concrete.

J. Forms for Smooth Finish Concrete:

1. Use steel, plywood or lined board forms.

2. Use clean and smooth plywood and form liners, uniform in size and free from surface and edge damage capable of affecting resulting concrete finish.

3. Install form lining with close-fitting square joints between separate sheets without springing into place.

4. Use full size sheets of form lines and plywood wherever possible.

5. Tape joints to prevent protrusions in concrete.

6. Use care in forming and stripping wood forms to protect corners and edges.

7. Level and continue horizontal joints.

8. Keep wood forms wet until stripped.

K. Forms for Surfaces to Receive Membrane Waterproofing: Use plywood or steel forms. After erection of forms, tape form joints to prevent protrusions in concrete.

L. Framing, Studding and Bracing:

1. Size framing, bracing, centering, and supporting members with sufficient strength to maintain shape and position under imposed loads from construction operations.

2. Distribute bracing loads over base area on which bracing is erected.

3. When placed on ground, protect against undermining, settlement or accidental impact.

M. Erect formwork, shoring, and bracing to achieve design requirements, in accordance with requirements of ACI 301.

N. Arrange and assemble formwork to permit dismantling and stripping. Do not damage concrete during stripping. Permit removal of remaining principal shores.

3.3 APPLICATION - FORM RELEASE AGENT

A. Apply form release agent on formwork in accordance with manufacturer's recommendations.

B. Apply prior to placement of reinforcing steel, anchoring devices and embedded items.

C. Do not apply form release agent to formwork which is to be left in place or where concrete surfaces are indicated to receive special finishes or applied coverings that could be affected by agent. Soak inside surfaces of untreated forms with clean water. Keep surfaces coated prior to placement of concrete.

D. Reuse and Coating of Forms: Thoroughly clean forms and reapply form coating before each reuse. For exposed work, do not reuse forms with damaged faces or edges. Apply form coating to forms in accordance with manufacturer’s specifications. Do not coat forms for concrete indicated to receive “scored finish”. Apply form coatings before placing reinforcing steel.

3.4 INSTALLATION - ACCESSORIES, INSERTS, EMBEDDED PARTS AND OPENINGS

A. Provide formed openings where required for items to be embedded in or passing through concrete work. Provide temporary access pockets for vibrating concrete at wide opening sills.

B. Locate and set in place items required to be cast directly into concrete. Use templates to hold anchor rods in place during concrete placement.

C. Coordinate with Work of other sections in forming and placing openings, slots, reglets, recesses, chases, sleeves, bolts, anchors, other inserts and components of other Work.

D. Install accessories in accordance with manufacturer's instructions, straight, level, and plumb. Ensure items are not disturbed during concrete placement.

E. Install waterstops continuous per manufacturer's requirements and as shown without displacing reinforcement. Seal joints watertight to waterstop manufacturer’s recommendations.

F. Provide temporary ports or openings in formwork where required to facilitate cleaning and inspection. Locate openings at bottom of forms to allow flushing water to drain.

G. Close temporary openings with tight fitting panels, flush with inside face of forms, and neatly fitted so joints will not be apparent in exposed concrete surfaces.

H. Form Ties:

1. Use sufficient strength and sufficient quantity to prevent spreading of forms.

2. Place ties at least 1 inch (25 mm) away from finished surface of concrete unless noted otherwise.

3. Leave inner rods in concrete when forms are stripped.

4. Space form ties equidistant, symmetrical and aligned vertically and horizontally unless otherwise shown on Drawings.

5. When architecturally exposed ties are used, assure the pattern and style are as detailed on the drawings.

I. Construction Joints:

1. Install surfaced pouring strip where construction joints intersect exposed surfaces to provide straight line at joints.

2. Just prior to subsequent concrete placement, remove strip and tighten forms to conceal shrinkage.

3. Show no overlapping of construction joints. Construct joints to present same appearance as butted plywood joints.

4. Arrange joints in continuous line straight, true and sharp.

J. Embedded Items:

1. Make provisions for pipes, sleeves, anchors, inserts, reglets, anchor slots, nailers, waterstops, and other features.

2. Do not embed wood or uncoated aluminum in concrete. Obtain installation and setting information for embedded items furnished under other Specification sections.

3. Securely anchor embedded items in correct location and alignment prior to placing concrete.

4. Verify conduits and pipes, including those made of coated aluminum, meet requirements of ACI 318 for size and location limitations.

K. Screeds:

1. Set screeds and establish levels for tops of concrete slabs and levels for finish on slabs.

2. Slope slabs to drain where required or as shown on Drawings.

3. Before depositing concrete, remove debris from space to be occupied by concrete and thoroughly wet forms. Remove freestanding water.

L. Screed Supports:

1. For concrete over waterproof membranes and vapor retarder membranes, use cradle, pad or base type screed supports which shall not puncture the membrane.

2. Staking through membrane is not permitted.

M. Cleanouts and Access Panels:

1. Provide removable cleanout sections or access panels at bottoms of forms to permit inspection and effective cleaning of loose dirt, debris and waste material.

2. Clean forms and surfaces against which concrete is to be placed. Remove chips, saw dust and other debris. Thoroughly blow out forms with compressed air just before concrete is placed.

N. Install dowels, rebar, threaded or smooth steel dowels and all thread rebar, size and spacing to match reinforcing in adhesive anchor per manufacturers requirements, and as shown on drawings. Holes must be blown out with air gun or vacuumed out per manufacturer’s requirements. Special inspection is required. Refer to general notes and special inspection drawing. See section 032000.

O. Adhesive anchors shall be installed by an Adhesive Anchor Installer certified by the ACI-CRSI Adhesive Anchor Installation Certification Program where installed in a horizontal or upwardly inclined position and where indicated in the plans as an “adhesive tension anchor.”

P. Unless indicated, separate slabs on grade from vertical surfaces with 3/8 inch thick, joint filler indicated in Section 033000. Extend joint filler from bottom of slab to within 1/4 inch of finished slab surface. Use joint sealer 3/8” wide by 1/4” deep to seal joint. Refer to Section 079200.

Q. Install joint devices in accordance with manufacturer's instructions. See section 033000.

R. Install joint covers in one piece longest practical length, when adjacent construction activity is complete.

S. Floor control joint device (e.g. zip strip) or Speed-E-Joint by W.R. Meadows, used as a floor crack inducer shall be used only in areas covered by finished flooring materials and shall not be used in areas either indoor or outdoor where exposed to view. See section 033000.

T. Install bearing pads per manufacturer's recommendations. Where steel plates are welded to imbeds, use the smallest diameter weld rod to minimize heat build-up so that PTFE bond will not be subject to more than 300ºF. Refer to Section 055000.

U. Install epoxy coated dowels where indicated on drawings. See Section 032000.

3.5 FORM CLEANING

A. Clean forms as erection proceeds, to remove foreign matter within forms.

B. Clean formed cavities of debris prior to placing concrete.

C. Flush with water or use compressed air to remove remaining foreign matter. Ensure that water and debris drain to exterior through clean-out ports.

D. During cold weather, remove ice and snow from within forms. Do not use de-icing salts. Do not use water to clean out forms, unless formwork and concrete construction proceed within heated enclosure. Use compressed air or other means to remove foreign matter.

3.6 FORM REMOVAL

A. Do not remove forms or bracing until concrete has gained sufficient strength to carry its own weight and imposed loads and after flatness/levelness has been approved.

B. Loosen forms carefully. Do not wedge pry bars, hammers or tools against finish concrete surfaces scheduled for exposure to view.

C. Store removed forms in manner that surfaces to be in contact with fresh concrete will not be damaged. Discard damaged forms.

D. Under ordinary conditions, formwork and supports shall remain in place for not less than the periods of time under schedule - Form Removal. These periods represent cumulative number of days or hours, not necessarily consecutive, during which the temperature of the air surrounding the concrete is above 50ºF. If high-early-strength concrete is used, these periods may be reduced as approved by the Architect. Conversely, if ambient temperatures remain below 50ºF or if retarding agents are used, then these periods shall be increased at the discretion of the Architect.

E. Forms and shoring in the formwork used to support the weight of concrete in beams, slabs and other structural members shall remain in place until the formwork for the supported member is allowed to be removed.

F. Before shore removal the strength to be attained by members carrying their own dead load shall be no less than 75% of the specified strength, f'c. Furthermore the contractor shall restrict construction live loading to 50% of the design live load.

3.7 CONCRETE CURING AND FINISHING

A. Cure concrete floors as specified in Section 033500 - Concrete Curing and Finishing.

B. For general concrete curing refer to ACI 308.1.

3.8 ERECTION TOLERANCES

A. Tolerances: Construct formwork to produce completed concrete surfaces within construction tolerances specified in ACI 117, except as otherwise indicated.

B. Construct and align formwork for elevator hoistway(s) in accordance with ASME A17.1.

C. Camber slabs and beams as indicated on drawings.

3.9 FIELD QUALITY CONTROL

A. Section 014000 - Quality Requirements: Field inspecting, testing, adjusting and balancing.

B. Inspect erected formwork, shoring, and bracing to ensure that work is in accordance with formwork design, and that supports, fastenings, wedges, ties, and items are secure.

C. Notify Architect/Engineer after placement of reinforcing steel in forms, but prior to placing concrete.

D. Schedule concrete placement to permit formwork inspection before placing concrete.

3.10 SCHEDULES - FORM REMOVAL

A. The following times represent a cumulative amount of time during which the temperature of the air surrounding the concrete is above 50° F;

1. Walls and column encasement: 12 hours.

2. Columns: 12 hours.

3. Sides of beams: 12 hours.

4. Beam soffits: Under 10 feet clear span between structural supports: 7 days.

5. Beam soffits: Over 10 feet clear span between structural supports: 14 days.

6. Precast floor panel infill: 4 days.

3.11 SCHEDULE - TESTING BY OWNER-FURNISHED TESTING LAB

A. Refer to Special Inspecting and Testing on Structural Drawings

3.12 SCHEDULES

A. Provide concrete as indicated and detailed on drawings.

END OF SECTION 031000

PART 1 GENERAL

1.1 SUMMARY

A. Section Includes:

1. Reinforcing bars.
2. Welded wire fabric.
3. Reinforcement accessories.

B. Related Sections:

1. Section 030100 - Concrete Repair.
2. Section 031000 - Concrete Forming and Accessories.
3. Section 033000 - Cast-In-Place Concrete.
4. Section 033500 - Concrete Curing and Finishing
5. Division 26 - Grounding and Bonding for Electrical Systems: Grounding concrete reinforcement.

1.2 REFERENCES

A. American Concrete Institute:

1. ACI 301 - Specifications for Structural Concrete.
2. ACI 318 - Building Code Requirements for Structural Concrete.
3. ACI 530.1 - Specifications for Masonry Structures.
4. ACI SP-66 - ACI Detailing Manual.

B. ASTM International:

1. ASTM A615/A615M - Standard Specification for Deformed and Plain Carbon Steel Bars for Concrete Reinforcement.
2. ASTM A706/A706M - Standard Specification for Deformed and Plain Low-Alloy Steel Bars for Concrete Reinforcement.
3. ASTM A767/A767M - Standard Specification for Zinc-Coated (Galvanized) Steel Bars for Concrete Reinforcement.
4. ASTM A780/A780M Standard Practice for Repair of Damaged and Uncoated Areas of Hot-Dip Galvanized Coatings.

5. ASTM A1064/A1064M - Standard Specification for Carbon-Steel Wire and Welded Wire Reinforcement, Plain and Deformed, for Concrete.

C. American Welding Society:

1. AWS D1.4 - Structural Welding Code - Reinforcing Steel.

D. Concrete Reinforcing Steel Institute:

1. CRSI - Manual of Standard Practice.

2. CRSI - Placing Reinforcing Bars.

1.3 SUBMITTALS

A. Section 013300 - Submittal Procedures: Submittal procedures.

B. Shop Drawings:

1. Indicate bar sizes, spacing, locations, and quantities of reinforcing steel [and welded wire fabric,] bending and cutting schedules and supporting and spacing devices for reinforcement and accessories in 1/4 inch minimum scale elevations and plans.

2. General Contractor and Subcontractor to review shop drawings and add all proposed openings to drawings before submitting to Architect.

C. Certificates: Submit AWS qualification certificate for welders employed on the Work.

D. Submit ICC reports for each product where ICC approval is required.

E. Manufacturer's Certificate: Certify Products meet or exceed specified requirements.

F. Submit request to use splices not shown on the project drawings.

G. Submit request to use mechanical splices not shown on the project drawings.

H. Submit request for placement of column dowels without the use of templates.

I. Submit request and procedure to field bend or straighten partially embedded reinforcement.

J. Submit description of reinforcement weld locations, weld procedures, and welder qualifications.

K. Submit proposed supports for coated reinforcement and uncoated reinforcement when it is necessary to move reinforcement beyond the specified placing tolerances to avoid interference with other reinforcement, conduits, or embedded items. Provide a submittal showing the resulting arrangement of reinforcement.

L. Submit request to heat and bend reinforcement when required.

M. Submit certified copies of mill test report of reinforcement materials analysis.

1.4 DELIVERY, STORAGE, AND HANDLING OF MATERIALS

A. Deliver, store, protect and handle products to site under provisions of Section 016000 - Product Requirements.

B. Store off ground in ventilated and protected manner to prevent deterioration from moisture.

1.5 QUALITY ASSURANCE

A. Perform Work in accordance with CRSI - Manual of Standard Practice and ACI 301.

B. Prepare shop drawings in accordance with ACI SP-66.

1.6 QUALIFICATIONS

A. Welders: AWS qualified within previous 6 months.

1.7 COORDINATION

A. Section 013100 - Project Management and Coordination and project conditions.

B. Coordinate with placement of formwork, formed openings and other Work.

C. All trades with openings in concrete or masonry are to show size and location of proposed openings on shop drawings before submitting drawings to Architect for approval.

D. Location of reinforcement takes precedence over that of work by other trades.

PART 2 PRODUCTS

2.1 REINFORCEMENT

A. Reinforcing Steel: As noted on the Structural Drawings.

B. Deformed Reinforcement: ASTM A615, 60 ksi yield grade, steel bars, unfinished.

C. Deformed and Plain Reinforcement: ASTM A706; 60 ksi yield strength, steel bars, unfinished where weldable rebar is required. Other grades as noted on drawings.

D. Plain Wire: ASTM A1064/A1064M; galvanized finish.

E. Welded Deformed Wire Fabric: ASTM A1064/A1064M; in flat sheets; unfinished.

F. Welded Plain Wire Fabric: ASTM A1064/A1064M; in flat sheets; unfinished.

G. All Thread Rebar: “Williams” Grade 75 meets or exceeds physical properties of ASTM A615.

H. Epoxy Coating: As noted on the Structural Drawings conforming to applicable ASTM Standard.

2.2 ACCESSORY MATERIALS

A. Tie Wire: As noted on the Structural Drawings, or patented system as approved.

B. Chairs, Bolsters, Bar Supports, Spacers: Sized and shaped for strength and support of reinforcement during concrete placement conditions, including CRSI "SBU" Type chairs or load bearing pads on bottom to prevent vapor retarder puncture.

C. Special Chairs, Bolsters, Bar Supports, Spacers Adjacent to Weather Exposed Concrete Surfaces: Plastic-coated steel, Plastic tipped steel or Stainless steel type; size and shape and spacing to maintain bars in required position.

D. Precast concrete block chairs to be made from 4000 psi concrete and have (2) 16 gauge tie wires cast in center.

E. Flanged Rebar Couplers (FRC): Williams Form Engineering Corp. C2D rebar flange coupler, Dayton-Superior D340 Taper Lock Flange Coupler, or approved equivalent. Provide in size to meet or exceed rebar capacity. System may be used as substitutions for dowel bars.

F. All Thread Rebar Couplers: Williams Form Engineering., Portland, OR (503) 285-4548.

G. Ferrule Loop Insert - “F-42" by Dayton Superior, size as indicated. Substitutions per specification Section 012500 - Substitution Procedures.

H. Bar Couplers: Provide ICC or IAPMO report.

1. HRC Xtender 500/510 Position Couplers.

2. Dayton Superior Bar Lock Couplers System.

3. Sizes as required.

4. Substitutions per specification section 012500 - Substitution Procedures.

I. Expansion Bolts: Refer to Section 031000 - Concrete Forming and Accessories.

J. Adhesive Anchors: Refer to Section 031000 - Concrete Forming and Accessories.

K. Screw Anchors: Refer to Section 031000 - Concrete Forming and Accessories.

L. Provide templates for placing column, footing anchor rods.

M. Welding electrodes of type complying with AWS Code as required for welding ASTM A706, grade 60 steel as applicable.

N. Threaded Dowels: Fabricate from ASTM A615 Grade 60 reinforcement steel threaded to fit expansion anchor furnished. Dowel to be one diameter size larger than continuous reinforcement size shown.

2.3 FABRICATION

A. Fabricate concrete reinforcement in accordance with CRSI Manual of Practice and ACI 318.

B. Form standard hooks for: 180 degree bends, 90 degree bend, stirrup and tie hooks, and seismic hooks as indicated on Drawings.

C. Form reinforcement bends with minimum diameters in accordance with ACI 318.

D. Weld reinforcement in accordance with AWS D1.4.

E. Locate reinforcement splices not indicated on Drawings, at point of minimum stress. Review location of splices with Engineer.

2.4 SHOP FINISHING

A. Galvanized Finish for Steel Bars: ASTM A767/A767M, Class I, hot dip galvanized after fabrication.

PART 3 EXECUTION

3.1 PLACEMENT

A. Refer to applicable Division 3 and 4 sections.

B. Place, support and secure reinforcement against displacement. Provide carrier bars as required to maintain position of bars. Do not deviate from required position beyond specified tolerance.

1. Do not weld crossing reinforcement bars for assembly.

C. Do not displace or damage vapor retarder.

D. Accommodate placement of formed openings.

E. Space reinforcement bars with minimum clear spacing in accordance with ACI 318.

1. Where bars are indicated in multiple layers, place upper bars directly above lower bars, unless noted otherwise.

F. Maintain concrete cover around reinforcement in accordance with ACI 318 and as noted on the drawings.

G. Call for special inspection. Concrete is not to be ordered for delivery until after formwork and reinforcement has been approved by the Special Inspector.

H. Splice reinforcing where indicated on Drawings in accordance with splicing device manufacturer’s instructions.

I. Epoxy coated bars that are field bent or damaged in the field shall be touched up with 2 brush coats of epoxy paint.

J. Galvanized rebar that are field bent, welded, or damaged in the field shall be touched up with 2 brush coats of organic, zinc rich paint, passing ASTM A780.

K. Bond and ground reinforcement in accordance with requirements of Division 26.

3.2 ERECTION TOLERANCES

A. Section 014000 - Quality Requirements: Tolerances.

B. Install reinforcement within the tolerances specified in ACI 301.

3.3 FIELD QUALITY CONTROL

A. Refer to applicable Divisions 03 and 04 sections.

B. Section 014000 - Quality Requirements and 017000 - Execution: Field inspecting, testing, adjusting and balancing.

C. Field inspection and testing will be performed by Testing Laboratory and Inspector employed by the Owner in accordance with applicable code.

D. Provide free access to Work and cooperate with appointed firm. See drawings S-011 & S-012.

E. Reinforcement Inspection: See drawings S-011 & S-012.

END OF SECTION 032000

PART 1 GENERAL

1.1 SUMMARY

A. Section Includes:

1. Foundation walls.
2. Slabs on grade.
3. Joint devices: Control, expansion and contraction.
4. Equipment pads.
5. Concrete Mix/Materials.
6. Admixtures.
7. Controlled Low Strength Material (CLSM, CDF and lean concrete)

B. Related Sections:

1. Section 030100 - Concrete Repair.
2. Section 031000 - Concrete Forming and Accessories.
3. Section 032000 - Concrete Reinforcing.
4. Section 033500 - Concrete Curing and Finishing.
5. Section 036000 - Grouting.
6. Section 055000 - Metal Fabrications: Supply of metal fabrications for placement by this Section.
7. Section 072600 - Vapor Retarders: Provide vapor retarders for placement by this Section.
8. Division 22 - Mechanical items for casting into concrete.
9. Division 26 - Electrical items for casting into concrete.

1.2 REFERENCES

A. American Concrete Institute:

1. ACI 301 - Specifications for Structural Concrete.
2. ACI 305.1 - Specification for Hot Weather Concreting.
3. ACI 306.1 - Standard Specification for Cold Weather Concreting.

4. ACI 308.1 - Standard Specification for Curing Concrete.

5. ACI 318 - Building Code Requirements for Structural Concrete.

B. ASTM International:

1. ASTM B221/B221M - Standard Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes.

2. ASTM C31/C31M - Standard Practice for Making and Curing Concrete Test Specimens in the Field.

3. ASTM C33 - Standard Specification for Concrete Aggregates.

4. ASTM C39/C39M - Standard Test Method for Compressive Strength of Cylindrical Concrete Specimens.

5. ASTM C42/C42M - Standard Test Method for Obtaining and Testing Drilled Cores and Sawed Beams of Concrete.

6. ASTM C94/C94M - Standard Specification for Ready-Mixed Concrete.

7. ASTM C143/C143M - Standard Test Method for Slump of Hydraulic Cement Concrete.

8. ASTM C150 - Standard Specification for Portland Cement.

9. ASTM C172 - Standard Practice for Sampling Freshly Mixed Concrete.

10. ASTM C173/C173M - Standard Test Method for Air Content of Freshly Mixed Concrete by the Volumetric Method.

11. ASTM C231 - Standard Test Method for Air Content of Freshly Mixed Concrete by the Pressure Method.

12. ASTM C260 - Standard Specification for Air-Entraining Admixtures for Concrete.

13. ASTM C330 - Standard Specification for Lightweight Aggregates for Structural Concrete.

14. ASTM C494/C494M - Standard Specification for Chemical Admixtures for Concrete.

15. ASTM C595 - Standard Specification for Blended Hydraulic Cements.

16. ASTM C618 - Standard Specification for Coal Fly Ash and Raw or Calcined Natural Pozzolan for Use as a Mineral Admixture in Concrete.

17. ASTM C685/C685M - Standard Specification for Concrete Made By Volumetric Batching and Continuous Mixing.

18. ASTM C845 - Standard Specification for Expansive Hydraulic Cement.
19. ASTM C979 - Standard Specification for Pigments for Integrally Colored Concrete.
20. ASTM C989 - Standard Specification for Ground Granulated Blast-Furnace Slag for Use in Concrete and Mortars.
21. ASTM C1017/C1017M - Standard Specification for Chemical Admixtures for Use in Producing Flowing Concrete.
22. ASTM C1059 - Standard Specification for Latex Agents for Bonding Fresh to Hardened Concrete.
23. ASTM C1064/C1064M - Standard Test Method for Temperature of Freshly Mixed Hydraulic-Cement Concrete.
24. ASTM C1107/C1107M - Standard Specification for Packaged Dry, Hydraulic-Cement Grout (Non-shrink).
25. ASTM C1116 - Standard Specification for Fiber-Reinforced Concrete and Shotcrete.
26. ASTM C1157 - Standard Performance Specification for Hydraulic Cement.
27. ASTM C1218/C1218M - Standard Test Method for Water-Soluble Chloride in Mortar and Concrete.
28. ASTM C1240 - Standard Specification for Silica Fume Used in Cementitious Mixtures.
29. ASTM C1602 - Standard Specification for Mixing Water Used in the Production of Hydraulic Cement Concrete.
30. ASTM D994 - Standard Specification for Preformed Expansion Joint Filler for Concrete (Bituminous Type).
31. ASTM D1751 - Standard Specification for Preformed Expansion Joint Filler for Concrete Paving and Structural Construction (Non-extruding and Resilient Bituminous Types).
32. ASTM D1752 - Standard Specification for Preformed Sponge Rubber and Cork Expansion Joint Fillers for Concrete Paving and Structural Construction.
33. ASTM D6690 - Standard Specification for Joint and Crack Sealants, Hot Applied, for Concrete and Asphalt Pavements.
34. ASTM E96/E96M - Standard Test Methods for Water Vapor Transmission of Materials.

35. ASTM E119 - Standard Test Methods for Fire Tests of Building Construction and Materials.

36. ASTM F710 - Standard Practice for Preparing Concrete Floors to Receive Resilient Flooring.

C. California Department of Health Services:

1. CA/DHS/EHLB/R-174 - Standard Practice for the Testing of Volatile Organic Emissions from Various Sources Using Small-Scale Environmental Chambers, including 2004 Addenda.

D. South Coast Air Quality Management District:

1. SCAQMD Rule 1168 - January 7, 2005 - Adhesive and Sealant Applications.

1.3 SUBMITTALS

A. Section 013300 - Submittal Procedures: Submittal procedures.

B. Manufacturer's Certificate: Certify that products meet or exceed specified requirements.

C. Product Data for proprietary materials and items including admixtures, joint systems, finishing materials, and other as requested by Architect.

D. Design Data: Prior to placing any concrete and within 20 days of award of contract, submit for Architect's review the following per Structural General Notes - Deferred Submittals;

1. Submit to Architect and inspecting and testing firm for review prior to commencement of work, identifying each class of concrete with letters corresponding to those indicated in the Concrete Mix Design Table in the Structural General Notes. Minimum acceptable evidence shall be laboratory trial mix data or field test data (30 or more tests or mixes, identical to proposed mix, made during the past 12 months) with the appropriate standard deviation analysis, all in accordance with ACI 301

2. Identify mix ingredients and proportions, including admixtures.

E. Materials certificates shall be signed by manufacturers and contractor, certifying that each material item complies with or exceeds specified requirements. Provide certification from admixture manufactures that chloride content complies with specification requirements.

F. Submit control joint and pour stop layout to Engineer ten (10) days prior to installation.

G. Prior to placement in 95 degree Fahrenheit or warmer weather, for concrete exposed to view; submit a thermal control plan.

H. Closeout Submittals

1. Section 017700 - Closeout Procedures: Closeout procedures.

2. Project Record Documents: Accurately record actual locations of embedded utilities and components concealed from view in finished construction.

1.4 QUALITY ASSURANCE

A. Perform Work in accordance with ACI 301. Maintain one copy of ACI 301 on site.

B. Conform to ACI 305.1 when concreting during hot weather.

C. Conform to ACI 306.1 when concreting during cold weather.

D. Acquire cement and aggregate from one source for Work.

E. Pre-Installation Meeting:

1. Section 013119 - Project Meetings.

2. Convene minimum one week prior to commencing work of this section. Parties in attendance to be General Contractor, Owners Representative, Architect, Flooring Installer, Mechanical Engineer, Electrical Engineer, Structural Engineer, Independent Inspector, Concrete Foreman, Concrete Supplier, Pumping Contractor, and Concrete Finisher. Agenda to include coordinating embed items and openings, mix design and additives, testing and inspection, form tolerances and stripping, curing methods, finishes and control joint locations.

1.5 PRODUCT DELIVERY, STORAGE, AND HANDLING

A. Section 016000 - Product Requirements.

B. Maintain concrete temperature after installation per ACI 301.

1.6 COORDINATION

A. Section 013000 - Administrative Requirements: Coordination and project conditions.

B. Coordinate placement of joint devices with erection of concrete formwork and placement of form accessories.

PART 2 PRODUCTS

2.1 PERFORMANCE AND DESIGN CRITERIA

A. Vapor Retarder Permeance: Refer to Section 072600 - Vapor Retarders.

2.2 CONCRETE MATERIALS

A. Cement: ASTM C150, Type I - Normal Portland type. Type II - Moderate Portland type.

B. Blended Cement: ASTM C595; Blended cements are permitted to be used in lieu of ASTM C150 cement if all requirements for fly ash, slag, pozzolans and cement are met. Color to be selected.

C. Fine and Coarse Aggregates: ASTM C33. No iron aggregates allowed in concrete.

D. Water: Comply with ASTM C1602.

E. Fly Ash: ASTM C618, Class F.

F. Slag for Cement: ASTM C989.

G. Controlled Density Fill (CDF, CLSM and lean concrete): Designed and proportioned specifically for this project, obtained by a predetermined combination of water-reducing/set controlling/ plastic flow producing admixtures conforming to ASTM C494 types A through G as an Admixture System.

2.3 ADMIXTURES

A. Acceptable Manufacturers:

1. Master Builders Solutions.

2. Euclid.

3. GCP Applied Technologies.

4. Sika.

5. Substitutions: Section 012500 - Substitution Procedures.

B. All admixtures shall be from the same manufacturer to ensure compatibility.

C. Prohibited Admixtures: Calcium chloride, thiocyanate or admixtures containing more than 0.05% chloride ions are not permitted.

D. Shrinkage-Reducing Admixture: Conforming to ASTM C494, Type S.

E. Air Entrainment: ASTM C260. Certified by manufacturer to be compatible with other admixtures.

F. Water Reducing Admixture: Conforming to ASTM C494, Type A shall contain no chlorides (not more than 0.05 percent). The amount of admixture added to the concrete shall be in accordance with the manufacturer's recommendations to obtain between 5% and 10% water reduction.

G. Water Reducing, Retarding Admixture: Conforming to ASTM C494, Type D and not containing more chloride ions than are present in municipal drinking water.

H. High Range Water Reducing Admixture (Superplasticizer): Conforming to ASTM C494 type F or G. The admixture shall be free of chlorides and alkalis. Use a third generation superplasticizer which shall be job site added in measured container, extended plastic-flow time, maintain setting characteristics similar to normal concrete throughout its recommended dosage range at varying concrete temperatures, reduce water 30 to 40 percent, give high early and ultimate strengths.

I. Non-Corrosive, Non-Chloride Accelerator: Conforming to ASTM C494, Type C or E shall be non-chloride and shall not promote corrosion of reinforcing steel in concrete.

J. Corrosion Inhibitor: Calcium nitrite (if called for on the drawings). Per manufacturers' recommendation, to be added to specified concrete.

K. Microsilica (Silica Fume) Admixture Conforming to ASTM C1240: Dry densified or slurry formed. Microsilica shall come from the same source throughout the project. If a single source cannot be maintained, laboratory testing of each new source shall be required before acceptance by the Engineer at no cost to the Owner.

L. Polyfiber Reinforcement

1. Acceptable Manufacturers:

    a. Fibermesh, Sika.

    b. Forta Concrete Fiber.

    c. Euclid Concrete Fibers.

    d. GCP Applied Technologies.

    e. Substitutions under provisions of Section 012500.

2. Polyfiber Reinforcement (Micro): Conforming to ASTM C1116. Fibers of collated fibrillated polypropylene containing no pre-processed Olefin materials to reduce plastic and hardened concrete shrinkage, improve impact strength, increase fatigue resistance and for secondary reinforcing of concrete slabs and members. Medium-duty fiber to increase bonding power, long-term concrete durability, and secondary/temperature control. Nylon fibers not allowed. The product shall have a UL rating. Apply at rate recommended by manufacturer to achieve optimal performance.

3. Polyfiber Reinforcement (Macro): Fibers of collated fibrillated polypropylene/polyethyene or a blend of cold drawn steel wire fiber and 100% polypropylene fibers containing no pre-processed Olefin materials to reduce plastic and hardened concrete shrinkage, improve impact strength, increase fatigue resistance and for secondary reinforcing of concrete slabs and members. Heavy-duty fiber to increase bonding power, long-term concrete durability, and secondary/temperature control. Nylon fibers not allowed. The product shall have a UL rating. ASTM C1116, minimum of 2 inches long, and aspect ratio of 50 to 90. Fiber manufacturer shall provide data to satisfy engineering requirements. Fiber manufacturer shall provide 2 hour fire resistance certification from UL when used in lieu of WWF in composite metal decks. Macro fibers shall be used and dosed in strict accordance with the manufacturer's maximum recommendations unless noted otherwise on the drawings. Apply at rate recommended by manufacturer to achieve optimal performance.

4. Admixtures not listed above are to be approved by Engineer on Record before use. Including, but not limited to; pigments, pumping aids, and anti-freeze.

2.4 ACCESSORIES

A. Bonding Agent for Concrete to Concrete:

1. W.R. Meadows: Intralok or Acry-lok Bonding Agent.

2. Euclid Chemical Co. Product: SBR Latex.

3. Master Builders Solutions.

4. Larsen Product Co.: Weldcrete.

5. L&M Construction Materials Product: Everbond.

6. GCP Applied Technologies: Daraweld.

7. Substitutions: Under provision of Section 012500 - Substitution Procedures.

B. Vapor Retarder: Refer to Section 072600 - Vapor Retarders.

C. Non-Shrink Grout: Refer to Section 036000 - Grouting.

D. Metal stair nosings and abrasive strips: Refer to Section 055000 - Metal Fabrications.

E. Additional concrete accessories refer to Section 031000 - Concrete Reinforcing.

2.5 JOINT DEVICES AND FILLER MATERIALS

A. Section 030100 - Concrete Repair: For cracks over 1/2 inch.

B. Recessed Preformed Joint Fillers:

1. Asphalt Impregnated Joint Filler: Conforming to ASTM D1751. W.R. Meadows, Fibre Expansion Joint No. 320-F, specified for type and quality.

2. Rigid Foam Joint Fillers: W.R. Meadows Deck-O-Foam with removable pre-scored strip for installation of elastomeric joint sealants and backer rods, specified for type and quality.

C. Interior Semi-Rigid Joint Fillers: For use at concrete slab saw-cuts, cold joints/construction joints and narrow cracks.

1. Industrial quality, two component, USDA approved, ASTM D2240, minimum Shore A 75-85, matching approximate color of natural concrete finish.

a. Epoxy Semi-Rigid Joint Filler: Intended for filling cracks and control joints subject to hard wheels and heavy loads.

1) Acceptable Manufacturers

(a) Master Builder Solutions; MasterSeal CR 190.

(b) Dayton Superior; Poxy Fil (J-52).

(c) Euclid; EUCO 700 or EUCO 800.

(d) US MIX; US SPEC, SR 50 EJF.

(e) Vexcon; Power Coat Epoxy Flexible Joint Sealant.

(f) W.R. Meadows; Rezi-Weld Flex.

b. Polyurea Semi-Rigid Joint Filler: Intended for filling cracks and control joints not subject to significant movement; rigid enough to support concrete edges under traffic.

1) Acceptable Manufacturers:

(a) Master Builder Solutions; MasterSeal CR 100.

(b) Euclid; EUCO QWIKjoint 200.

(c) L&M Construction Chemicals; Joint Tite 750.

(d) VersaFlex; SL/75.

c. Substitutions under provisions of Section 012500.

2.6 CONTROL JOINT DEVICES

A. Wall (below grade): Marflex Control Joint System (joint form, elastomeric sealant and fiberglass fabric reinforcement); (800-498-1411).

B. Wall (above grade): Provide form material as required to produce control joints and rustication joints as shown on the drawings.

C. Elevated Slab Control Joints (seismic joints): As detailed or approved by Engineer.

D. Sealant and Primer: Type, as specified in Section 079200 - Joint Sealants.

2.7 CONCRETE MIX

A. Provide concrete to meet all requirements shown on the drawings. The contractor is responsible for the preparation of design mixtures for each class of concrete used in construction.

B. Select proportions for normal weight concrete in accordance with ACI 301 using the method of trial mixes.

C. Calcium chloride not allowed in concrete.

D. Ready Mixed Concrete: Mix and deliver concrete in accordance with ASTM C94/C94M.

E. For exposed slab-on-grade, conform to ASTM C157, and submit data showing length change not to exceed 0.05 percent.

PART 3 EXECUTION

3.1 GENERAL

A. This section shall conform to requirements of ACI 301 specifications for Structural Concrete for buildings, except as modified by the supplemental requirements below.

3.2 EXAMINATION

A. Verify site conditions under provisions of Section 013100 - Project Management and Coordination. Verify dimension with drawings.

B. Verify requirements for concrete cover over reinforcement.

C. Verify anchors, seats, plates, reinforcement, and other items to be cast into concrete are accurately placed, positioned securely, and will not interfere with placing concrete.

3.3 PREPARATION

A. Prepare previously placed concrete by cleaning with steel brush and applying bonding agent. Remove laitance, coatings, and unsound materials.

B. Remove debris and ice from formwork, reinforcement, and concrete substrates.

C. Remove water from areas receiving concrete before concrete is placed.

3.4 PLACING CONCRETE

A. Do not place concrete until installation of embedded electrical conduit is verified to conform to IBC requirements and notes on structural drawings.

B. Verify requirements for concrete cover over reinforcement.

C. Verify that anchors, seats, plates, conduit, reinforcement and other items to be cast into concrete are accurately placed, positioned securely, and will not cause hardship in placing concrete.

D. Clean formed cavities of debris prior to placing concrete.

E. Flush with water or use compressed air to remove remaining foreign matter. Ensure that water and debris drain to exterior through clean-out ports.

F. During cold weather, remove all ice, frost and snow from within forms and reinforcing. Do not use de-icing salts. Do not use water to clean out forms, unless formwork and concrete construction proceed within heated enclosure. Use compressed air or other means to remove foreign matter.

G. Do not cast concrete against frozen surfaces. Refer to ACI-306.1 “Cold Weather Concrete” preparation before placing concrete.

H. Maintain freshly placed concrete temperature at minimum 50 degrees Fahrenheit for 7 days, minimum.

I. Place concrete in accordance with ACI 301, ACI 305.1 - Hot Weather Concreting, and ACI 306.1 - Cold Weather Concreting. Record daily High-Low temperatures at the site.

J. Notify Architect and Special Inspector minimum 24 hours prior to commencement of operations.

K. Ensure reinforcement, anchor rods, trench drains, inserts, embedded parts, formed joint fillers and utilities are not disturbed during concrete placement.

L. Do not drop concrete freely more than 10 feet for concrete containing high-range water-reducing admixture (superplasticizer) or 5 feet for conventional concrete. Where greater drops are required, use a tremie or flexible spout (canvas elephant trunk), attached to a suitable hopper.

M. Continuously place concrete until an entire unit between construction joints is placed. Rate and method of placing concrete shall be such that no concrete between construction joints will be deposited upon or against partly set concrete, after its initial set has taken place, or after 45 minutes of elapsed time during concrete placement.

N. Concrete on Metal Deck: Class and minimum thickness shown. Provide uniform thickness of concrete as directed in the structural drawings, regardless of the deflection of the steel beams and the metal deck under the weight of wet concrete.

    1. Provide depressed slabs in locations indicated.

2. Shores for metal deck shall be supported by the beams which support that deck element, and as directed by the Shoring Engineer.

3. Allow for deflection of steel beams and metal deck under the weight of wet concrete in calculating concrete quantities for slab.

O. Consolidation: Conform to ACI 309R. Immediately after depositing, spade concrete next to forms, work around reinforcement and into angles of forms, tamp lightly by hand, and compact with mechanical vibrator applied directly into concrete at approximately 1.5 foot intervals. Mechanical vibrator shall be power driven, hand operated type with minimum frequency of 5,000 cycles per minute having an intensity sufficient to cause flow or settlement of concrete into place. Vibrator head to meet D.O.T. non-metal head specifications when using with epoxy coated rebar. Vibrate concrete to produce thorough compaction, complete embedment of reinforcement and concrete of uniform and maximum density without segregation of mix. Do not transport concrete in forms by vibration.

1. Use of form vibration shall be approved only when concrete sections are too thin or too inaccessible for use of internal vibration.

2. Carry on vibration continuously with placing of concrete. Do not insert vibrator into concrete that has begun to set.

P. Maintain records of concrete placement. Record date, location, quantity, wind speed, rain, high and low air temperature, and test samples taken.

Q. Place concrete continuously between predetermined joints.

R. Do not interrupt successive placement; do not permit cold joints to occur.

3.5 PLACING CONCRETE SLABS

A. Verify that base course has been prepared per Division 31 - Earthwork.

B. Monitoring and Adjustment: Provide continuous cycle of placement, measurement, evaluation and adjustment of procedures to produce slabs within specified tolerances. Monitor elevations of structural steel in key locations before and after concrete placement to establish typical deflection patterns for the structural steel.

C. Set perimeter screed using either optical or laser instruments. Use rigid screed guides to control strikeoff elevation for all types of elevated slabs. Divide bays into halves or thirds by hard screeds. Adjust as necessary where monitoring of previous placements indicates un-shored structural steel deflections to other than a level profile.

D. Place slabs monolithically. Once slab placement commences, complete finishing operations within same day. Slope finished slab to floor drains where they occur, whether shown or not.

E. Use straight edges specifically made for screeding, such as hollow magnesium straightedges or power strikeoffs. Do not use pieces of dimensioned lumber. Strike off and screed slab to a true surface at required elevations. Use optical or laser instruments to check concrete finished surface grade after strikeoff. Repeat strikeoff as necessary. Complete screeding before any excess moisture or bleeding water is present on surface. Do not sprinkle dry cement on the surface.

F. Immediately following screeding, and before any bleed water appears, use a 10-foot wide highway straightedge in a cutting and filling operation to achieve surface flatness. Do not use bull floats or darbys, except that darbying may be allowed for narrow slabs and restricted spaces.

G. If saw cuts are used as an alternative to preformed slab joint, cut joints within 4 to 12 hours after placing, 4 hours in hot weather and 12 hours in cold. Using 3/16 inch thick blade, cut into 1/4 depth of slab thickness. Saw cuts must be in a straight line, with no deviation.

H. Soff Cut or early entry saw-cutting equivalent may be used within 1 to 4 hours after placing as an alternate, provided manufacturer's recommendations are followed, 1 hour in hot weather and 4 hours in cold weather.

I. Screed floors and slabs on grade level, maintaining surface flatness tolerances.

J. Install joint fillers, primer and sealant in accordance with manufacturer’s instructions. After full cure, shave joint filler flush with top of concrete slab.

3.6 SEPARATE FLOOR TOPPINGS

A. Prior to placing floor topping, roughen smooth substrate concrete surface per ACI 301and remove deleterious material. Broom and vacuum clean.

B. Place required dividers, edge strips, reinforcing, waterproofing membrane, insulation, and other items to be cast in.

C. Apply bonding agent to substrate in accordance with manufacturer's instructions if required by topping manufacturer.

D. Place concrete floor toppings to required lines and levels.

E. Screed toppings level, maintaining surface flatness of maximum indicated in 033500 - Concrete Curing and Finishing, unless noted otherwise.

3.7 CONCRETE FINISHING

A. Finish concrete floor surfaces to requirements of Section 033500 - Concrete Curing and Finishing.

3.8 CURING AND PROTECTION

A. Immediately after placement, protect concrete from premature drying, excessively hot or cold temperatures, and mechanical injury.

B. Maintain concrete with minimal moisture loss at relatively constant temperature for period necessary for hydration of cement and hardening of concrete.

C. Cure concrete floor surfaces as specified in Section 033500 - Concrete Curing and Finishing. For general concrete curing refer to ACI 308.1.

3.9 FIELD QUALITY CONTROL

A. Section 014000 - Quality Requirements: Field inspecting, testing, adjusting, and balancing.

B. Field inspection and testing will be performed by Owner furnished testing laboratory as scheduled in the drawings.

C. Provide inspection of concrete batch plant in accordance with ACI 301, Chapter 1 and schedule listed therein.

D. For number and frequency of tests refer to Schedule - Testing.

E. Provide free access to Work and cooperate with testing and special inspection firm.

F. Submit proposed mix design of each class of concrete to inspection and testing firm for review prior to commencement of Work.

G. Tolerances not scheduled shall be in accordance with ACI 301, Chapter 1 and ACI-117.

H. Evaluation and acceptance of concrete strength shall be in accordance with ACI 301.

I. Tests of cement and aggregates may be performed to ensure conformance with specified requirements.

3.10 PATCHING

A. Allow Architect/Engineer to inspect concrete surfaces immediately upon removal of forms.

B. Excessive honeycomb or embedded debris in concrete is not acceptable. Notify Architect/Engineer upon discovery.

C. Patch imperfections to match original design intent. Use-materials specified in Section 030100 - Concrete Repair.

3.11 DEFECTIVE CONCRETE

A. Defective Concrete: Concrete not conforming to required lines, details, dimensions, tolerances, surface finish or specified requirements.

B. Repair or replacement of defective concrete will be determined by Architect/Engineer.

C. Do not patch, fill, touch-up, repair, or replace exposed concrete except upon express direction of Architect/Engineer for each individual area.

D. Refer to Specification Section 030100 - Concrete Repair, for repair instructions, and as directed by Architect.

3.12 SCHEDULE - CONCRETE TYPES AND FINISHES

A. Refer to Concrete Mix Design Table in the drawings, Section 033500 - Concrete Curing and Finishing, Section 033543 - Polished Concrete, and Finish and Color schedule.

B. Refer to Concrete Mix Design Table in the drawings, Section 033500 - Concrete Curing and Finishing.

END OF SECTION 033000

PART 1 GENERAL

1.1 SUMMARY

A. Section Includes:

1. Initial and final curing of horizontal and vertical concrete surfaces.
2. Finishing concrete floors and floor toppings.
3. Floor surface treatment.
4. Tolerances.

B. Related Sections:

1. Section 030100 - Concrete Repair
2. Section 031000 - Concrete Forming and Accessories.
3. Section 033000 - Cast-In-Place Concrete.
4. Section 072600 - Vapor Retarders.
5. Section 079200 - Joint Sealants.
6. Section 079500 - Expansion Control.

1.2 REFERENCES

A. American Concrete Institute:

1. ACI 301 - Specifications for Structural Concrete.
2. ACI 302.1R - Guide for Concrete Floor and Slab Construction.
3. ACI 308.1 - Standard Specification for Curing Concrete.
4. ACI 318 - Building Code Requirements for Structural Concrete.

B. ASTM International:

1. ASTM C171 - Standard Specification for Sheet Materials for Curing Concrete.
2. ASTM C309 - Standard Specification for Liquid Membrane-Forming Compounds for Curing Concrete.
3. ASTM C1315 - Standard Specification for Liquid Membrane-Forming Compounds Having Special Properties for Curing and Sealing Concrete.
4. ASTM D2103 - Standard Specification for Polyethylene Film and Sheeting.

5. ASTM E1155 - Standard Test Method for Determining FF Floor Flatness and of FL Floor Levelness Numbers.

6. ASTM F710 - Standard Practice for Preparing Concrete Floors to Receive Resilient Flooring.

C. California Department of Health Services:

1. CA/DHS/EHLB/R-174 - Standard Practice for the Testing of Volatile Organic Emissions from Various Sources Using Small-Scale Environmental Chambers, including 2004 Addenda.

D. South Coast Air Quality Management District:

1. SCAQMD Rule 1113 - January 1, 2004 - Architectural Coatings.

1.3 SUBMITTALS

A. Section 013300 - Submittal Procedures: Submittal procedures.

B. Product Data: Submit data on concrete: hardener, sealer, curing compounds, curing sheets and slip resistant treatment; compatibilities and limitations.

C. Closeout Submittals

1. Section 017700 - Closeout Procedures.

2. Operation and Maintenance Data: Submit data on maintenance renewal of applied coatings.

1.4 QUALITY ASSURANCE

A. Perform Work in accordance with ACI 301 and ACI 302.1R.

B. Qualifications

1. Manufacturer: Company specializing in manufacturing Products specified in this section with minimum three years documented experience.

2. Applicator/Installer: Company specializing in performing work of this section with minimum 3 years documented experience.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Section 016000 - Product Requirements: Product storage and handling requirements.

B. Deliver materials in manufacturer's packaging including application instructions.

1.6 ENVIRONMENTAL REQUIREMENTS

A. Section 016000 - Product Requirements: Environmental conditions affecting products on site.

B. Temporary Lighting: Minimum 200 W light source, placed 8 feet (2.5 m) above floor surface, for each 425 sq ft (40 sq m) of floor being finished.

C. Temporary Heat: Ambient temperature of 50 degrees F (10 degrees C) minimum.

D. Ventilation: Sufficient to prevent injurious gases from temporary heat or other sources affecting concrete.

1.7 COORDINATION

A. Section 013100 - Project Management and Coordination: Coordination and project conditions.

B. Coordinate the Work with concrete floor placement and concrete floor curing.

PART 2 PRODUCTS

2.1 PERFORMANCE AND DESIGN CRITERIA

A. Compatibility: Determine compatibility of curing compounds with applied finishes and adhesives before starting work. Do not use incompatible products or when prohibited by resilient flooring or adhesive manufacturer. Provide curing/sealing products coordinated with the final approved flooring finishes selected.

2.2 FINISHING AND CURING MATERIALS

A. Acceptable Manufacturers:

1. US Spec.

2. The Euclid Company.

3. W.R. Meadows.

4. Laticrete, L&M.

5. Dayton Superior.

6. Substitutions under provisions of Section 012500.

B. Curing Compound:

1. ASTM C309 Type 1-D, clear or translucent with fugitive dye, waterborne, membrane forming, and curing compound.

2. ASTM C309, Type 1, Class B, clear or translucent resin-based, water-based curing compound.

C. Sealing Compound: Hardener and dustproofer: Water based sodium silicate. Compound does not change the appearance of the concrete.

D. Curing/Sealing Compound: ASTM C1315 Type 1, Class A 30% solids, clear without fugitive dye, waterborne membrane-forming curing and sealing compound. Comply with Federal Air Quality Regulations 40 CFR 52.254.

E. Evaporation Retarder: Waterborne, monomolecular, film forming for application to fresh concrete.

F. Removable Curing Compound: Removable, VOC compliant curing compound designed to be easily removed by the application of a cleaner. ASTM C309, Type 1, Class B, for interior use.

G. Absorptive Mats: ASTM C171, cotton fabric or burlap-polyethylene, minimum 9 oz/sq yd (305 grams/sq m) bonded to prevent separation during handling and placing.

H. Waterproof Paper: ASTM C171, curing paper treated to prevent separation during handling and placing, regular color.

I. Polyethylene Film: ASTM C171, ASTM D2103, 6 mil, clear.

J. Curing Covers:

1. McTech Group, Inc.; Ultra Cure “NCF” or Ultra Cure “SUN.”

2. PNA Construction Technologies; S16 Hydracure Covers for single-use or M5 for multi-use.

3. Substitutions Section 012500 - Substitution Procedures.

K. Water: Potable, not detrimental to concrete.

PART 3 EXECUTION

3.1 EXAMINATION

A. Section 013100 - Project Management and Coordination: Coordination and project conditions.

B. Verify surfaces are acceptable to receive the Work of this section.

3.2 CURING - HORIZONTAL SURFACES

A. Cure concrete in accordance with ACI 308.1 using one of the following methods:

1. Ponding: Maintain 100 percent coverage of water over floor slab areas, continuously for 4 days.

2. Spraying: Spray water (fog) over floor slab areas and maintain wet for 7 days.

3. Absorptive Mat: Spread approved mat over floor slab areas. Spray with water until mats are saturated, and maintain in saturated condition for 7 days.

4. Absorptive Mat: Saturate burlap-polyethylene and place burlap-side down over floor slab areas, lapping ends and sides; maintain in place for 7 days.

5. Membrane Curing Compound: Apply curing compound in compliance with manufacturer's written recommendations.

6. Non-Membrane Forming Curing Compound: Apply curing compound in one coat. Maintain surface wet with curing compound, without ponding for time recommended by manufacturer.

7. Polyethylene Film: Spread over floor slab areas, lap edges and sides, seal with pressure sensitive tape; maintain in place for 7 days.

3.3 CURING - VERTICAL SURFACES

A. Cure concrete in accordance with ACI 308.1 using one of the following methods:

1. Spraying: Spray water over surfaces and maintain wet for 7 days.

2. Membrane Curing Compound: Apply compound in compliance with manufacturer's written recommendations.

3. Non-Membrane Forming Curing Compound: Apply curing compound in one coat. Maintain surface wet with curing compound for time recommended by manufacturer.

3.4 FLOOR SURFACE TREATMENT

A. Apply hardener as scheduled on floor surfaces.

B. Apply sealer as scheduled on floor surfaces.

3.5 PROTECTION OF FINISHED WORK

A. Section 017000 - Execution: Protecting Installed Construction.

B. Do not permit traffic over exposed concrete floor surface or stair treads and landings.

3.6 SCHEDULE - CONCRETE FINISHES

A. Finish concrete floor surfaces in accordance with ACI 301 and ACI 302.1.

B. In areas with floor drains, maintain design floor elevation at walls; slope surfaces uniformly to drains at 2 percent slope or as indicated on Drawings.

C. Foundation Walls: Form finish with honeycomb and tie holes filled and fins removed unless noted otherwise.

D. Underside of Supported Floors and Structure not Exposed to View: Form finish with holes and honey combs filled and surface finished unless noted otherwise.

E. Underside of Supported Floors and Structure Exposed to View: Sack rubbed finish unless noted otherwise.

F. Floor Surfaces to Receive Ceramic, Tile, Quarry Tile, Cementitious Terrazzo, Terrazzo on Full Bed Setting System or Concrete Topping: Wood Float unless noted otherwise.

G. General Exposed Concrete Floor Surfaces and Surfaces to Receive Carpet, Resilient Flooring, Seamless Flooring, Thin Set Terrazzo, Thin Set Ceramic Tile, Thin Set Quarry Tile: Steel trowel unless noted otherwise.

H. Special Exposed Concrete Floor Surfaces, see finish schedule and Section 033518 - Polished Concrete.

I. Exterior Flatwork: Light Broom Finish unless noted otherwise.

J. Interior Exposed Vertical Concrete: Smooth formed finish unless noted otherwise. Patch tile holes and defects. Remove fins exceeding 1/8 inch in height.

K. Exterior Exposed Vertical Concrete Unless Noted Otherwise: Smooth form finished unless noted otherwise.

L. Interior Stair Treads: Steel trowel finish unless noted otherwise. Acid washand seal.

M. For a blast finish, the degree of blasting is to be based on the following:

1. Brush: Sufficient to dull surface sheen but not to have any reveal.

2. Light: Maximum 1/16 inch aggregate exposure.

3. Medium: Maximum 1/4 inch aggregate exposure.

4. Heavy: Maximum 1/3 inch of the large aggregate diameter.

3.7 SCHEDULE - FLATWORK TOLERANCE

A. Section 014000 - Quality Requirements: Tolerances.

B. Measure for FF and FL tolerances for floors in accordance with ASTM E1155, within 72 hours after slab installation.

C. Finished slab flatness (FF) and levelness (FL) values comply with the following minimum requirements:

1. Slab-on grade areas covered with carpeting, or not specified otherwise in 2. below:

a. Specified overall value FF 25/FL 20

b. Minimum local value FF 17/FL 15

c. Level tolerance such that 80 percent of all points fall within a 3/4 inch envelope (+3/8 inch, -3/8 inch) from the design elevation.

2. Slab-on grade areas that will be exposed, receive thin-set tile or resilient flooring:

a. Specified overall value FF 30/FL 20

b. Minimum local value FF 24/FL 15

c. Level tolerance such that 80 percent of all points fall within a 3/4 inch envelope (+3/8 inch, -3/8 inch) from the design elevation.

3. Framed elevated floor areas covered with carpeting, or not specified otherwise in 4. below:

a. Specified overall value FF 25

b. Minimum local value FF 17

c. Level tolerance such that 80 percent of all points fall within a 3/4 inch envelope (+3/8 inch, -3/8 inch) from the design elevation.

4. Framed elevated floor areas that will be exposed, receive thin-set tile or resilient flooring:

a. Specified overall value FF 30

b. Minimum local value FF 24

c. Level tolerance such that 80 percent of all points fall within a 3/4 inch envelope (+3/8 inch, -3/8 inch) from the design elevation.

5. Specified overall value is based on the composite of all measured values in a placement derived in accordance with ASTM E1155.

D. Measurements: Owner retained testing laboratory will take measurements to verify compliance with FF, FL, and other finish requirements. Measurements will occur within 72 hours after completion of concrete placement (weekends and holidays included). Make measurements before shores or forms are removed to insure the “as-built” levelness is accurately assessed. Profile data for above characteristics may be collected using a laser level or any Type II apparatus (ASTM E1155, “profileograph” or “dipstick”). Contractor’s surveyor shall establish reference elevations to be used by testing laboratory.

E. Contractor not experienced in using FF and FL criteria is encouraged to retain the services of a floor consultant to assist with recommendations concerning adjustments to slab thicknesses and procedures on measurements of the finish as it progresses in order to achieve the specific flatness and levelness numbers.

F. Unacceptable Work: Individual slab section measuring less than either of specified minimum local FF/FL numbers, that section shall be rejected and remedial measures shall be required. Sectional boundaries may be set at construction and contraction (control) joints, and not smaller than one-half bay. If composite value of entire slab installation, combination of all local results, measures less than either of specified overall FF/FL numbers, then whole slab shall be rejected and remedial measures shall be required.

G. Remedial Measures for Rejected Slabs: Correct rejected slab areas by grinding. Patching of low spots is not permitted. Repair or removal and replacement of entire rejected slab areas, as directed by Architect, until a slab finish constructed within specified tolerances is accepted. Grinding shall be done as soon as possible, preferably within three days, but not until concrete is sufficiently strong to prevent dislodging of coarse aggregate particles.

H. Correct defects in defined traffic floor by grinding or removal and replacement of defective Work. Areas requiring corrective Work will be identified. Re-measure corrected areas by same process.

3.8 SCHEDULE - CURING AND SEALING

A. In general cure concrete surfaces in accordance with ACI 301 (Refer to Schedule Curing). Apply compounds in accordance with manufacturer's instructions. Check for compatibility with finishes.

B. Interior Flatwork:

1. Typical:

a. Curing Compound without sealer.

b. Absorptive mats and polyethylene Film with sealing compound.

2. Below grout set Flooring or Terrazzo:

a. Mats or Film without sealer.

3. Below Adhesive applied Flooring and at Stained concrete:

a. Absorptive mats and polyethylene Film or Curing covers without sealer.

4. Arrange Schedule for flatwork requiring adhesive applied flooring so that concrete will dry to meet the installation requirements of Division 9 Sections.

END OF SECTION 033500

PART 1 GENERAL

1.1 SUMMARY

A. Section Includes: Types of grout are as follows:

1. Grout for structural steel members, metal fabrications, and as indicated.

2. Types of grout: C, F, and N.

B. Related Sections:

1. Section 051200 - Structural Steel Framing.

2. Section 055000 - Metal Fabrications.

1.2 REFERENCES

A. American Concrete Institute:

1. ACI 301 - Specifications for Structural Concrete.

2. ACI 318 - Building Code Requirements for Structural Concrete.

B. American Society for Testing and Materials:

1. ASTM C33/C33M - Standard Specification for Concrete Aggregates.

2. ASTM C40/C40M - Standard Test Method for Organic Impurities in Fine Aggregates for Concrete.

3. ASTM C150/C150M - Standard Specification for Portland Cement.

1.3 SUBMITTALS

A. Submit product data under provisions of Section 013300 - Submittal Procedures.

B. Submit product data indicating product standards, physical and chemical characteristics, technical specifications, limitations, and general recommendations regarding each manufactured product submitted for approval.

C. Submit manufacturer's installation instructions under provisions of Section 013300 - Submittal Procedures.

D. Manufacturer’s Certificate: Certify products meet or exceed specified requirements.

1.4 DELIVERY, STORAGE, AND HANDLING

A. Deliver products to site under provisions of Section 016000 - Product Requirements.

B. Store and protect products under provisions of Section 016000 - Product Requirements.

C. Comply with instructions for storage, shelf life limitations and handling.

PART 2 PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS

A. Type N Grout, Non-Shrink: Meet ASTM C1107, minimum 6500 psi.

1. Laticrete, L&M Construction Chemicals: Crystex or Duragrout.
2. W.R. Meadows: 588 Precision Grout.
3. Euclid Chemical Co.: NS Grout.
4. Master Builders Solutions: Masterflow 713 Grout or Masterflow 555 or Masterflow 928.
5. Five Star Products, Inc.: Five Star Grout.
6. Substitutions: Under provision of Section 012500 - Substitution Procedures.

B. Bonding Agent: Refer to Section 033000.

2.2 GROUT MATERIALS

A. Portland Cement: ASTM C150, Type I or II; color as selected.

B. Water: Potable; containing no impurities, suspended particles, algae or dissolved natural salts in quantities capable of causing:

1. Corrosion of steel.
2. Volume change increasing shrinkage cracking.
3. Efflorescence.
4. Excess air entraining.

C. Fine Aggregate:

1. Washed natural sand.
2. Gradation in accordance with ASTM C33 and represented by smooth granulometric curve within required limits.
3. Free from injurious amounts of organic impurities as determined by ASTM C40.

D. Mix: Portland cement, sand and water. Do not use ferrous aggregate or staining ingredients in grout mixes.

E. Gravel: Clean, washed, 3/8" minus.

2.3 MIXING CEMENTITIOUS (TYPE C & F) GROUT

A. Type C Grout: Portland cement, 3/8" minus gravel and clean sand. Mix to a consistency to suit the application and meet the design requirements.

B. Type F Grout: Portland cement and clean sand. Mix to a consistency to suit the application and meet the design requirements.

C. Include bonding agent as additive to grout mix intended for exterior locations. Comply with additive manufacturer's mixing and application instructions.

PART 3 EXECUTION

3.1 EXAMINATION

A. Verify that surfaces are ready to receive work.

3.2 PREPARATION - CONCRETE

A. Clean surfaces of dirt, laitance, corrosion, or other contamination; wire brush using water. Rinse surface and allow to dry.

B. Where Type C and F Grouts are used, roughen surface before wire brushing then saturate surface with water for 24 hours prior to applying bonding compound or installing grout containing bonding additive.

3.3 APPLICATION - GENERAL

A. Fill space to be grouted full. Finish exposed surfaces smooth and even.

B. Seal spaces at penetrations of floors and walls so as to provide a fire resistive rating equal or greater than the construction penetrated.

C. Maintain grout and surfaces in contact with grout at min. 45º for 3 days.

3.4 APPLICATION - CEMENTITIOUS (TYPE C AND F) GROUT

A. For application of grouts containing no bonding additive, apply coating of bonding agent to damp concrete surfaces. Pre-wet surface for 24 hours.

B. Place grout after bonding compound has dried. Rod grout until it rings when struck. Cover fresh grout with wet burlap for four days. Apply curing compound upon removing burlap.

3.5 APPLICATION - TYPE N

A. Apply and cure proprietary grouts according to manufacturer's printed instructions.

3.6 FIELD QUALITY CONTROL

A. Field inspection and testing of Type F and Type C grout will be performed under provisions of Section 014000 - Quality Requirements and ACI 301.

3.7 SCHEDULE

A. Provide grout types as follows unless noted otherwise.

B. Type F Grout: (4,000 psi unless noted otherwise)

1. Concrete wall and floor penetrations, i.e. pipe and duct.

2. Steel door and window frames in concrete construction (2,000 psi).

3. Division 05 product bearing plates not indicated as Type N Grout.

C. Type C Grout: Voids 3 inches or greater where Type F grout is scheduled or indicated.

D. Type N Grout: (Strength per manufacturer)

1. Below structural steel column bearing plates.

2. Below steel beam and girder bearing surfaces.

3. Filling of holes for rods, bolts and handrail posts anchored in concrete.

4. Machinery Bases.

END OF SECTION 036000

DIVISION 04

MASONRY

PART 1 GENERAL

1.1 SUMMARY

A. Section Includes:

1. Mortar and grout for masonry.

B. Related Sections:

1. Section 042113 - Masonry Veneer: Installation of mortar and grout.

1.2 REFERENCES

A. ASTM International:

1. ASTM C5 - Standard Specification for Quicklime for Structural Purposes.
2. ASTM C143/C143M - Standard Test Method for Slump of Hydraulic Cement Concrete.
3. ASTM C144 - Standard Specification for Aggregate for Masonry Mortar.
4. ASTM C150/C150M - Standard Specification for Portland Cement.
5. ASTM C207 - Standard Specification for Hydrated Lime for Masonry Purposes.
6. ASTM C270 - Standard Specification for Mortar for Unit Masonry.
7. ASTM C387/C387M - Standard Specification for Packaged, Dry, Combined Materials for Mortar for Concrete and High Strength Mortor.
8. ASTM C404 - Standard Specification for Aggregates for Masonry Grout.
9. ASTM C476 - Standard Specification for Grout for Masonry.
10. ASTM C595/C595M - Standard Specification for Blended Hydraulic Cements.
11. ASTM C618 - Standard Specification for Coal Fly Ash and Raw or Calcined Natural Pozzolan for Use in Concrete.
12. ASTM C780 - Standard Test Method for Preconstruction and Construction Evaluation of Mortars for Plain and Reinforced Unit Masonry.
13. ASTM C989/C989M - Standard Specification for Slag Cement for Use in Concrete and Mortars
14. ASTM C1019 - Standard Test Method for Sampling and Testing Grout.
15. ASTM C1072 - Standard Test Method for Measuring of Masonry Flexural Bond Strength.

16. ASTM C1142 - Standard Specification for Extended Life Mortar for Unit Masonry.
17. ASTM C1314 - Standard Test Method for Compressive Strength of Masonry Prisms.
18. ASTM C1357 - Standard test methods for evaluating masonry bond strength.
19. ASTM C1384 - Standard Specification for Admixtures for Masonry Mortars.
20. ASTM C1611/C1611M - Standard Test Method for Slump Flow of Self-Consolidating Concrete.
21. ASTM E96- Standard Test Methods for Water Vapor Transmission of Materials.

B. The Masonry Society

1. TMS 402 - Building Code Requirements for Masonry Structures. (Formally ACI 530)
2. TMS 602 - Specifications for Masonry Structures. (Formally ACI 530.1)

1.3 SUBMITTALS

A. Section 013300 - Submittal Procedures: Submittal requirements.

B. Mortar Specific Submittals:

1. Samples: Submit two samples of mortar, illustrating mortar color and color range.
2. Design Data: Submit design mix performing to ASTM C270 including required environmental conditions and admixture limitations.
3. Test Reports: Submit reports on mortar indicating conformance of component mortar materials to requirements of ASTM C270 and test and evaluation reports to ASTM C780 for aggregate ratio and water content, air content, consistency and compressive strength.

C. Grout Specific Submittals:

1. Test Reports: Submit reports indicating conformance of component grout materials to requirements of ASTM C476 and test and evaluation reports to ASTM C1019.

D. Manufacturer's Installation Instructions: Submit premix mortar and grout manufacturer's installation instructions.

E. Manufacturer's Certificate: Certify products meet or exceed specified requirements.

1.4 QUALITY ASSURANCE

A. Perform Work in accordance with TMS 402 and 602.

1.5 PRECONSTRUCTION TESTING

A. Testing will be conducted by an independent test agency, in accordance with provisions of Section 014000 - Quality Requirements.

1. Mortar Mixes: Test mortars prebatched by weight in accordance with ASTM C780 recommendations for preconstruction testing.

a. Test results will be used to establish optimum mortar proportions and establish quality control values for construction testing.

2. Grout: Compressive strength tests per ASTM C1019. Form grout specimens using units used for this project. Do not use cardboard forms unless written approval is obtained based on comparative preconstruction testing performed with units used for this project.

3. Self-consolidating grout: Compressive strength tests per ASTM C1019 and slump flow and visual stability index (VSI) per ASTM C1611.

1.6 ENVIRONMENTAL REQUIREMENTS

A. Section 015000 - Temporary Facilities and Controls: Requirements for ambient condition control facilities for product storage and installation.

B. Section 016000 - Product Requirements.

C. Cold Weather Requirements: In accordance with TMS 602 when ambient temperature or temperature of masonry units is less than 40 degrees F (4 degrees C).

D. Hot Weather Requirements: In accordance with TMS 602 when ambient temperature is greater than 100 degrees F (38 degrees C) or ambient temperature is greater than 90 degrees F (32 degrees C) with wind velocity greater than 8 mph (13 km/h).

E. Vent heaters to the outside to prevent damage to the masonry work from carbon dioxide buildup.

1.7 DELIVERY, STORAGE & HANDLING

A. Store products in manufacturer’s unopened packaging.

B. Store cementitious materials on elevated platforms in dry location. Keep materials covered with weatherproof sheeting secured from wind.

PART 2 PRODUCTS

2.1 MORTAR AND MASONRY GROUT

A. At Contractor's option, mortar and grout may be field-mixed from packaged dry materials, made from factory premixed dry materials with addition of water only, or ready-mixed.

2.2 ACCEPTABLE PACKAGED DRY MATERIALS MANUFACTURERS

A. Mutual Materials.

B. Spec Mix.

C. Quikrete.

D. Basalite.

E. Amerimix.

F. Laticrete.

G. Substitutions: Section 012500 - Substitution Procedures.

2.3 COMPONENTS

A. Portland Cement: ASTM C150, Type I color as scheduled.

B. Blended Cement: ASTM C595, Type IL (15), color to be selected.

C. Structural Masonry Mortar & Grout per Structural General Notes Sheet.

D. Extended Life Mortar: ASTM C1142, Types S, using color cement.

E. Premix Mortar: ASTM C387/C387M, Type S and N, using white color cement.

F. Mortar Aggregate: ASTM C144, standard masonry type.

G. Hydrated Lime: ASTM C207, Type S or N.

H. Grout Aggregate: ASTM C404, fine and coarse.

I. Water: Drinkable. Clean and free of deleterious amounts of acids, alkalis, or organic materials or to comply with ASTM C1602.

J. Fly Ash: ASTM C618.

K. Slag: ASTM C989.

L. Pigments for Colored Mortar: Pure, concentrated mineral pigments specifically intended for mixing into mortar and complying with ASTM C979/C979M.

1. Acceptable Manufacturers:

a. Davis Colors.

b. Lambert Corporation.

c. Solomon Colors.

d. Substitutions under provisions of Section 012500.

2. Color: To match existing. To be approved by Architect prior to construction.

M. Mortar Water Repellent: Required in mortar for all exterior building walls, ASTM C1384.

1. At concrete masonry units (CMU), ensure compatible with the water-repellent admixture used in CMU.

2. Meet ASTM E514 for wind-driven rain resistance.

3. Meet ASTM C1072 for bond strength to mortar.

4. Meet ASTM E96 for reduction of water vapor transmission.

N. Admixtures: Use admixtures as required. Certified by manufacturer to be compatible with other admixtures.

1. Mortar admixtures to comply with ASTM C1384.

2. Grout admixtures to comply with ASTM C476.

a. Do not use water-repellent materials/admixture or air-entraining admixture when grout will be in contact with reinforcement.

O. Calcium chloride is not permitted.

2.4 MIXES

A. Mortar Mixes:

1. Mortar For Non-Structural Masonry: ASTM C270, Type N.

2. Pointing Mortar: ASTM C270, Type N. If repairing existing mortar, match existing, Type N, K, O, or lime.

B. Mortar Mixing:

1. Thoroughly mix mortar ingredients in accordance with ASTM C270 in quantities needed for immediate use.

2. Achieve uniformly damp sand immediately before mixing process.

3. Add mortar color and admixtures to achieve uniformity of mix and coloration.

4. Re-temper only within two hours of mixing to replenish water lost to evaporation only. After two hours discard.

C. Grout Mixes:

1. Grout for Non-Structural Masonry: 2,000 psi (14 MPa) strength at 28 days; 8-11 inches (200-280 mm) slump; mixed in accordance with ASTM C476.

2. Grout for Structural Masonry: See Structural General Notes. Mixed in accordance with ASTM C476.

3. Application:

a. Coarse Grout: For grouting spaces with minimum 3 inches (100 mm) clear dimension in every direction.

b. Fine Grout: For grouting other spaces.

c. Self-consolidating grout: For grouting other spaces.

D. Grout Mixing:

1. Thoroughly mix grout ingredients in quantities needed for immediate use in accordance with ASTM C476.

2. Add admixtures; mix uniformly.

PART 3 EXECUTION

3.1 EXAMINATION

A. Section 013000 - Administrative Requirements: Coordination and project conditions.

B. Examine mortar and grout per Section 042113 Masonry Veneer as applicable.

3.2 PREPARATION

A. Prepare mortar and grout per Section 042113 Masonry Veneer as applicable.

3.3 INSTALLATION

A. Install mortar and grout per Section 042113 Masonry Veneer as applicable.

3.4 FIELD QUALITY CONTROL

A. Section 014000 - Quality Requirements: Field inspecting, testing, adjusting, and balancing.

B. Provide a Masonry Foreman to oversee Work and assure consistent work quality.

C. Mortar Testing:

1. Establishing Mortar Mix: In accordance with ASTM C270.

2. Testing of Mortar Mix: In accordance with ASTM C780 for aggregate ratio and water content, air content, consistency, and compressive strength.

3. Test flexural bond strength of mortar and masonry units to ASTM C1357; test in conjunction with masonry unit sections specified.

4. Test compressive strength of mortar and masonry to ASTM C1314; test in accordance with masonry unit sections specified.

D. Grout Testing:

1. Testing per ASTM C 1019.

2. Testing per ASTM C 1611.

3. Three test specimens shall constitute one sample. A strength test shall be the average of the strengths of the specimen tested at the age specified.

4. Specimens shall be tested at 7 and 28 days.

5. The compression strength will be considered satisfactory if the average of three consecutive tests of the grout is equal to or greater than the specified strength and no individual strength test falls below the specified strength by more than 500 psi.

3.5 SCHEDULES

A. Exterior Cavity Wall: Brick masonry with Type S mortar with Type N pointing mortar.

B. Brick: Type S mortar with Type N pointing mortar.

END OF SECTION 040514

PART 1 GENERAL

1.1 SUMMARY

A. Section includes:

1. Facing Brick.
2. Reinforcement.
3. Anchorage.
4. Accessories.

B. Related Sections:

1. Section 040514 - Masonry Mortaring and Grouting: Product Requirements for Mortar.
2. Section 055000 - Metal Fabrications: Execution requirements for loose steel lintels, fabricated steel items and miscellaneous metal items for placement by this section.
3. Section 072600 - Vapor Retarders: Vapor retarder membrane placed as detailed.

1.2 REFERENCES

A. ASTM International:

1. ASTM A951/A951M - Standard Specification for Steel Wire for Masonry Joint Reinforcement.
2. ASTM C67 - Standard Test Methods for Sampling and Testing Brick and Structural Clay Tile.

B. International Energy Conservation Code (IECC)

1. C104.2.1.1 Wall Insulation Inspection

C. The Masonry Society

1. TMS 402 - Building Code Requirements for Masonry Structures. (Formally ACI 530)
2. TMS 602 - Specifications for Masonry Structures. (Formally ACI 530.1)

1.3 SUBMITTALS

A. Section 013300 - Submittal Procedures.

B. Product Data:

1. Submit data for each product specified.

C. Samples: Submit four samples of each type of masonry unit specified to illustrate color, texture and extremes of color range.

D. Manufacturer's Certificate: Certify products meet or exceed specified requirements.

1.4 QUALITY ASSURANCE

A. Perform Work in accordance with TMS 402 and 602.

B. Qualifications

1. Installer: Company specializing in performing Work of this section with minimum three years documented experience.

2. Certified member in good standing with the Washington State Conference of Mason Contractors (WSCMC) or accepted by architect prior to bid date. Other installers who meet or exceed quality assurance and qualifications criteria of WSCMC may submit bid upon acceptance by Architect.

C. Mockup

1. Provide in-place mockup to infill one opening for visual appearance of how brick veneer will be blendeing in to match existing.

2. Provide adequate lead time to complete mock up and make needed detail adjustments prior to final installation.

3. When accepted, mock-up will demonstrate minimum standard for the Work. Mockup may remain as part of the Work.

D. Pre-installation meetings

1. Section 013113 - Project Meetings: Pre-installation meeting.

2. Convene minimum one week prior to commencing work of this section.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Section 016000 - Product Requirements: Product storage and handling requirements.

B. Accept units on site. Inspect for damage.

1.6 ENVIRONMENTAL REQUIREMENTS

A. Section 016000 - Product Requirements.

B. Cold Weather Requirements: In accordance with TMS 602 when ambient temperature or temperature of masonry units is less than 40 degrees F (4 degrees C).

C. Hot Weather Requirements: In accordance with TMS 602 when ambient temperature is greater than 100 degrees F (38 degrees C) or ambient temperature is greater than 90 degrees F (32 degrees C) with wind velocity greater than 8 mph (13 km/h).

1.7 COORDINATION

A. Section 013100 - Project Managment and Coordination: Coordination and project conditions.

B. Coordinate masonry work with adjacent construction.

PART 2 PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS:

A. Mutual Materials.

B. Interstate Brick.

C. Substitutions: As allowed in Section 012500 - Substitution Procedures.

2.2 BRICK UNITS

A. Masonry Veneer: Facing Brick; ASTM C216, Type FBX, Grade SW.

1. Compressive strength: 3,000 psi minimum, average of 5 bricks; 2,500 psi minimum individual brick.

B. Nominal Size: To match existing veneer. Approved by Architect prior to construction.

C. Color/Finish: To match existing veneer. Architect to approve prior to construction.

D. Efflorescence: Face brick shall show no signs of efflorescence when tested in accordance with ASTM C67, unless waiver is granted upon manufacturer’s submittal of evidence stating that no efflorescence will become evident after brick surfaces are sealed.

E. Special shapes: Contractor has the option of field cutting face brick above relieving angles or fabricating such brick notched to accept steel angles while maintaining the required mortar joint dimension. No overcutting is allowed.

2.3 MASONRY FLASHING

A. Stainless Steel Fabric Flashing:

1. Acceptable manufacturers:

a. York Mfg. Co, Multi Flash SS.

b. Prosoco R Guard, SS Thru Wall.

c. Hohmann & Barnard, Mighty-Flash Stainless Steel Fabric Flashing.

d. Product substitutions under provisions of Section 012500.

2. Stainless steel core with polymer fabric laminated to bottom stainless steel face with non-asphalt adhesive. Type 304 stainless steel.

3. Provide prefabricated stainless steel end dams, prefabricated stainless steel inside corners, and prefabricated stainless steel outside corners where these conditions exist.

a. Gauge: 26 ga.

b. Material: 304 stainless steel.

4. Sealant: Recommended by flashing manufacturer.

B. Stainless steel termination bar; compatible with membrane and adhisives.

C. Stainless steel drip edge; compatible with membrane and adhesives.

D. Cavity Drain Material: Fabric mesh shaped to ensure moisture drainage to cavity weeps and break up mortar droppings.

1. Manufacturers:

a. Hohmann & Barnard, Mortar Trap.

b. York Manufacturing, Weep-Armor.

c. Wire-Bond, Cavity Net RS (Rain Screen).

d. Substitutions: Section 012500 - Substitution Procedures.

E. Weeps/Vents:

1. Acceptable manufacturers:

a. York Mfg. Co, Stainless steel weep vent.

b. Hohmann & Barnard, Quadro-Vent.

c. Wire-Bond, Mortar Net.

d. Substitutions under provisions of Section 012500 - Substitution Procedures.

2.4 ACCESSORIES

A. Single and Multiple Wythe Joint Reinforcement: ASTM A951/A951M; truss or ladder type; steel; 0.188 inch diameter side rods with 0.148 inch diameter cross ties; hot dip galvanized.

B. Reinforcing Steel: type, specified in Section 032000. As indicated on drawings.

C. Wall Ties: Masonry Veneer to Gypsum Sheathing, Steel stud framing or Structural steel. All material to be Hot Dip Galvanized:

1. Hohmann & Barnard 2-Seal Thermal Wing Nut Anchor, 3/16 inch diameter compressed leg hook. Provide 3/16 diameter compressed leg Seismic Hook and 9 GA continuous wire where required.

2. Wire-Bond Sure Tie Anchoring System Thermal, 3/16 inch diameter Sure Tie Triangle. Provide Sure Tie Anchoring System Thermal Seismic (Metal) and 9 GA continuous wire where required.

D. Mortar: As specified in Section 040514.

E. Joint Filler/Control Joint: Closed cell polyethylene; oversized 50 percent to joint width; self expanding; by maximum lengths. Hohmann & Barnard, Inc. backer rod.

F. Cleaning Solution: As recommended by masonry supplier. Do not use meratic acid.

1. Acceptable manufacturers: Prosoco and Fabrikem.

G. Steel Lintels: Refer to Section 055000, size as indicated on Drawings.

H. Insulation: As specified in Section 072113.

PART 3 EXECUTION

3.1 EXAMINATION

A. Section 013100 - Project Management and Coordination: Coordination and project conditions.

B. Verify field conditions are acceptable and are ready to receive work.

C. Verify items provided by other sections of work are properly sized and located.

D. Verify built-in items are in proper location, and ready for roughing into masonry work.

3.2 PREPARATION

A. Direct and coordinate placement of metal anchors supplied to other sections.

B. Furnish temporary bracing during installation of masonry work. Maintain in place until building structure provides permanent support.

3.3 INSTALLATION

A. Establish lines, levels, and coursing indicated. Protect from displacement.

B. Maintain masonry courses to uniform dimension. Form bed and head joints of uniform thickness.

C. Coursing of Brick Units:

1. Bond: To match existing.

2. Coursing: To match existing.

3. Mortar Joints: To match existing.

D. Placing And Bonding:

1. Buttering corners of joints or excessive furrowing of mortar joints are not permitted.

2. Remove excess mortar as work progresses.

3. Interlock intersections and external corners.

4. Do not shift or tap masonry units after mortar has achieved initial set. Where adjustment is required, remove mortar and replace.

5. Perform job site cutting of masonry units with proper tools to assure straight, clean, un-chipped edges. Prevent broken masonry unit corners or edges.

6. IECC C104.2.1.1 Wall Insulation Inspection: To be made after all wall insulation and air vapor retarder sheet or film materials are in place, but before any wall covering is placed.

7. Isolate masonry from vertical structural framing members with movement joint as indicated on Drawings.

8. Isolate top of masonry from horizontal structural framing members and slabs or decks with compressible joint filler.

E. Weeps and Vents: Furnish weeps and vents in outer wythe at 32 inches (600 mm) oc horizontally above through-wall flashing, above shelf angles and lintels, at bottom of walls, and vents as indicated.

F. Cavity Wall: Do not permit mortar to drop or accumulate into cavity air space or to plug weeps.

1. Install cavity drain material continuously at bottom of each cavity above through wall flashing.

G. Joint Reinforcement and Anchorage: Refer to Structural General Notes and details.

1. Seismic Wire Joint Reinforcement: Joint reinforcement is required when running bond is not used. Per TMS 402, running bond occurs when there is at least 1/4 unit overlap (reference TMS 402 Figure CC-4.5-1). If a wall pattern includes running bond and stack bond, at sections where running bond is not provided joint reinforcement is required for that section.

H. Veneer tie spacing: Refer to Structural General Notes and details.

I. Masonry Flashings:

1. Install masonry through wall flashing to divert water from inside wall cavity to exterior at all locations where downward flow of water will be interrupted, including at bottom of wall.

2. Extend flashings horizontally through outer wythe at foundation walls, above ledge or shelf angles and lintels, under parapet caps and at bottom of walls and turn down on outside face to form drip.

3. Turn flashing up minimum 8 inches (200 mm) and seal to substrate.

4. Lap end joints minimum 6 inches (150 mm) and seal watertight.

5. Turn flashing, fold, and seal at corners, bends, and interruptions.

J. Lintels: See Structural General Notes and details.

K. Control And Expansion Joints:

1. Install control and expansion joints at the following maximum spacings, unless otherwise indicated on Drawings:

a. Exterior Walls: 20 feet (6000 mm) on center and within 24 inches (600 mm) on one side of each interior and exterior corner.

b. Interior Walls: 30 feet (9000 mm) on center.

c. At changes in wall height.

2. Do not continue horizontal joint reinforcement through control and expansion joints.

3. Install preformed control joint device in continuous lengths. Seal butt and corner joints.

4. Size control joint in accordance with Section 079200 for sealant performance.

5. Form expansion joint by omitting mortar and cutting unit to form open space or as detailed.

L. Cutting And Fitting:

1. Cut and fit for penetrations and built-in items. Coordinate with other sections of work to provide correct size, shape, and location.

2. Obtain Architect/Engineer’s approval prior to cutting or fitting masonry work not indicated or where appearance or strength of masonry work may be impaired.

M. Install Work in accordance with applicable codes.

3.4 ERECTION TOLERANCES

A. Section 014000 - Quality Requirements: Tolerances.

B. Maximum Variation from Alignment of Columns and Pilasters: 1/4 inch.

C. Maximum Variation from Unit to Adjacent Unit 1/16 inch.

D. Maximum Variation from Plane of Wall: 1/4 inch in 10 ft (6 mm/3 m) and 1/2 inch in 20 ft (13 mm/6 m) or more.

E. Maximum Variation from Plumb: 1/4 inch (6 mm) per story non-cumulative; 1/2 inch (13 mm) in two stories or more.

F. Maximum Variation from Level Coursing: 1/8 inch in 3 ft (3 mm/m) and 1/4 inch in 10 ft gauge (6 mm/3 m); 1/2 inch in 30 ft (13 mm/9 m).

G. Maximum Variation of Joint Thickness: 1/8 inch.

H. Maximum Variation from Cross Sectional Thickness of Walls: 1/4 inch (6 mm).

I. Maximum Variation for Steel Reinforcement:

1. Install reinforcement within the tolerances specified in TMS 602 for foundation walls.

2. Plus or minus 1/2 inch (13 mm) when distance from centerline of steel to opposite face of masonry is 8 inches (200 mm) or less.

3. Plus or minus 1 inch (25 mm) when distance is between 8 and 24 inches (200 and 600 mm).

4. Plus or minus 1-1/4 inch (32 mm) when distance is greater than 24 inches (600 mm).

5. Plus or minus 2 inches (50 mm) from location along face of wall.

3.5 FIELD QUALITY CONTROL

A. Section 014000 - 017000 - Execution: Field inspecting, testing, adjusting, and balancing.

3.6 CLEANING

A. Section 017700 - Closeout Procedures: Final cleaning.

B. Remove excess mortar and mortar smears as work progresses.

C. Replace defective mortar. Match adjacent work.

D. Clean soiled surfaces with cleaning solution.

E. Use non-metallic tools in cleaning operations.

3.7 PROTECTION OF FINISHED WORK

A. Section 017000 - Execution and Closeout Requirements: Requirements for protecting finished Work.

B. Protect exposed external corners subject to damage.

C. Protect base of walls from mud and mortar splatter.

D. Protect masonry and other items built into masonry walls from mortar droppings and staining caused by mortar.

E. Protect tops of masonry work with waterproof coverings secured in place without damaging masonry. Provide coverings where masonry is exposed to weather, when work is not in progress, to prevent water from entering air space.

END OF SECTION 042113

DIVISION 05

METALS

PART 1 GENERAL

1.1 SUMMARY

A. Section Includes:

1. Structural steel framing members.
2. Fasteners, connectors, and anchors.
3. Anchor Rods.
4. Base plates and floor plates.
5. Grouting under base plates.
6. Accessories.

B. Related Sections:

1. Section 014000 - Quality Requirements.
2. Section 033000 - Cast-In-Place Concrete: Supply of anchors for casting into concrete.
3. Section 036000 - Grouting: Grout for setting base plates.
4. Section 055000 - Metal Fabrications: Steel fabrications affecting structural steel work.
5. Section 099000 - Painting and Coating: Finish painting.

1.2 REFERENCES

A. American Institute of Steel Construction:

1. AISC 303 - Code of Standard Practice for Steel Buildings and Bridges.
2. AISC 360-16: Specification for Structural Steel Buildings.
3. AISC 341-16: Seismic Provisions for Structural Steel Buildings.

B. American Society for Testing and Materials:

1. ASTM A36/A36M - Standard Specification for Carbon Structural Steel.
2. ASTM A53/A53M - Standard Specification for Pipe, Steel, Black and Hot Dipped, Zinc Coated, Welded and Seamless.
3. ASTM A108 - Standard Specification for Steel Bar, Carbon and Alloy, Cold Finished.

4. ASTM A123/A123M - Standard Specification for Zinc (Hot Dip Galvanized) Coatings on Iron and Steel Products.

5. ASTM A307 - Standard Specification for Carbon Steel Bolts, Studs, and Threaded Rod 60 000 PSI Tensile Strength.

6. ASTM A384/A3684M - Standard Practice for Safeguarding Against Warpage and Distortion During Hot Dip Galvanizing of Steel Assemblies.

7. ASTM A500/A500M - Standard Specification for Cold-Formed Welded and Seamless Carbon Steel Structural Tubing in Rounds and Shapes.

8. ASTM A529/A529M - Standard Specification for High-Strength Carbon-Manganese Steel of Structural Quality.

9. ASTM A563 - Standard Specification for Carbon and Alloy Steel Nuts.

10. ASTM A572/A572M - Standard Specification for High Strength Low Alloy Columbium Vanadium Structural Steel.

11. ASTM A588/A588M - Standard Specification for High-Strength Low-Alloy Structural Steel, up to 50 ksi Minimum Yield Point, with Atmospheric Corrosion Resistance.

12. ASTM A615/A615M - Standard Specification for Deformed and Plain Carbon-Steel Bars for Concrete Reinforcement.

13. ASTM A706/A706M - Standard Specification for Low-Alloy Steel Deformed and Plain Bars for Concrete Reinforcement.

14. ASTM A780/A780M - Standard Practice for Repair of Damaged and Uncoated Areas of Hot-Dip Galvanized Coatings.

15. ASTM A786/A786M Standard Specification for Hot-Rolled Carbon, Low-Alloy, High-Strength Los-Alloy, and Alloy Steel Floor Plates.

16. ASTM A992/A992M - Standard Specification for Structural Steel Shapes.

17. ASTM A1064/A1064M - Standard Specification for Carbon-Steel wire and Welded Wire Reinforcement, Plain and Deformed, for Concrete.

18. ASTM F436/F436M - Standard Specification for Hardened Steel Washers.

19. ASTM F959/F959M - Standard Specification for Compressible Washer Type Direct Tension Indicators for Use with Structural Fasteners, Inch and Metric.

20. ASTM F1554 - Standard Specification for Anchor Bolts, Steel, 36, 55, and 105-ksi Yield Strength.

21. ASTM F3125/F3125M - Standard Specification for High Strength Structural Bolts, Steel and Alloy Heat Treated, 120 and 105ksi Minimum Tensile Strength, Inch and Metric Dimensions.

C. American Welding Society:

1. AWS A2.4 - Standard Symbols for Welding, Brazing, and Nondestructive Examination.

2. AWS D1.1 - Structural Welding Code - Steel.

3. AWS D1.3 - Structural Welding Code - Sheet Steel.

4. AWS D1.8 - Structural Welding Code - Seismic Supplement.

D. Research Council on Structural Connections:

1. RCSC - Specification for Structural Joints Using ASTM F3125/F3125M Bolts.

E. SSPC: The Society for Protective Coatings:

1. SSPC - Painting Manual.

2. SSPC Paint 15 - Steel Joist Shop Primer/Metal Building Primer.

3. SSPC SP 1 - Solvent Cleaning.

4. SSPC SP 2 - Hand Tool Cleaning.

5. SSPC SP 3 - Power Tool Cleaning.

1.3 SUBMITTALS

A. Section 013300 - Submittal Procedures: Requirements for submittals.

B. Shop Drawings:

1. Indicate profiles, sizes, spacing, and locations of structural members, openings, attachments, and fasteners. Include erection drawings, elevations and details where applicable, showing shipping piece marks. Reference pieces on drawings to applicable design details. Drawings to be on a 24" x 36" minimum sheet size.

2. Connections.

3. Cambers.

4. Indicate welded connections with AWS A2.4 welding symbols. Indicate net weld lengths.

C. Manufacturer's Mill Certificate: Certify that Products meet or exceed specified requirements.

D. Mill Test Reports: Submit indicating structural strength, destructive and non-destructive test analysis.

E. Shop Certificate: Submit a copy of a certificate indicating that the fabrication shop complies with "Approved Fabricator" requirements of the Building Official to the Architect.

F. Non-Approved Fabricator: Submit copies of special inspection reports to the Architect.

G. Welders Certificates:

1. Job Site: Certify welders employed on the Work before work commences. Verify WABO or AWS qualification within the previous 6 months. Submit certificates to Welding Special Inspector and Architect for approval. Welders added after job in progress must also be approved by Special Inspector prior to admittance on job site.

2. Fabricators: Welders employed shall be WABO/AWS certified. Verify qualifications within the previous 6 months. Submit certificates to Welding Special Inspector and Architect for approval.

1.4 QUALITY ASSURANCE

A. Fabricate structural steel members in accordance with AISC Code of Standard Practice. Shop must be AISC certified or meet Non-certified conditions below.

B. AISC and WABO Certified Fabricator: Special Inspection per IBC Section 1704 shall not be required when the work is done on the premises of an AISC certified fabricator, when the shop has approved NDT testing procedures in place. When a shop does not have NDT testing procedures in place, then Special Inspection for those welds are required by Section 1704. An AISC certified fabricator shall either be registered and approved by the Building Official to perform such work without Special Inspection, and have a current certification to the AISC Certification Program for Structural Steel Fabricators, Standard for Steel Building Structures. Fabricators meeting these requirements are still required to pass an initial shop audit by the special inspector.

C. Non-AISC Certified Fabricator: Special inspection per IBC Section 1704 shall be required when work is completed on the premises of a non-AISC certified fabricator. Special inspector shall meet qualifications per IBC Section 1704.2.1 and be approved by local jurisdiction. Cost of special inspections required due to non-AISC certification shall be borne by the contractor.

D. Erector: Company specializing in performing the work of this section with minimum five years' experience.

E. Visual special inspection of welds shall be done by an I.B.C. / W.A.B.O. certified welding inspector. Non-destructive weld testing (N.D.T.) shall be done by a Level III certified individual.

F. Non-Destructive testing and continuous visual special inspection to be done on all special moment resisting and full penetration welds as noted on drawings. Cost to be by the Owner. Non-destructive testing type to be magnetic particle (MT) or ultrasonic testing (UT). Testing to be done per A.W.S. code. Extent to be as indicated on the drawings. Acceptance criteria to be per AWS D1.1 and D1.8 (latest version). Costs for re-testing of welds to be deducted from contract payment to Contractor.

G. Pre-Installation Meeting:

1. Under provisions of Section 013113.

2. Contractor to convene a preconstruction meeting 1 week prior to erection of structural steel. Parties in attendance to be the General Contractor, Architect, Engineer, Fabricator, Erector and Special Inspector.

1.5 FIELD MEASUREMENTS

A. Verify field measurements shown on Drawings, shop drawings and manufacturer's instructions.

PART 2 PRODUCTS

2.1 STRUCTURAL STEEL FRAMING MEMBERS

A. Provide as noted on the Structural Drawings and specified herein.

B. Structural Steel Members: Wide Flange Shapes; ASTM A709 or A992, Fy = 50 ksi.

1. Other structural shapes: ASTM A572 or A588, Fy = 50 ksi.

C. Structural T-Shapes: Cut from structural W-shapes, M-shapes or S-shapes.

D. Channels and Angles: ASTM A36, Fy=36 ksi.

E. Hollow Structural Section:

1. Rectangular or Square: ASTM A500, Grade C, Fy = 50 ksi.

2. Round: ASTM A500, Grade C, Fy = 46 ksi.

F. Pipe: ASTM A53, Grade B, Fy = 35ksi.

2.2 FASTENERS, CONNECTORS, AND ANCHORS

A. Shear Stud Connectors (Weld Studs): ASTM A108, Grade C1010 through 1020, forged steel, headed, uncoated. Lengths as indicated.

1. Nelson Stud Welding, www.stanleyengineeredfastening.com

2. Tru-Weld Stud Welding. 800.321.5588, www.truweldstudwelding.com.

3. Stud Welding Products, Inc.800.252.1919, www.studweldprod.com.

4. Substitutions under provisions of Section 012500 - Substitution Procedures.

B. Erection Bolts: ASTM A307, Grade B.

C. Expansion Bolts: Bolts, nuts and washers shall be in lengths as noted on drawings.

1. Refer to Section 031000 - Concrete Forming and Accessories.

D. Structural Bolts: ASTM F3125/F3125M. Load indicator bolts required

1. Lejeune Bolt Company

2. Nucor Fasteners.

3. St. Louis Screw and Bolt Co.

4. Substitutions under provisions of Section 012500.

E. Threaded Rod Ties: ASTM F1554 type, 36,000 psi yield strength. Provide with turnbuckles, clevis, clevis pins and other related accessories, and as shown.

F. Heavy Hex Nuts for F3125/F3125M Bolts: ASTM A563, Grades C3, D, H, DH3.

G. Hardened Steel Washers: ASTM F436.

H. Direct Tension Indicator Washers: ASTM F959.

I. Screw Anchors (1 piece carbon steel threaded bolt for concrete or masonry):

1. Refer to Section 031000 - Concrete Forming and Accessories.

J. Deformed Bar Anchors (DBA): Fluxed deformed bar anchor studs; conforming to ASTM A1064/A1064M, sizes, shapes, and lengths as indicated.

1. Nelson Stud Welding.

2. Stud Welding Products.

3. Substitutions under provisions of Section 012500 - Substitution Procedures.

K. Welded Reinforcement Anchors: ASTM A706.

L. Adhesive Anchor:

1. Refer to Section 031000 - Concrete Forming and Accessories.

M. Cold Weather Adhesive Anchor: Acceptable Products:

1. Refer to Section 031000 - Concrete Forming and Accessories.

2.3 ANCHOR RODS

A. Product Description: For embedding into concrete and masonry.

B. ASTM F1554, Grade 55, Supplementary Requirement S1, (Weldable).

C. Welding Materials: E70XX type or as otherwise required for materials being welded.

2.4 BASE PLATES AND FLOOR PLATES

A. Slide Bearing Plates: Teflon (PTFE) coated.

B. Floor Plates: ASTM A786/A786M; raised pattern.

2.5 GROUTING UNDER BASE PLATES

A. Grout: Non-shrink (Type N), pre-mixed compound specified in Section 036000 - Grouting.

2.6 ACCESSORIES

A. Suspension Cable: Wire rope.

B. Structural Bearing Pads: Reinforced Teflon (PTFE) bearing elements; type as indicated, complying with AASHO Specification 2.10.3(M).

1. Fabreeka International, Structural Expansion Bearings

2. Fluorocarbon, 'Fluoroglide' Slide Bearings;

3. JVI, Inc Masticord (Random Oriented Fiber pad not PTFE)

4. Con-Slide by Con-Serv, Inc.

5. Substitutions under provisions of Section 012500.

C. Weld Studs: Provide headed studs made from material conforming to ASTM A108, size and length as indicated. Manufactured by TRW Nelson, Stud Welding Products Co., or approved equal.

1. Substitutions under provisions of Section 012500 - Substitution Procedures.

D. Structural Thermal Isolation Blocks: High density polyurethane foam.

1. Basis of Design: GP General Plastics. Substitutions under provisions of Section 012500.

2.7 FINISHES

A. Standard Shop and Touch-Up Primer: SSPC Paint 15, Type 1. Refer to Section 2.10.A.

B. Coal Tar Epoxy: Two component cold applied bituminous mastic compound applied 15 mils thick. Sherwin Williams product TarGuard Coal Tar Epoxy C-200 or Simco Product Simtar-200 Coal Tar Epoxy.

C. Special Finishes: Provide bolts, nuts and washers with cadmium plated or hot dipped galvanized finish where connection is likely to be exposed to weather or moisture. Coating type to match material fastened.

2.8 FABRICATION

A. General:

1. Fabricate items in accord with AISC Specifications and as indicated on final shop drawings; provide camber in structural members where indicated. Camber to have tolerance of minus zero plus one-eighth inch for each 10 feet of member length. Place natural camber for beams up.

2. The ends of all steel columns shall be plain and cut square with all burrs removed.

3. Properly mark, match-mark materials for field assembly; fabricate for delivery sequence which will expedite erection, minimize field handling.

4. Furnish templates, other devices as necessary for presetting bolts and other anchors to accurate locations.

5. There shall be no square cut reentrant corners. All reentrant corners to have a minimum 1 inch radius.

6. Furnish threaded studs, nuts, bolts, bent plates, and other specialty items welded to framing members as required for securing other work to members.

7. Where exposed to view, continuously seal between intermittent welds with plastic filler. If material is to be hot dip galvanized, use 3/16" continuous fillet weld instead of plastic filler.

8. Use A307 bolts for erection purposes only. Refer to S001, Structural General Notes.

B. Welding (Refer to PART 3 - EXECUTION):

1. For welded construction, comply with the AWS Code for procedures, pre-qualifications, quality of welds, and for methods used in correcting welding work. Grind exposed welds smooth.

2. Weld per AWS D1.1, D1.3 and D1.8 cold weather technique when ambient air temperature is less than 40ºF.

3. Welding processes other than shielded metal arc and submerged may be used provided procedure pre-qualification tests in accordance with the American Welding Society are made for the intended application of any such process.

4. Welds not specified shall be continuous fillet welds, using not less than the minimum fillet as specified by AISC, for 3/16" plates or thicker.

5. Assemble and weld built-up sections by methods which will produce true alignment of axes without warp.

C. Weld Studs, Deformed Bar Anchors and Welded Deformed Reinforcement:

1. All welds and welders are to be pre-qualified.

2. The area where welded studs are to be attached must be free of all foreign material, such as rust, oil, grease, paint, etc. Remove mill scale by grinding or sandblasting if sufficiently thick to cause difficulty in obtaining proper welds.

3. Space weld studs and deformed bar anchors as shown. Shop installation of studs on top of beams is prohibited. Install with Manufacturer's Gun using certified installer.

4. Fillet welding of weld studs or welded deformed bar anchors is not permitted unless inspected by a certified inspector at no cost to the Owner.

5. Use ASTM 706 bars for welded reinforcement. Use of welded ASTM 615 rebar will not be allowed.

D. Holes:

1. Provide holes for work as required for securing other work to framing members and for passage of other work through framing members.

2. Holes as required, shall be drilled or punched and reamed; burning of holes or use of drift pins not permitted. Do not heat members for bending.

E. Unless otherwise indicated, continuously seal joined members by continuous welds. Grind exposed welds smooth.

F. Where a connection is noted as slip critical, facing surfaces shall be prepared per RCSC Specification, for Structural Joints using ASTM F3125/F3125M bolts, Section 3.2.2. Unless noted otherwise, prep for Class A.

2.9 FINISH

A. Shop prime with standard primer, structural steel surfaces at interior of buildings to be finish painted. Surfaces to be field welded, paint free and 2" back from weld areas. Primer to be compatible with finish paint. Refer to Section 099000 - Painting and Coating.

B. Enclosed structural steel does not need primer, unless it is to be finish painted. Use surface prep SSPC 1 and 3 at areas to be welded.

C. Prepare structural component surfaces needing primer in accordance with SSPC SP-1, 2 and 3.

D. Do not prime surfaces in contact with concrete. Do not prime surfaces that will be spray fireproofed. Prepare surfaces to be spray fireproofed per SSPC 1 and 2.

E. Paint structural steel located below grade (below finish floor slab) and where indicated, with coal tar epoxy. Prepare steel per epoxy manufacturer recommendations.

F. Shop prime exposed surfaces of angles, plates and other connections in contact with precast concrete roof plank and exterior precast concrete wall units.

G. Galvanize all steel members exposed to weather as indicated after fabrication to ASTM A123. Provide galvanized coating thickness per ASTM A123. Do not "quench" the galvanized coating where painting the steel is specified. Section 099000 - Painting and Coating for cleaning and painting of exterior galvanized steel.

1. Plug exposed to view or moisture holes using tapered zinc filler plugs.

2.10 SOURCE QUALITY CONTROL AND TESTS

A. Testing and analysis of components will be performed under provisions of Section 014000 - Quality Requirements and the General Notes and Special Inspection Drawings.

B. Hot Dip Galvanized members to meet ASTM Material Fabrication Tolerances, and AISC Code of Standard Practice Tolerances for straightness before shipping to erection site.

PART 3 EXECUTION

3.1 EXAMINATION

A. Verify that field conditions are acceptable and are ready to receive work.

B. Beginning of installation means erector accepts existing conditions.

3.2 ERECTION

A. Allow for erection loads, and for sufficient temporary bracing to maintain structure safe, plumb, and in true alignment until completion of erection and installation of permanent bracing.

B. Install thread rods in adhesive anchor and expansion bolts per manufacturer's requirements. Size and location per drawings. Holes must be blown out with compressed air or vacuumed out. Special inspection is required per general notes on drawings.

C. Coordinate placement of cast-in-place embeds and anchor rods. Set anchor rods with a wood or steel template, securely attached to form work or reinforcing. Also, securely attach embed items. Verify accuracy of position before placing concrete.

D. Install Columns; set leveling nuts, and plumb with plastic (not steel) shims or leveling nuts. Tighten anchor rods after supported members have been positioned, plumbed. Nick anchor rod threads or apply Lock Tite to prevent loosening.

E. Grout under base plates and where indicated, in accordance with Section 036000 - Grouting. Complete grouting before pouring concrete on floors above.

F. Unless noted, use load indicator high strength bolts and F-436 washers for all connections. Tighten bolts in accordance with AISC and manufacturer's recommendations. Where conditions do not allow load indicator bolts, use A325 bolts with load indicator washers and heavy hex nuts.

G. Install bolts in concrete or CMU per manufacturer's requirements (expansion bolt, wedge bolt or epoxy anchored type).

H. Welding:

1. For welded construction, comply with AWS Code for procedures, pre-qualifications, quality of welds, and for methods used in correcting welding work. Grind exposed welds smooth.

2. Weld filler metal to conform to AWS D1.1 and D1.8 for demand critical welds.

3. Weld per AWS D1.1, D1.3 and D1.8 cold weather technique when ambient air temperature is less than 40°F.

4. Welding processes other than shielded metal arc and submerged may be used provided procedure pre-qualification tests in accordance with the American Welding Society are made for the intended application of any such process.

5. Welds not specified shall be continuous fillet welds, using not less than the minimum fillet as specified by AISC, for 3/16" plates or thicker.

6. Assemble and weld built-up sections by methods which will produce true alignment of axes without warp.

7. Weave welds are to be pre-qualified.

8. Field weld components indicated on Drawings. Minimum length of field fillet weld: 4 inches and minimum size of weld per AISC or as noted on drawing. All welds are to be thoroughly defluxed by the welder. Wipe weld clean, wash with mild acid solution and rinse with clean water within 48 hours of completing weld. Call for special inspection after welds are washed. Prime paint field welds within 24 hours of approved inspection.

I. Do not field cut or alter structural members (Field Bending) without approval of Architect/Engineer.

J. Splice members only where indicated and accepted on shop and construction drawings.

K. Field weld shear studs (weld studs) using "TRW Nelson," “Stud Welding Products Co.,” or approved equipment. Operator to have current certificate to use equipment. Manual welding with fillet welds to be inspected by Certified Inspector at Owner’s expense.

L. Carry framing up true and plumb accurately assembled to lines and elevations indicated. Align and adjust members forming a complete frame or structure before securely fastening.

M. Fasten splices in compression members after abutting surfaces have been brought completely into contact. Clean bearing surfaces before assembling.

N. Touch up or repair dings, dents or other damage which occurs during the erection process, apply primer with a brush. Refer to Section 099000.

O. Galvanizing Touch Up: For galvanized materials that have been damaged, or where galvanizing has been removed for erection procedures, follow ASTM A780 guidelines. Apply 2 brush coats of organic zinc cold galvanizing compound, 12 hours apart minimum. Dry coat thickness to be 1.5 mils min., verified by Special Inspector.

P. All O.S.H.A. safety regulations must be adhered to.

3.3 ERECTION TOLERANCES

A. Maximum Variation From Plumb: 1/4 inch per story, non-cumulative.

B. Maximum Offset From True Alignment: 1/4 inch.

3.4 FIELD QUALITY CONTROL

A. Field inspection will be performed under provisions of Section 014000 - Quality Requirements and special inspection requirements on Structural General Notes and Special Inspection sheet.

B. Scope of field inspection and tests as indicated on Drawings and as required by code.

END OF SECTION 051200

PART 1 GENERAL

1.1 SUMMARY

A. Section Includes:

1. Shop-fabricated metal items (as Detailed).
2. Custom Guardrails.
3. Structural supports.

B. Related Requirements:

1. Section 033000 - Cast-In-Place Concrete: Execution requirements for embedded anchors and attachments for metal fabrications specified by this Section in concrete.
2. Section 031000 - Concrete Forming and Accessories: Execution requirements for embedded anchors and attachments for metal fabrications specified by this Section in concrete.
3. Section 099000 - Painting and Coating: Field applied paint finish.

1.2 REFERENCE STANDARDS

A. Aluminum Association:

1. AA DAF-45 - Designation System for Aluminum Finishes.

B. American Architectural Manufacturers Association:

1. AAMA 611 - Voluntary Specification for Anodized Architectural Aluminum.
2. AAMA 2603 - Voluntary Specification, Performance Requirements and Test Procedures for Pigmented Organic Coatings on Aluminum Extrusions and Panels.
3. AAMA 2604 - Voluntary Specification, Performance Requirements and Test Procedures for High Performance Organic Coatings on Aluminum Extrusions and Panels.
4. AAMA 2605 - Voluntary Specification, Performance Requirements and Test Procedures for Superior Performing Organic Coatings on Aluminum Extrusions and Panels.

C. American National Standards Institute:

1. ANSI A14.3 - Ladders - Fixed - Safety Requirements

D. ASTM International:

1. ASTM A36/A36M - Standard Specification for Carbon Structural Steel.

2. ASTM A53/A53M- Standard Specification for Pipe, Steel, Black and Hot-Dipped, Zinc-Coated, Welded and Seamless.

3. ASTM A123/A123M - Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products.

4. ASTM A153/A153M - Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware.

5. ASTM A193/A193M - Standard Specification for Alloy-Steel and Stainless Steel Bolting for High Temperature or High Pressure Service and Other Special Purpose Applications.

6. ASTM A194/A194M - Standard Specification for Carbon Steel, Alloy Steel, and Stainless Steel Nuts and Bolts for High Pressure or High Temperature Service, or Both.

7. ASTM A240/A240M - Standard Specification for Chromium and Chromium-Nickel Stainless Steel Plate, Sheet, and Strip for Pressure Vessels and for General Applications.

8. ASTM A269/A269M - Standard Specification for Seamless and Welded Austenitic Stainless Steel Tubing for General Service.

9. ASTM A276/A276M - Standard Specification for Stainless Steel Bars and Shapes.

10. ASTM A307 - Standard Specification for Carbon Steel Bolts, Studs, and Threaded Rod 60 000 PSI Tensile Strength.

11. ASTM A312/A312M - Standard Specification for Seamless, Welded, and Heavily Cold Worked Austenitic Stainless Steel Pipes.

12. ASTM A354 - Standard Specification for Quenched and Tempered Alloy Steel Bolts, Studs, and Other Externally Threaded Fasteners.

13. ASTM A500/A500M - Standard Specification for Cold-Formed Welded and Seamless Carbon Steel Structural Tubing in Rounds and Shapes.

14. ASTM A501/A501M - Standard Specification for Hot-Formed Welded and Seamless Carbon Steel Structural Tubing.

15. ASTM A554/A554M - Standard Specification for Welded Stainless Steel Mechanical Tubing.

16. ASTM A563/A563M - Standard Specification for Carbon and Alloy Steel Nuts.

17. ASTM A572/A572M - Standard Specification for High-Strength Low-Alloy Columbium-Vanadium Structural Steel.

18. ASTM A653/A653M - Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process.

19. ASTM A666 - Standard Specification for Annealed or Cold-Worked Austenitic Stainless Steel Sheet, Strip, Plate, and Flat Bar.

20. ASTM A992/A992M - Standard Specification for Structural Steel Shapes.

21. ASTM B26/B26M - Standard Specification for Aluminum-Alloy Sand Castings.

22. ASTM B85/B85M - Standard Specification for Aluminum-Alloy Die Castings.

23. ASTM B177/B177M - Standard Guide for Engineering Chromium Electroplating.

24. ASTM B209/B209M - Standard Specification for Aluminum and Aluminum-Alloy Sheet and Plate.

25. ASTM B210/B210M - Standard Specification for Aluminum and Aluminum-Alloy Drawn Seamless Tubes.

26. ASTM B211/B211M - Standard Specification for Aluminum and Aluminum-Alloy Rolled or Cold-Finished Bar, Rod, and Wire.

27. ASTM B221/B221M - Standard Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes.

28. ASTM B695 - Standard Specification for Coatings of Zinc Mechanically Deposited on Iron and Steel.

29. ASTM E935 - Standard Test Methods for Performance of Permanent Metal Railing Systems and Rails for Buildings.

30. ASTM F436/F436M - Standard Specification for Hardened Steel Washers.

31. ASTM F1554 - Standard Specification for Anchor Bolts, Steel, 36, 55, and 105 ksi Yield Strength.

32. ASTM F3125/F321M - Standard Specification for High Strength Structural Bolts, Steel and Alloy Heat Treated, 120 and 105ksi Minimum Tensile Strength, Inch and Metric Dimensions.

E. American Welding Society:

1. AWS A2.4 - Standard Symbols for Welding, Brazing, and Nondestructive Examination.

2. AWS D1.1 - Structural Welding Code - Steel.

3. AWS D1.6 - Structural Welding Code - Stainless Steel.

F. Builders Hardware Manufacturers Association (BHMA):

1. ANSI/BHMA A156.20 - American National Standard for Strap and Tee Hinges, and Hasps.

G. Green Seal:

1. GC-03 - Green Seal Environmental Criteria for Anti-Corrosive Paints.

H. National Ornamental & Miscellaneous Metals Association:

1. NOMMA Guideline 1 - Joint Finishes.

I. SSPC: The Society for Protective Coatings:

1. SSPC - Steel Structures Painting Manual.

2. SSPC SP 1 - Solvent Cleaning.

3. SSPC SP 10 - Near-White Blast Cleaning.

4. SSPC Paint 15 - Steel Joist Shop Primer/Metal Building Primer.

5. SSPC Paint 20 - Zinc-Rich Coating (Type I - Inorganic and Type II - Organic).

1.3 SUBMITTALS

A. Section 013300 - Submittal Procedures: Requirements for submittals.

B. Shop Drawings: Indicate profiles, sizes, connection attachments, reinforcing, anchorage, size and type of fasteners, and accessories. Include erection drawings, elevations, and details where applicable. Indicate welded connections using standard AWS A2.4 welding symbols. Indicate net weld lengths.

C. Samples: Submit two 4” x 4” samples, illustrating factory finishes.

D. Welders Certificates: Certify welders employed on the Work, verifying AWS qualification within previous 12 months.

E. Field Quality-Control Submittals: Indicate results of Contractor-furnished tests and inspections.

1.4 QUALITY ASSURANCE

A. Finish joints according to NOMMA Guideline 1.

1.5 QUALIFICATIONS

A. Licensed Professional: Professional engineer experienced in design of specified Work and licensed at Project location.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Section 016000 - Product Requirements: Requirements for transporting, handling, storing, and protecting products.

B. Inspection: Accept metal fabrications on-Site in labeled shipments. Inspect for damage.

C. Protect metal fabrications from damage by exposure to weather or by ground contact.

1.7 EXISTING CONDITIONS

A. Field Measurements: Verify field measurements prior to fabrication. Indicate field measurements on Shop Drawings.

PART 2 PRODUCTS

2.1 CUSTOM GRAUDRAILS

A. Refer to Structural and Architectural details and fabricate from materials in this section.

B. Railing assembly, wall rails and attachments to resist lateral force of 200 lbs. at any point without damage or permanent set. Test in accordance with ASTM E935.

C. Comply with IBC 1607.8 Loads on handrails, guards, grab bars, seats, and vehicle barriers.

2.2 STRUCTURAL SUPPORTS

A. Other Structural Supports: Steel sections, shape and size as indicated on Drawings or required to support applied loads with maximum deflection of 1/240 of the span; Interior: prime paint, one coat; exterior: galvanized (and paint if exposed 099000)] [mill finish].

2.3 MATERIALS

A. Steel:

1. Structural W-Shapes: ASTM A992 (A992M).

2. Channels and Angles: ASTM A36 (A36M).

3. Steel Plate: ASTM A572/A572M; Grade 50.

4. Hollow Structural Sections (HSS): ASTM A500/A500M, Grade C.

5. Steel Pipe: ASTM A53/A53M, Grade B.

6. Sheet Steel: ASTM A653 (A653M), Grade 33 Structural Quality.

7. Bolts: ASTM A307; Grade A or B, ASTM F3125/F3125M; Type 1.

8. Nuts: ASTM A563 (A563M) heavy hex type.

9. Washers: ASTM F436 (F436M); Type 1.

10. Welding Materials: AWS D1.1; type required for materials being welded.

B. Stainless Steel:

1. Bars and Shapes: ASTM A276; Type 304.

2. Tubing: ASTM A269; Type 304.

3. Pipe: ASTM A312 (A312M), seamless; Type 304.

4. Plate, Sheet, and Strip: ASTM A240 (A240M); Type304.

5. Bolts, Nuts, and Washers: ASTM A354.

6. Welding Materials: AWS D1.6; type required for materials being welded.

C. Aluminum:

1. Extruded Aluminum: ASTM B221 (B221M) Alloy 6063, Temper T5.

2. Sheet Aluminum: ASTM B209 (B209M) Alloy.

3. Aluminum-Alloy Drawn Seamless Tubes: ASTM B210 (B210M)] Alloy 6063, Temper T6.

4. Aluminum-Alloy Bars: ASTM B211 (B211M) Alloy 6063, Temper T6.

5. Aluminum-Alloy Sand Castings: ASTM B26 (B26M).

6. Aluminum-Alloy Die Castings: ASTM B85, Alloy as required to suit application.

7. Bolts, Nuts, and Washers: Stainless steel.

8. Welding Materials: AWS D1.1; type required for materials being welded.

D. Bolts, Nuts, and Washers for Equipment and Piping:

1. Carbon Steel:

a. Structural Connections: ASTM A307, Grade [A] [or] [B], hot-dip galvanized.

b. Anchor Bolts: [ASTM A307, Grade A] [ASTM A307, Grade B] [ASTM A36 (A36M), hot-dip galvanized.

c. Pipe and Equipment Flange Bolts: ASTM A193 (193M), Grade B-7.

2. Stainless Steel: Type 316 stainless steel, class 2; ASTM A193 (193M) for bolts; ASTM A194 for nuts.

2.4 FABRICATION

A. Fit and shop assemble items in largest practical sections for delivery to Site.

B. Fabricate items with joints tightly fitted and secured.

C. Grind exposed joints flush and smooth with adjacent finish surface. Make exposed joints butt tight, flush and hairline. Ease exposed edges to small, uniform radius.

D. Exposed Welded Joints: NOMMA Guideline 1 Joint Finish 2.

E. Exposed Mechanical Fastenings: Flush countersunk screws or bolts; unobtrusively located; consistent with design of component, except where specifically noted otherwise.

F. Supply components required for anchorage of fabrications. Fabricate anchors and related components of same material and finish as fabrication, except where specifically noted otherwise.

G. Fabrication Tolerances:

1. Squareness: 1/8 in maximum difference in diagonal measurements.

2. Maximum Offset between Faces: 1/16 in.

3. Maximum Misalignment of Adjacent Members: 1/16 in.

4. Maximum Bow: 1/8 inch in 48 in.

5. Maximum Deviation from Plane: 1/16 inch in 48.

2.5 FINISHES

A. Steel:

1. Clean surfaces of rust, scale, grease, and foreign matter prior to finishing.

2. Do not prime surfaces in direct contact with concrete or where field welding is required.

3. Prime paint items with [one coat] [two coats] except where galvanizing is specified.

4. Structural Steel Members: Refer to Section 051200.

5. Galvanizing: ASTM A123 (A123M); hot-dip galvanize after fabrication.

6. Galvanizing for Fasteners, Connectors, and Anchors:

a. Hot-Dip Galvanizing: ASTM A153 (A153M).

b. Mechanical Galvanizing: ASTM B695; Class 50 minimum.

7. Sheet Steel: Galvanized with G90 coating class.
8. Bolts: Hot-dip galvanized.
9. Nuts: Hot-dip galvanized.
10. Washers: Hot-dip galvanized.
11. Shop Primer: SSPC Paint 15, Type 1, red oxide.
12. Touch-Up Primer for Galvanized Surfaces: SSPC Paint 20 Type I Inorganic or Type II Organic.

B. Stainless Steel:

1. Satin-Polished Finish: Number 4, satin directional polish parallel with long dimension of finished face.

C. Aluminum:

1. Finish coatings to conform to AAMA 611. Comply with AA DAF-45.
2. Exterior Aluminum Surfaces:
   a. Exterior anodized to clear color, to 0.0007 in (0.018 mm) thickness.
3. Interior Aluminum Surfaces:
   a. Interior anodized to clear color, to 0.0007 in (0.018 mm) thickness.
4. Apply one coat of bituminous paint to concealed aluminum surfaces in contact with cementitious or dissimilar materials.

PART 3 EXECUTION

3.1 EXAMINATION

A. Section 013000 - Administrative Requirements: Requirements for installation examination.

B. Verify field conditions are acceptable and are ready to receive Work.

3.2 PREPARATION

A. Section 017000 - Execution and Closeout Requirements: Requirements for installation preparation.

B. Clean and strip primed steel items to bare metal and aluminum where field welding is required.

C. Supply steel items required to be cast into concrete or embedded in masonry with setting templates to appropriate sections.

3.3 INSTALLATION

A. Install items plumb and level, accurately fitted, and free from distortion or defects.

B. Make provisions for erection stresses. Install temporary bracing to maintain alignment until permanent bracing and attachments are installed.

C. Field weld components indicated on Drawings.

D. Perform field welding according to AWS D1.1.

E. Obtain approval of Architect/Engineer prior to Site cutting or making adjustments not scheduled.

3.4 TOLERANCES

A. Section 014000 - Quality Requirements: Requirements for tolerances.

B. Maximum Variation from Plumb: 1/4 in (6 mm) per story or for every 12 ft (4 m) in height, whichever is greater, non-cumulative.

C. Maximum Variation from Level: 1/16 inch (1.5 mm) in 3 ft (1 m) and 1/4 inch (6 mm) in 10 ft (3 m).

D. Maximum Offset from Alignment: 1/4 in (6 mm).

E. Maximum Out-of-Position: 1/4 in (6 mm).

3.5 FIELD QUALITY CONTROL

A. Section 014000 - Quality Requirements: Requirements for inspecting and testing.

B. Section 017000 - Execution and Closeout Requirements: Requirements for testing, adjusting, and balancing.

C. Welding: Inspect welds according to AWS D1.1.

D. Replace damaged or improperly functioning hardware.

E. After erection, touch up welds, abrasions, and damaged finishes with prime paint or galvanizing repair paint to match shop finishes.

F. Touch up factory-applied finishes according to manufacturer-recommended procedures.

3.6 ADJUSTING

A. Section 017000 - Execution and Closeout Requirements: Requirements for adjusting.

B. Adjust operating hardware and lubricate as necessary for smooth operation.

END OF SECTION 055000

DIVISION 06

WOOD, PLASTICS, AND COMPOSITES

PART 1 GENERAL

1.1 SUMMARY

A. Section Includes:

1. Wood panel products.
2. Lumber products.
3. Miscellaneous framing and sheathing.
4. Concealed wood blocking.
5. Sheathing and underlayment materials.
6. Fireblocking and draftstopping.
7. Fasteners and Anchors.
8. Accessories.
9. Factory wood treatment.

B. Related Sections:

1. Section 055000 - Metal Fabrications: Prefabricated steel structural supports.
2. Section 099000 - Painting and Coating

1.2 REFERENCES

A. American Wood Protection Association:

1. AWPA U1 - Use Category System: User Specification for Treated Wood.

B. APA - The Engineered Wood Association:

1. APA - Plywood Design Specification, including supplements.
2. APA AFG-01 - Adhesives for Field-Gluing Plywood to Wood Framing.

C. APA PS 1 - Voluntary Product Standard - Structural Plywood

D. American Society for Testing and Materials:

1. ASTM A123/A123M - Standard Specification for Zinc (Hot Dip Galvanized) coatings on Iron and Steel Products.
2. ASTM A153/A153M - Standard Specification for Zinc Coating (Hot Dip) on Iron and Steel Hardware.

3. ASTM A653/A653M - Standard Specification for Steel Sheet, Zinc Coated (Galvanized) or Zinc Iron Alloy-Coated (Galvannealed) by the Hot Dip Process.

4. ASTM B695 - Standard Specification for Coatings of Zinc Mechanically Deposited on Iron and Steel

5. ASTM D226/D226M - Standard Specification for Asphalt Saturated Organic Felt Used in Roofing and Waterproofing.

6. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials.

7. ASTM E119/E119M - Standard Test Methods for Fire Tests of Building Construction and Materials.

8. ASTM F1667/F1667M - Standard Specification for Driven Fasteners: Nails, Spikes, and Staples.

E. National Fire Protection Association:

1. NFPA 255 - Standard Method of Test of Surface Burning Characteristics of Building Materials.

F. Underwriters Laboratories Inc.:

1. UL 723 - Tests for Surface Burning Characteristics of Building Materials.

G. U.S. Department of Commerce - National Institute of Standards and Technology:

1. DOC PS 1 - Structural Plywood.

2. DOC PS 2 - Performance Standard for Wood-Based Structural-Use Panels.

3. DOC PS 20 - American Softwood Lumber Standard.

1.3 COORDINATION

A. Section 013000 - Administrative Requirements: Requirements for coordination.

1.4 SUBMITTALS

A. Section 013300 - Submittal Procedures: Submittal procedures.

B. Product Data: Submit technical data on wood preservative materials, and application instructions.

1.5 QUALITY ASSURANCE

A. Perform Work in accordance with the following:

1. Lumber Grading Agency: Certified by DOC PS 20.

2. Wood Structural Panel Grading Agency: Certified by APA - The Engineered Wood Association.

B. Source wood products from sustainably managed forest programs certified under the Forest Stewardship Council, certified under the Sustainable Forestry Initiative, or certified under the American Tree Farm System.

C. Fire Rated Wall Construction: Rating as indicated on Drawings.

1. Tested Rating: Determined in accordance with ASTM E119.

D. Surface Burning Characteristics:

1. Fire Retardant Treated Materials: Maximum 25/450 flame spread/smoke developed index when tested in accordance with ASTM E84.

E. Apply label from agency approved by authority having jurisdiction to identify each fire retardant treated material.

F. Perform Work in accordance with IBC standards.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Section 016000 - Product Requirements: Product storage and handling requirements.

PART 2 PRODUCTS

2.1 DESIGN REQUIREMENTS

A. Dimension Lumber: Comply with PS 20 and requirements of specified grading agencies.

1. Species: Douglas Fir-Larch, unless otherwise indicated.

2. If no species is specified, provide any species graded by the agency specified; if no grading agency is specified, provide lumber graded by any grading agency meeting the specified requirements.

3. Grading Agency: Any grading agency whose rules are approved by the Board of Review, American Lumber Standard Committee (www.alsc.org) and who provides grading service for the species and grade specified; provide lumber stamped with grade mark unless otherwise indicated.

4. Lumber of other species or grades is acceptable provided structural and appearance characteristics are equivalent to or better than products specified.

2.2 LUMBER MATERIALS

A. Non-structural Light Framing: Douglas Fir/Larch, No 2 and better, 19 percent maximum moisture content.

B. Studding: Douglas Fir/Larch, No 2 and better, 19 percent maximum moisture content.

C. Miscellaneous Framing and blocking: Douglas Fir/Larch, No 2 and better, 19 percent maximum moisture content, pressure preservative treat.

2.3 WOOD PANEL PRODUCTS

A. APA Grade Stamp each panel. Conform to DOC PS 1 and DOC PS 2 for cross-laminated veneer panel.

1. APA PS 1, A-C Group 1, Exposure 1: Face exposed one side.

2. Where A side of face of plywood is left exposed as finish or room interior, ensure no wood stamp is present on face and no paint on sides.

B. Communications and Electrical Panel Boards: ¾ inch Plywood to be painted with fire retardant coating per Specification Section 099000 - Painting and Coating or Type AC fire rated plywood with A side facing out.

C. Roof Sheathing: APA Rated Sheathing; Span Rating 24/0; Exposure Durability 1 exterior.

D. Sloped Roof Sheathing: Refer to structural for thickness and Span Rating 48 x 96 inch sized sheets, square edges.

E. Above Grade Wall Sheathing: Refer to structural for thickness and Span Rating, 48 x 96 inch sized sheets, square edges, fire-retardant-treated.

F. Subflooring: APA Rated Sheathing Exposure 1.

1. APA Span Rating: Refer to Structural drawings.

2. Thickness: Refer to Structural drawings.

3. T&G edges.

4. Sanded both sides.

G. Floor Underlayment: APA Underlayment Group 1 Exposure 1.

1. Non-spanning underlayment for finish flooring systems over plywood subflooring.

2. 3/8 inches thick, unless otherwise noted.

3. Sanded.

2.4 FASTENERS AND ANCHORS

A. Fasteners: ASTM A153/A153M, hot dipped galvanized or ASTM B695, Class 55 mechanically galvanized, 304 stainless steel for high humidity and treated wood locations, unfinished steel elsewhere.

B. Nails: ASTM F1667.

C. Anchors: Adhesive anchor with screen type for anchorage to hollow masonry. Expansion bolt and screw anchor type for anchorage to solid masonry or concrete. A307 Bolt, Self Drilling Screw or ballistic fastener for anchorages to steel. All material to be zinc coated or stainless steel.

D. Structural Steel Framing Connectors: All hardware in contact with preservative treated wood shall be grade 316 stainless steel per ASTM A653. Use Sizes to suit framing conditions.

2.5 ACCESSORIES

A. Provide polymeric membrane material as a barrier between copper containing preservative treated lumber and steel deck products, metal panels, and accessory metal materials.

2.6 FACTORY WOOD TREATMENT

A. Wood Preservative (Pressure Treatment): AWPA Treatment U1 using water borne preservative with 0.25percent retainage.

B. Treat with wood preservative any wood to come in contact with concrete.

C. Fire Retardant Treatment: Chemically treated and pressure impregnated, having flame spread of 25 or less when tested in accordance with ASTM E84 and showing no evidence of significant progressive combustion when test is continued for an additional 20 minute period, Interior Type.

D. Moisture Content after Treatment: Kiln dried (KDAT).

1. Lumber: Maximum 19 percent.

2. Structural Panels: Maximum 15 percent.

PART 3 EXECUTION

3.1 INSTALLATION - GENERAL

A. Select material sizes to minimize waste.

B. Reuse scrap to the greatest extent possible; clearly separate scrap for use on site as accessory components, including: shims, bracing, and blocking.

C. Where treated wood is used on interior, provide temporary ventilation during and immediately after installation sufficient to remove indoor air contaminants.

3.2 COMMUNICATIONS AND ELECTRICAL ROOM PANEL BOARDS

A. Secure with screws to studs with edges over firm bearing; space fasteners at maximum 24 inches on center on all edges and into studs in field of board. Install with wood structural panel where required.

1. At fire-rated walls, install board over wall board indicated as part of the fire-rated assembly.

2. Where boards are indicated as full floor-to-ceiling height, install with long edge of board parallel to studs.

3. Install adjacent boards without gaps.

3.3 SUBFLOORING AND UNDERLAYMENT

A. Maintain 1/8 inch space between sheathing panel end and edge joints.

B. Subfloor: Glue to framing with construction adhesive and nail with ring-shank nails or screw shank nails. Space fasteners to penetrate fully into solid framing. Conform to Structural Drawings.

1. Edge Nail Spacing: 6 inch on center, except 12 inch each way for subfloor under 3/4 inch thick.

2. Panel Face Nail Spacing: 12 inch on center each way.

C. Flooring Underlayment: Lay with staggered joints over dry subflooring.

1. Nail with ring shank-nails.

2. Space fasteners so as not to penetrate framing.

3. Allow 1/32 inch space between joints.

4. Set nails and patch as necessary to prevent telegraphing through finish flooring.

5. Do not use staples.

3.4 FRAMING

A. Set structural members level and plumb, in correct position.

B. Make provisions for erection loads, and for sufficient temporary bracing to maintain structure safe, plumb, and in alignment until completion of erection and installation of permanent bracing.

C. Place horizontal members, crown side up.

D. Construct load bearing framing and curb members full length without splices.

E. Double members at openings as noted on structural drawings.

F. Construct double joist headers at floor and ceiling openings and under wall stud partitions parallel to floor joists. Frame rigidly into joists.

G. Bridge joists as detailed. Fit solid blocking at ends of members where indicated.

H. Curb roof openings except where prefabricated curbs are provided. Form corners by alternating lapping side members.

3.5 SITE APPLIED WOOD TREATMENT

A. Apply preservative treatment.

B. Brush apply one coat of preservative treatment on wood in contact with cementitious materials; roofing and related metal flashings. Treat site-sawn cuts.

C. Allow preservative to dry prior to erecting members.

3.6 TOLERANCES

A. Section 014000 - Quality Requirements: Tolerances.

B. Framing Members: 1/4 inch from indicated position, maximum.

3.7 SCHEDULES

A. Provide products of this section where detailed or indicated.

END OF SECTION 061000

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Glue laminated wood beams and purlins.

B. Steel hardware and attachment brackets.

1.2 RELATED REQUIREMENTS

A. Section 061000 - Rough Carpentry.

B. Section 099000 - Painting and Coating.

1.3 REFERENCE STANDARDS

A. ANSI 117 - Standard Specification for Structural Glued Laminated Timber of Softwood Spicies current year of issue.

B. ANSI A190.1 - American National Standard for Wood Products - Structural Glued Aaminated Timber current year of issue.

C. AITC 111 - Recommended Practice for Protection of Structural Glued Laminated Timber During Transit, Storage and Erection.

D. AITC 110 - Standard Appearance Grades For Structural Glued Laminated Timber.

E. ASTM A36/A36M - Standard Specification for Carbon Structural Steel 2019.

F. ASTM A123/A123M - Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products 2017.

G. ASTM A153/A153M - Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware 2016a.

H. ASTM A563 - Standard Specification for Carbon and Alloy Steel Nuts 2021a.

I. ASTM D2559 - Standard Specification for Adhesives for Bonded Structural Wood Products for Use Under Exterior Exposure Conditions 2012a (Reapproved 2018).

J. ASTM F3125/F3125M - Standard Specification for High Strength Structural Bolts and Assemblies, Steel and Alloy Steel, Heat Treated, Inch Dimensions 120 ksi and 150 ksi Minimum Tensile Strength, and Metric Dimensions 830 MPa and 1040 MPa Minimum Tensile Strength 2022.

K. AWS D1.1/D1.1M - Structural Welding Code - Steel 2020, with Errata (2022).

1.4 SUBMITTALS

A. See Section 013300 - Submittal Procedures.

B. Shop Drawings: Indicate framing system, sizes and spacing of members and cambers, bearing and anchor details, bridging and bracing, and framed openings.

1.5 QUALITY ASSURANCE

A. Manufacturer/Fabricator Qualifications: Company specializing in manufacture of glue laminated structural units with three years of documented experience, and certified by ANSI in accordance with ANSI A190.0.

B. Erector Qualifications: Company specializing in erection of products of the type specified with three years documented experience and approved manufacturer.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Protect members to AITC 111 requirements for not wrapped.

B. Fire Retardant Treated Wood: Prevent exposure to precipitation during shipping, storage, or installation.

PART 2 PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS

A. Boise Cascade.

B. Red Built.

C. Substitutions under provisions of Section 012500.

2.2 MATERIALS

A. Lumber: Softwood lumber complying with RIS (GR); SPIB (GR) grading rules with 12 percent maximum moisture content before fabrication.

B. Steel Connections and Brackets: ASTM A36/A36M weldable quality, galvanize per ASTM A123/A123M.

C. Anchor Bolts: hot-dip galvanized to meet requirements of ASTM A153/A153M.

D. Laminating Adhesive: Tested for wet/exterior service in accordance with ASTM D2559.

E. Bearing Plate Anchors: Expansion shield and lag bolt type for anchorage to solid masonry or concrete.

2.3 WOOD TREATMENT

A. Refer to Section 061000.

B. Fire Retardant Treatment: Refer to Section 061000.

2.4 FABRICATION

A. Fabricate glued-laminated structural members according to ANSI A190.1.

1. Stamp members according to ANSI A190.1 in a location which will be concealed from view in its as-built condition.

2. For conditions where quality mark stamp cannot be concealed, accompany member with an ANSI Certificate of Conformance.

B. Grade: Refer to Schedule at end of section.

C. Layup:

1. Apply TOP stamp

a. On the top of the member.

b. At both ends.

c. Spaced at a maximum of 8 feet.

d. In letters at least 2 inch in height.

D. Welding: Perform welding in accordance with AWS D1.1/D1.1M.

E. Verify dimensions and site conditions prior to fabrication.

F. Cut and fit members accurately to length to achieve tight joint fit.

G. Camber: 2000 foot radius unless noted otherwise. No camber in cantilever members or members continous over supports.

H. Fabricate member with camber built in.

I. Do not splice or join members in locations other than those indicated without permission.

J. Fabricate steel hardware and connections with joints neatly fitted, welded, and ground smooth.

K. After end trimming, seal with penetrating sealer in accordance with AITC 111 requirements.

2.5 SOURCE QUALITY CONTROL

A. Section 014500 - Quality Control: Requirements for testing, inspection, and analysis.

B. Inspection: Inspect Work performed at manufacturer's/fabricator's facility to verify conformance to Contract Documents.

C. Certificate of Compliance:

1. If manufacturer/fabricator is approved by authorities having jurisdiction, submit certificate of compliance indicating Work performed at manufacturer's/fabricator's facility conforms to Contract Documents.

2. Specified shop tests are not required for Work performed by approved manufacturer/fabricator.

PART 3 EXECUTION

3.1 EXAMINATION

A. Verify that supports are ready to receive units.

B. Verify sufficient end bearing area.

3.2 PREPARATION

A. Coordinate placement of bearing and support items.

3.3 ERECTION

A. Lift members using protective straps to prevent visible damage.

B. Set structural members level and plumb, in correct positions or sloped where indicated.

C. Provide temporary bracing and anchorage to hold members in place until permanently secured.

D. Fit members together accurately without trimming, cutting, splicing, or other unauthorized modification.

E. Swab and seal the interior wood surfaces of field drilled holes in members with primer.

3.4 TOLERANCES

A. Framing Members: 1/2 inch; maximum from true position.

3.5 PROTECTION

A. Section 016000 - Product Requirements: Requirements for protecting finished Work.

B. Do not remove factory protective wrapping until glued laminated beams are under building protection and ready to be installed.

3.6 SCHEDULE - FINISH

A. Non-Exposed to View Members: Industrial Appearance Grade per AITC 110-2001.

END OF SECTION 061800

DIVISION 07

THERMAL AND MOISTURE PROTECTION

PART 1 GENERAL

1.1 SUMMARY

A. Section includes

1. Repair of existing roof systems at areas of new mechanical roof openings.

2. Temporary roofing protection.

B. Related Sections:

1. Section 024119 - Selective Demolition.

2. Division 23 Heating, Ventilation and Aricinditioning HVAC.

1.2 ADMINISTRATIVE REQUIREMENTS

A. Preinstallation Meeting: Convene one week before starting work of this section.

1. Attendees:

a. Integrus Architecture.

b. Contractor.

c. Owner.

d. Roofing membrane installer.

2. Meeting Agenda: Provide agenda to participants prior to meeting in preparation for discussions on the following:

a. Removal and installation schedule.

b. Necessary preparatory work.

c. Protection before, during, and after roofing system installation.

B. Schedule work to coincide with commencement of installation of new mechanical roof openings.

1.3 SUBMITTALS

A. Refer to Section 013300.

B. Shop Drawings: Indicate size, configuration, and installation details.

1.4 QUALITY ASSURANCE

A. Installer Qualifications:

1. Company specializing in performing work of the type specified and with at least three years of documented experience.

2. Cut, patch, and repair existing work using skilled specialists, qualified to perform work in a manner to cause least damage of work to remain.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Ensure storage and staging of materials does not exceed static and dynamic load-bearing capacities of roof decking.

1.6 FIELD CONDITIONS

A. Existing Roofing System: Modified bituminous roofing systems.

B. Do not remove existing roofing membrane when weather conditions threaten the integrity of building contents or intended continued occupancy.

C. Maintain continuous temporary protection prior to and during installation of new roofing system to keep the building weather tight.

D. Provide notice at least three days before starting activities that will affect normal building operations.

E. Owner will occupy building areas directly below re-roofing area.

1. Provide Owner with at least 48 hours written notice of roofing activities that may affect their operations and to allow them to prepare for upcoming activities as necessary.

2. Do not disrupt Owner's operations or activities.

3. Maintain access of Owner's personnel to corridors, existing walkways, and adjacent buildings.

1.7 SCHEDULING

A. Section 013100 - Project Management and Coordination: Coordination and project conditions.

B. Schedule Work to coincide with commencement of installation of roofing repair.

1.8 COORDINATION

A. Section 013100 - Project Management and Coordination: Coordination and project conditions.

B. Remove only existing roofing materials that can be replaced with new materials as the weather will permit.

C. Coordinate the Work with other affected mechanical and electrical work associated with roof penetrations.

1.9 WARRANTY

A. Existing Warranties: Perform this work using methods and materials that will maintain existing roof system warranties.

1. Notify existing roof system warrantor prior to starting this work and obtain written instructions for procedures necessary to maintain this existing warranty.

2. Upon completion of this work, notify warrantor of reroofing completion and obtain documentation to verify that existing roofing system has been inspected and warranty is still in effect.

a. Submit documentation upon project closeout.

PART 2 PRODUCTS

2.1 MATERIALS

A. Patching Materials: Provide necessary materials in accordance with requirements of existing roofing system.

B. Roofing Repair as Required: Remove existing Modified Bituminous roofing membrane and components of existing roofing system down to existing metal or wood roof deck as required for buildup of new mechanical curbs. Patch and repair roofing where new equipment is to be installed per the drawings. Layout indicated in the drawings is for reference only and exact locations should be coordinated with the Owner and final equipment locations.

C. Temporary Roofing Protection Materials:

1. Contractor's responsibility to select appropriate materials for temporary protection of roofing areas as determined necessary for this work.

D. All materials to match existing roofing system.

2.2 ACCESSORIES

A. Fasteners: Type and size as required and compatible with existing and new roofing system to resist local wind uplift.

PART 3 EXECUTION

3.1 EXAMINATION

A. Section 013100 – Project Management and Coordination: Coordination and project conditions.

B. Verify that existing roof surface has been cleared of materials being removed from existing roofing system and ready for next phase of work as required.

3.2 PREPARATION

A. Sweep roof surface clean of loose matter.

B. Remove loose refuse and dispose of properly off-site.

3.3 INSTALLATION

A. Coordinate scope of this work with requirements for installation of new mechanical roof openings. Refer to related roofing section for additional requirements.

3.4 EXISTING CONSTRUCTION

A. Remove membrane insulation and related roofing components in preparation for replacement membrane roof system specified herein.

B. Repair existing metal deck surface as necessary to provide smooth working surface for replacement roof system.

C. Construct mechanical curb as detailed on Drawings.

D. Replace insulation and roofing materials that have been removed for construction of curb.

E. Replace or repair flexible sheet base flashings to seal membrane to vertical elements. Reinforce as recommended by roofing membrane manufacturer.

F. Obtain approval from the roofing manufacturer providing the warranty on existing roof.

3.5 PROTECTION

A. Provide protection of existing roofing system that is not having work performed on it.

B. Provide temporary protective sheeting over uncovered deck surfaces.

C. Turn sheeting up and over parapets and curbing. Retain sheeting in position with weights.

D. Provide for surface drainage from sheeting to existing drainage facilities.

E. Do not permit traffic over unprotected or repaired deck surface.

END OF SECTION 070150

PART 1 GENERAL

1.1 SUMMARY

A. Section includes above and below grade sheet materials for controlling vapor diffusion.

B. Related Sections:

1. Section 033000 - Cast-In-Place Concrete.

2. Section 042113 - Masonry Veneer.

1.2 REFERENCES

A. American Concrete Institute (ACI):

1. ACI 302.2 R-06 - Guide for Concrete Slabs that Receive Moisture-Sensitive Flooring Materials.

B. ASTM International:

1. ASTM E96 - Standard Test Methods for Water Vapor Transmission of Materials.

2. ASTM E154 - Standard Test Methods for Water Vapor Retarders Used in Contact with Earth Under Concrete Slabs, on Walls, or as Ground Cover.

3. ASTM E1745 - Standard Specification for Plastic Water Vapor Retarders Used in Contact with Soil or Granular Fill Under Concrete Slabs.

4. ASTM F1249 - Standard Test Method for Water Vapor Transmission Rate Through Plastic Film and Sheeting Using a Modulated Infrared Sensor.

5. ASTM E1643 - Selection, Design, Installation, and Inspection of Water Vapor Retarders Used in Contact with Earth or Granular Fill Under Concrete Slabs.

1.3 SUBMITTALS

A. Submit under provisions of Section 013300 - Submittal Procedures.

B. Product Data: Submit data indicating material characteristics, performance criteria, and limitations.

C. Manufacturer's Installation Instructions: Submit preparation and installation requirements, techniques.

1.4 SEQUENCING

A. Do not install vapor retarder until items that penetrate the vapor retarder are in place.

PART 2 PRODUCTS

2.1 DESIGN REQUIREMENTS

A. Above Grade Vapor Retarder Permeance: Maximum 1 perm when tested in accordance with ASTM E96, Procedure A.

B. Below Grade Vapor Retarder Thickness: Minimum 15 mils thick.

2.2 ABOVE GRADE VAPOR RETARDERS

A. Acceptable Manufacturers:

1. MemBrain by CertainTeed.

2. Substitutions under provision of Section 012500.

B. Provide a 2 mil thick film of polyamide (nylon). Permeability changes with ambient humidity conditions.

C. Properties:

1. Water Vapor Transmission Rating (WVTR):

a. Less than 1.0 perms by ASTM E 96, Desiccant method.

b. More than 10 perms by ASTM E 96, Water method.

2. Surface Burning Characteristics:

a. Maximum Flame Spread Index: 20.

b. Max Smoke Developed Index: 55.

3. Fungi Resistance: No growth; ASTM C1338.

4. Corrosivity: No unusual aspect of corrosion such as pitting, cracking and adhesive cure inhibition; ASTM C665.

D. Adhesives

1. Spray Adhesive: 3M Spray 90 or equal. Water-based adhesives are not acceptable.

2. Double-Sided Adhesive Tape: Asphaltic mastic strips compatible with sheet barrier and substrate, with factory applied release paper. Use for bonding adjacent sheets of retarder to each other at seams.

3. Sealant/Mastic: Per Manufacturer.

2.3 BELOW GRADE (UNDER SLAB) VAPOR RETARDERS

A. Vapor Retarder:

1. Under slab Vapor Retarder: Minimum 15 mil thick Polyolefin geo membrane manufactured from prime, virgin resins. Water vapor retarder ASTM E1745, meets or exceeds Class A. Water transmission rate ASTM E96, 0.006 gr./ft²/hr. or lower permeance rating, ASTM E96, 0.01 perm or lower use manufacturers tapes, mastic and pipe boots.

2. Typical Vapor Retarder (Type 1)

    a. Stego Wrap, 15 mil, by Stego Industries, LLC (877-464-7834).

    b. Perminator, 15 mil, by W.R. Meadows (847-214-2100).

    c. “Vapor Block 15" by Raven Industries (800-635-3456).

    d. Substitutions: Section 012500 Substitution Procedures.

3. Vapor Retarder Tape: High density polyethylene tape with pressure sensitive adhesive, by manufacturer of vapor barrier, 3.75inches minimum width. Pipe Boots: Construct pipe boots from vapor barrier material, pressure sensitive tape and/or mastic per manufacturer’s instruction.

4. Vapor Proofing Mastic: Water transmission rate ASTM E96, 0.3 perms or lower. Recommended by manufacturer to comply with warranty requirements.

5. Double Sided Adhesive Strip: Synthetic Rubber blend, 0.03 perms. Recommended by manufacturer to comply with warranty requirements.

6. Plastic Termination Bar: Recommended by manufacturer to comply with warranty requirements.

7. Multi-layered tape: 0.03 perms. Recommended by manufacturer to comply with warranty requirements.

PART 3 EXECUTION

3.1 PREPARATION

A. Remove loose or foreign matter capable of impairing adhesion.

B. Clean and prime substrate surfaces to receive adhesive and sealants.

C. Below Grade (Under Slab):

1. Ensure that base material is approved by A/E.

2. Verify that base material is level and compacted.

3.2 INSTALLATION

A. Vapor Retarder For Stud Framed Walls: Secure sheet retarder to stud faces on room side of insulation at exterior walls with adhesive.

1. Conform to manufacturer's instructions for spray adhesives.

2. Perimeter Wall Openings: Seal Air Barrier (Section 072700) to Vapor Retarder with tape, providing a minimum 3 inches overlap.

3. Tape to seal butt ends, lapped flanges, tears, perimeter edges, and other openings in membrane.

B. Below Grade (Under Slab) Vapor Retarder: Install Vapor Retarder in accordance with manufacturer’s instructions and ASTM E1643.

1. Unroll vapor retarder with the longest dimension parallel with the direction of the concrete placement.

2. Lap vapor retarder over footings and seal to foundation walls.

3. Overlap joints 6 inches and seal with manufacturer’s tape.

4. Seal all penetrations (including pipes) per manufacturer’s instructions.

5. No penetration of the vapor retarder is allowed except for columns, walls, reinforcing steel and permanent utilities.

6. Repair damaged areas by cutting patches of vapor retarder, overlapping, damaged area 6 inches and sealing with tape.

7. Small punctures may be repaired by retarder tape.

8. The use of a skid steer on vapor retarder or curing layer is not allowed.

END OF DOCUMENT

DIVISION 09

FINISHES

PART 1 GENERAL

1.1 SUMMARY

A. In general, the principal items of work include, but are not limited to, the following:

1. Preparation of surfaces.

2. Surface preparation, priming and finish coats specified in this Section are in addition to shop priming and surface treatment specified in other Sections.

3. Painting and finishing of all exposed-to-view interior and exterior surfaces, except as otherwise indicated or specified.

a. Paint all surfaces unless otherwise indicated, scheduled, factory finished or indicated to receive a finish in other Sections of the specifications.

b. Refer to the Finish Schedule, notes on the drawings and Part 2 - PRODUCTS in this Section for a general guide to the painting requirements.

4. Field painting of all exposed-to-view mechanical and electrical items such as pipes, ducts, hangers, conduits, and like items in rooms or areas scheduled to be painted.

5. Field painting of prime painted finished door hardware to match the door frame. Hardware includes, but is not limited to, coordinators' housing and associated door closer mounting brackets on door frames, astragals, and other items as required.

6. Life Safety stenciling in accessible concealed space.

7. Sprinkler Piping: Contractor shall include in his bid to cover painting of all exposed sprinkler piping. It is the Contractor's responsibility to verify the extent of exposed sprinkler piping.

8. Touch-up paint all blemished or otherwise disfigured paint on all surfaces which occur prior to acceptance of the building by the Owner.

9. Touch-up paint for field-welded connections on materials that have a hot-dipped galvanized coating.

B. Where items or surfaces are not scheduled or specifically mentioned, paint these items the same as adjacent similar materials or areas. If finish is not designated, the Architect will select these from the paint systems specified.

C. Related Sections:

1. Section 051200 - Structural Steel Framing: Shop priming of exposed steel shapes.

2. Section 055000 - Metal Fabrications: Shop primed items.

1.2 REFERENCES

A. South Coast Air Quality Management District (SCAQMD):

1. SCAQMD Rule 1113 - Architectural Coatings (Amended June 3, 2011)

1.3 DEFINITIONS

A. Exposed Surfaces: The term "exposed surfaces" includes areas visible when permanent or built-in fixtures, covers, grilles, and similar components are in place. Extend painting in these areas as required to maintain the system integrity and provide desired protection.

B. DFT (dry film thickness): Minimum thickness, measured in mils (0.001 inch) of a coat of paint in the cured state.

C. Gloss Ratings: Determine in accordance with ASTM D 523, measured at 60 degree angle of incidence.

Gloss Level (GL)	**Traditional Name**	**Gloss at 60 degrees**	**Sheen at 85 degrees**
Gloss Level 1	Matte or Flat	maximum 5 units	maximum 10 units
Gloss Level 2	Low Sheen	maximum 10 units	10-35 units
Gloss Level 3	Egg Shell	10-25 units	10-35 units
Gloss Level 4	Satin	20-35 units	minimum 35 units
Gloss Level 5	Semi-Gloss	35-70 units	
Gloss Level 6	Gloss	70-85 units	
Gloss Level 7	High Gloss	more than 85 units	

1.4 SUBMITTALS

A. General: Make submittals in accordance with Section 013300 - Submittal Procedures.

B. Product Data: Submit complete list of products proposed for use, including technical data on each product to verify compliance; organize list to indicate painting systems to be used with each substrate.

1. Organize the paint submittal to follow the format in Part 2 of this Section in order to indicate painting systems to be used with each substrate.

2. Submittal shall contain any proposed revisions to specifications (i.e. surface preparation, method of application, etc.) which contractor feels are necessary in their execution of the Contract.

3. Any proposed revisions must be approved by the Architect prior to proceeding with the Work.

C. Submit paint manufacturer's product data sheets and Material Safety Data Sheets highlighting VOC limits for each paint or coating used in the building.

D. Samples: Using approved materials, prepare and submit samples of each type of finish, gloss, and color for approval. Label samples with color number, name and date. Provide one (1) samples each.

1. Prepare paint color samples on 8-1/2 inch by 11 inch heavy, durable non porous paper.

2. Furnish additional samples as required until colors and finishes are approved.

3. Provide a list of materials and applications for each coat of each sample. Label each sample for location and application.

E. Submit samples on the following substrates for the Architect's review of color and texture only:

1. Ferrous Metal: Provide one 4-inch square sample of flat metal and one 8-inch long sample of solid metal for each color and finish.

F. Qualification Data: For firms and persons specified in the "Quality Assurance" Article to demonstrate their capabilities and experience. Include lists of completed projects with project names and addresses, names and addresses of architects and owners, and other information specified.

G. Section 017700 - Closeout Procedures.

1. Include a Paint Project Summary with finish schedule, including detail designating where each product/color/finish was used, Product Data pages, Material Safety Data Sheets, care and cleaning instructions, touch-up procedures, and color samples of each color and finish used.

1.5 QUALITY ASSURANCE

A. Single Source:

1. To the maximum extent practicable, select a single manufacturer to provide all materials required by this Section, using additional manufacturers to provide systems not offered by the selected principal manufacturer.

2. For each individual system, provide primer and other undercoat paint produced by same manufacturer as finish coat. Use only thinners approved by paint manufacturer and use only within recommended limits.

3. Contractor grades are not acceptable.

B. Applicator Qualifications: Engage an experienced applicator who has completed painting system applications similar in material and extent to that indicated for this project with a record of successful in-service performance. The contractor is to have a foreman on site during preparation and painting work.

C. Visual Standards: Each distinct area of the finished Work shall be free of variations in color and sheen, runs, sags, holidays, blistering, checking, cracking, scratches and other signs of poor workmanship.

D. Pre-Work Meeting

1. Convene minimum one week prior to commencing work of this section.

1.6 DELIVERY, STORAGE AND HANDLING

A. General: Comply with requirements specified in Section 016000 - Product Requirements.

B. Deliver materials to building in sealed, original, labeled containers bearing manufacturer's name, type of material, brand name, color designation, and instructions for mixing and thinning.

C. Store materials in tightly covered containers when not in actual use in a place specifically assigned for that purpose which is well-ventilated, dry and out of direct sunlight. Store materials in a manner so as not to exceed the manufacturer's temperature limitations.

1. Protect from freezing. Keep storage area neat and orderly. Remove oily rags and waste daily. Take necessary measures to ensure that workers and work areas are protected from fire and health hazards resulting from handling, mixing and application.

1.7 PROJECT CONDITIONS

A. Environmental Conditions: Air temperature and substrate temperature and relative humidity shall be within the manufacturer’s established limits. Do not apply exterior paint when the following conditions exist, unless requirements of paint manufacturers are more restrictive.

1. Temperature: If surface and ambient temperature is above 90 degrees F, or below 50-degrees F.

2. Relative Humidity: If relative humidity is above 85 percent.

3. Weather: During damp and inclement weather or during excessively windy weather.

B. Lighting: Do not proceed with work under this section unless adequate lighting is available. Provide lighting level of at least 50 candlepower per square foot, measured mid-height at substrate surface.

C. Ventilation: Provide adequate ventilation as required for the type of paint and cleaning materials used. If necessary, consult paint manufacturer for recommendations.

D. Protection: Protect surrounding areas against damage due to painting operations. At a minimum, surrounding areas shall be covered with polyethylene sheeting and waterproof masking tape. The Owner shall not be responsible for Contractor's selection or method of protection.

1. Protective coverings shall be secured against wind and shall be vented to prevent collection of moisture on covered surfaces.

2. Provide "wet paint" signs as required to protect newly painted surfaces.

E. Precautions: Take all precautions to prevent fire; open containers of inflammable materials only when needed; keep rubbing cloths and oily rags in tightly closed containers and remove from site daily. Dispose of hazardous materials in accordance with all local, State and Federal regulations.

1.8 COORDINATION

A. Review other sections in which prime paints are to be provided to ensure compatibility of total coating system for various substrates. Notify Architect in writing of any anticipated problems using specified coating systems with substrates primed by others.

1.9 TESTING FOR ADHESION

A. Field Testing: Field test primers which are to be applied. The purpose of this field testing will be to ensure compatibility and total adhesion of the materials to the various substrates. Notify Architect if results of any test are not in total conformance with the paint manufacturer's specifications. Commencement of work constitutes full responsibility for any resulting unsatisfactory finish.

1.10 MAINTENANCE

A. Extra Materials: Furnish Owner with an additional 1 gallon of each material and color applied along with color book.

1.11 WARRANTY

A. Warrant and guarantee the work of this section against failure or non- performance for one year from the date of substantial completion. Failure or non-performance shall be corrected promptly upon discovery by the owner. Correction work will follow project specifications.

B. Warranty not applicable for failure of substrates, or work by others.

PART 2 PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS

A. Sherwin-Williams Company, Tel. 1-800-321-8194 (Technical Hotline), Website http://www.sherwin-williams.com

1. Local Rep: Leanne Dudley, 425.417.1765, Leanne.N.Dudley@sherwin.com

B. Benjamin Moore, Tel. 1-800-642-5678 Ext. 2217, Website http://www.benjaminmoore.com

1. Local Rep: Amy Griffin, 206.492.4228, Amy.Griffin@Benjaminmoore.com

C. PPG Architectural Coatings, Website: http://www.ppgac.com/

1. Local Rep: Susan Williams, 206.450.5245, suwilliams@ppg.com

D. Miller Paints, Website: http://www.millerpaint.com/

1. Local Rep: Holly Davidson, 425.457.0983.

E. Rodda/Cloverdale Paint Company, Website http://www.roddapaint.com

1. Local Rep: Jeff McIntyre, 206.396.7074.

F. Substitution Requests: Submit for acceptance under provisions of Section 012500.

2.2 PAINT MATERIALS

A. Material Compatibility: Provide block fillers, primers, undercoats and finish-coat materials that are compatible with one another and the substrates indicated under conditions of service and application, as demonstrated by manufacturer based on testing and field experience.

B. Material Quality: Provide manufacturer's best-quality paint material of the various coating types specified. Paint-material containers not displaying manufacturer's product identification will not be acceptable.

C. VOC Compliance:

1. General Emissions Evaluation: Interior products must be tested and determined compliant in accordance with the California Department of Public Health (CDPH) Standard Method v1.1–2010 or the most current version, using the applicable exposure scenario.

2. VOC Content Requirements for Wet Applied Products: All paints and coatings wet-applied on site must meet the applicable VOC limits of the California Air Resources Board (CARB) 2007, Suggested Control Measure (SCM) for Architectural Coatings or the South Coast Air Quality Management District (SCAQMD) Rule 1113, effective February 5, 2016.

D. Paint Content Restrictions:

1. All interior latex paints and coatings must be free of alkylphenol ethoxylates (APEs). This means paint products do not contain intentionally added or unintentionally added/residual APEs (above 100 ppm) using, at a minimum, the list of CAS#s in Pharos: https://pharosproject.net/chemicals/2089943#hazards-panel

2. Epoxy paint should avoid bisphenols including BPA and BPS.

3. Products with antimicrobials marketed with a health claim are not acceptable.

E. Gloss levels: Confirm with Architect.

F. Interior Surfaces

1. DryFall, Multiple Substrates: Including exposed overhead structure, concrete, properly prepared metal, as well as pipes, ducts, hangers, conduits, and like items.

a. One Finish Coat: Water Based Dryfall, Eggshell.

1) Sherwin Williams: Low VOC Waterborne Dryfall, B42 Series, (<50 g/L VOC).

2) PPG Paints: 6-724XI Speedhide Super Tech Interior Dry-Fog Eggshell

3) Benjamin Moore: 395 Latex Dry Fall Flat.

4) Rodda 533801 Dryfall Acrylic Latex Eggshell Dryfall Coating.

5) Miller Paint: . 6-724XI Speedhide Super Tech Interior Dry-Fog Eggshell.

6) Additional coats may be required to achieve uniform color, hiding and appearance.

7) Clean galvanized steel surfaces as specified above.

b. Color: Match paint specified on adjacent walls or surfaces.

2. Structural Shop Primed Ferrous Metal: Including stairs.

a. One Primer Coat:

1) Sherwin Williams: Macropoxy 646-100 Fast Cure Epoxy B58-620 (100 g/L VOC).

2) PPG Paints: Amerlock 2 VOC High Solids Epoxy (<100 g/L VOC).

3) Benjamin Moore: COROTECH V410 Fast Dry Polyamide Epoxy.

4) Rodda: Carboline Carboguard 890 VOC.

5) Miller Paint: Amerlock 2 VOC High Solids Epoxy (<100 g/L VOC).

b. Two Finish Coats: Water based acrylic urethane.

1) Sherwin Williams: Waterbased Acrolon 100 Urethane B65W700 Series (<100 g/L VOC).

2) PPG Paints: Amershield VOC Gloss Urethane (<100 g/L VOC).

3) Benjamin Moore: COROTECH V540 Waterborne Urethane.

4) Rodda: Carboline Carbothane® 134 VOC.

5) Miller Paint: Amershield VOC Gloss Urethane (<100 g/L VOC).

c. Color: Match paint specified on adjacent walls or surfaces.

3. Ferrous Metal: Including factory primed Doors, Frames and Guard rails and Steel Columns.

a. One Primer Coat: Prime unprimed, bare metal (only), with water based corrosion resistant primer.

1) Sherwin Williams: Pro Industrial Pro-Cryl Universal Primer B66W00310 (<100 g/L VOC).

2) PPG Paints: 4020 Pitt-Tech Plus DTM Industrial Primer.

3) Benjamin Moore: Ultra Spec® HP Acrylic Metal Primer HP04.

4) Cloverdale 70323 Ecologic® Rustex Primer.

5) Miller Paint: Acrimetal DTM Primer Interior Exterior 5000.

b. Two Finish Coats: Light industrial water based coating, Semi-Gloss, resistant to harsh cleaners, light abrasion and softening by constant hand contact.

1) Sherwin Williams: Pro Industrial Pre-Catalyzed W/B Epoxy Semi-Gloss K46 Series (141 g/L VOC).

2) PPG Paints: 16-510 Pitt-Glaze WB1 Interior Semi-Gloss Pre-Catalyzed Water-Borne Acrylic Epoxy.

3) Benjamin Moore: Corotech Pre-Catalyzed Waterborne Epoxy Semi Gloss V341.

4) Rodda: Cloverdale 70623 Ecologic Interior - Exterior, 100% Acrylic Latex Semi-Gloss Finish.

5) Miller Paint: Waterborne Epoxy Semi Gloss 183-5-10.

c. Color: Match paint specified on adjacent walls or surfaces.

4. Factory primed or unprimed miscellaneous metal: Including Mechanical and Electrical and Equipment Items. Prep as appropriate for substrate.

a. Prime all bare metal as needed with water based corrosion resistant primer.

1) Sherwin Williams Pro Industrial Pro-Cyl Universal Primer B66W00310 (<100 g/L VOC).

2) PPG Paints: 4020 Pitt-Tech Plus DTM Industrial Primer.

3) Benjamin Moore: Ultra Spec® HP Acrylic Metal Primer HP04.

4) Rodda: Cloverdale 70323 Ecologic® Rustex Primer.

5) Miller Paint: Acrimetal DTM Primer Interior Exterior 5000.

b. Exposed Insulated Piping:

1) Finish Coats: Match paint specified on adjacent walls or surfaces.

c. Exposed Galvanized Ducts, Piping, Conduits, etc.:

1) Finish Coat: Match paint specified on closest adjacent walls or surfaces.

d. Exposed Ferrous Piping, Hangers (and like items):

1) Finish Coat. Match paint specified on adjacent walls or surfaces.

e. Interior of all Ducts at Grilles, Registers and Diffusers: One Coat.

1) Sherwin Williams: ProMar 200 Zero VOC Black.

2) PPG Paints: Speedhide Interior Flat Black Latex 6-753.

3) Benjamin Moore: Ultra Spec 500, Black.

4) Rodda 513601 MP Ultra Low Interior Gloss Level 1 Flat Finish Black.

5) Miller Paint Acrimetal DTM Velvet Black 310-277.

f. Unprimed grilles and diffuser face plates, Match paint specified on adjacent walls or surfaces.

5. Interior Pre-primed Mechanical Wall Grilles and Diffusers.

a. Two Finish Coats: Match paint specified on adjacent walls or surfaces.

6. Colors: Each paint color must be accurately mixed to ensure color continuity. No allowance will be granted for mis-matched paint of the same color when viewed under normal lighting conditions.

G. Provide primer and finish coats which are compatible with each other and with prime coats provided under other Sections. Provide barrier coats over incompatible primers or remove and re-prime as required.

H. Tint each undercoat a lighter shade than finish coat so that numbers of coats can be easily discerned. No color mixing will be allowed at the job-site.

I. Thinner: Type as recommended by the paint manufacturer. Use thinner only when recommended by the paint manufacturer, and then only in a quantity as indicated on the label.

J. Primers: Primers, except metal primers, shall be white in color for inspection purposes.

K. Secondary Products: Secondary products not specified by name and required for the job such as shellac, oils, patching compounds, putty, etc., shall be "best grade" products.

PART 3 EXECUTION

3.1 EXAMINATION

A. General: Examine surfaces to receive paint finish for conditions that will adversely affect execution, performance, or quality of work and which cannot be put into an acceptable condition through reasonable preparatory work as specified herein.

1. Surfaces which are unfit to receive the work of this section shall be repaired, replaced or re-finished such that they are acceptable and such that the work of this section may be done as specified. It shall be the responsibility of the General Contractor to ensure that these provisions are strictly enforced.

2. Commencement of Work constitutes acceptance of surfaces and conditions.

3.2 SURFACE PREPARATION (GENERAL)

A. General: Surface preparations and cleaning procedures shall be in strict accordance with the instructions and specifications of the paint manufacturer and with the requirements of this specification.

B. Removal of Fixtures: Cooperate with other trades and coordinate removal of fixtures, hardware items, and equipment, as required for painting work. Items to be removed on surfaces to be painted include: switch and receptacle plates, escutcheons and like plates, surface-mounted equipment, free-standing equipment which blocks access to painting surfaces, grilles and louvers at duct openings into finished spaces, and other items as required and directed.

C. Pre-Cleaning: Remove oil and grease prior to mechanical cleaning as hereinafter specified by methods outlined in SSPC-SP 1 "Solvent Cleaning."

3.3 SURFACE PREPARATION

A. Uncoated Ferrous Metal: For interior metals not requiring paint, surfaces are to remain as received from the factory.

B. Shop-Coated Ferrous Metal: Thoroughly degrease surfaces and clean using solvent (SSPC-SP 1). Remove loose rust, blistered and peeling paint to bare metal by scraping, sanding, wire brushing, or other abrasion methods in accordance with SSPC-SP 2 or SP 3; feather edges of adjacent sound paint. Dull glossy surfaces by scuff-sanding and wipe down. Spot-prime all abraded portions, rust areas, and bare surfaces with specified primer on same day of surface preparation. Finish prime after spot priming has dried thoroughly.

C. Galvanized Metal: Clean surfaces to remove factory films and oily residue as recommended by the paint manufacturer. Responsibility for insuring that the surface is properly prepared rests with the painting sub-contractor. Clean galvanized metal the same day to be painted.

3.4 CLEANING PRIOR TO PAINTING

A. Remove dust and loose deleterious materials from all surfaces before beginning painting operations. Program the cleaning and painting so that dust and other contaminants from the cleaning process will not fall in wet, newly painted surfaces.

3.5 APPLICATION OF PAINT

A. Mixing: Mix paint materials in accordance with the manufacturer's instructions and directions. Mix often enough during application to keep the paint uniform and to ensure complete dispersion of pigment and a uniform composition.

1. Prepare multiple component coatings using all of the contents of the container for each component as packaged by the manufacturer. Mixing of partial kits will not be permitted. Multiple component coatings that have been mixed shall not be used beyond their pot life. Only the components specified and furnished by the manufacturer, including thinner if required, shall be mixed.

B. Application: Apply paint in accordance with the manufacturer's directions. Use techniques best suited for substrate and type of material being applied. Brushes and rollers shall be of a type best suited for the type of material being applied.

1. Apply intermediate and finish coats within the manufacturer's recommended top coating time periods.

C. Apply each coat of paint as a continuous film of uniform thickness, free from holidays, sags, crawls, pinholes, blisters, unevenness in color, or other evidence of poor workmanship. Repaint thin spots or areas missed in the application and allow to dry before applying next coat of paint.

1. Give special attention to ensure that surfaces, such as edges, corners, crevices, welds and exposed fasteners receive a dry film thickness equivalent to that of flat surfaces.

2. Each coat shall be free of dirt, dust, moisture, etc., prior to application of next coat.

D. Allow each coat of paint to thoroughly dry, full thickness of the film, before application of the succeeding coat. Paint is considered dry for recoating when the next coat can be applied without the development of any detrimental film irregularities such as wrinkling, lifting, or loss of adhesion of the previous coat.

E. Coverage for each paint material is specified as either the total minimum dry film thickness in mils, or the spreading rate in square feet per gallon over the surface designated. Actual coverage rate will vary depending upon the texture and porosity of the surface, climatic conditions, etc.

1. The number of coats specified is the minimum required, irrespective of the coating thickness.

2. In the event the required paint thickness is not achieved, apply additional coats until the required thickness is obtained.

3. Do not exceed manufacturer's recommended maximum film build-up per coat (wet mils).

F. Recoat primed and sealed walls and ceilings where there is evidence of suction spots or unsealed areas in first coat to ensure a finish coat with no burn-through or other defects.

G. Sand lightly between coats of enamel to produce an even, smooth finish. Wipe to remove dust before recoating.

H. Make edges of paint adjoining other materials or colors clean and sharp with no overlapping.

I. Do not paint over any code-required labels or any equipment identification or nomenclature plates.

J. Tops and bottoms of metal doors shall be finished the same as the faces (primed and two finish coats of painted).

3.6 DAMAGED PAINT SURFACES

A. General: Before final acceptance of the work by the Architect, repair or re-finish painted surfaces which have been damaged at no additional cost. Refinish whole wall where portion of finish is not acceptable.

B. Painted Structural Steel: Areas of chipped, peeled, or abraded paint shall be hand or power sanded, feathering the edges. Prime and finish coat the areas using the same material as originally scheduled. Depending on the extent of repair and its appearance, an overall finish coat may be required by the Architect to achieve uniform appearance.

3.7 CLEAN-UP

A. General: During the progress of the work, remove from the project all discarded paint materials, rubbish, cans and rags. Leave premises clean and in orderly condition.

B. Cleaning: Upon completion of painting work, clean window glass and other paint-spattered surfaces. Remove spattered paint by proper methods of washing and scraping, using care not to scratch or otherwise damage finished surfaces.

3.8 PROTECTION

A. Protect work of other trades, whether being painted or not, against damage by painting. Correct damage by cleaning, repairing or replacing, and repainting, as approved by Architect.

B. Remove temporary protective wrappings after completing painting operations.

END OF SECTION 099000

DIVISION 23

HEATING, VENTILATING, AND AIR CONDITIONING (HVAC)

PART 1 GENERAL

1.01 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 00 and Division 01 Specification Sections, apply to this Section.

B. Requirements of Section 23 05 00 apply to this Section.

1.02 WORK INCLUDED

A. Operation and Maintenance Manual.

1.03 SUBMITTALS

A. General: Comply with Section 23 05 00 and Division 01.

B. Preliminary O&M: Submit preliminary review O&M manual for review.

C. Final O&M: Submit Final O&M manuals per Division 01.

PART 2 PRODUCTS

2.01 GENERAL

A. General Contents: A maintenance manual shall be compiled containing maintenance and operating information and maintenance schedules for all project mechanical systems. See Division 01 for quantities, organization, format, and other requirements; meet additional requirements as specified herein.

2.02 SUBMITTAL DATA AND TECHNICAL O&M DATA

A. Submittal Data:
   1. General: Provide a copy the submittal data (clearly identified and marked to suit each item). Note: The submittals are not retained by the Owner and a copy is therefore required in the O&M.
   2. Product Data: Manufacturer’s technical product data, with manufacturer's model number, description of the equipment, equipment capacities, equipment options, electrical power voltage/phase, special features, and accessories. Label data sheets with same designation as used on contract documents. Provide for all items requiring maintenance and for items that may require replacement over a 30-year period or be revised due to an Owner building improvement.
   3. Shop Drawings: Provide copy of final shop drawings as approved for each area where shop drawings were required to be submitted.

B. Technical O&M Data: Provide for each equipment or item requiring maintenance. Label O&M data to clearly indicate which equipment on the project it applies to (use same designation as used in the Contract Documents). Data to include:

1. Manufacturer's operating and maintenance manuals and instructions.
2. Itemized list of maintenance activities and their scheduled frequency.
3. Maintenance instructions for each maintenance activity.
4. Manufacturer's parts list.
5. Manufacturer's recommended lubricants.
6. Size, quantity and type of filters required (as applicable).
7. Size, quantity and type each belts unit requires (as applicable).
8. Size, quantity and type of fuses (as applicable).

C. Sources: Provide names, addresses, and phone numbers for local manufacturer's representative, service companies, and parts sources for mechanical system components.

D. Start-Up Reports: Include copies of all equipment and system start-up reports.

2.03 MAINTENANCE SCHEDULES

A. General: Provide Maintenance schedules with an itemized list of maintenance activities and their scheduled frequency (i.e., weekly, monthly, semi-annually, etc.) for item requiring maintenance.

B. Special Maintenance: List any critical maintenance items or areas requiring special attention.

C. Start-Up/Shut-Down: Provide normal start-up, operating, and shut-down procedures; emergency shut-down procedures; and (where applicable) seasonal shut-down procedures.

PART 3 EXECUTION

NOT USED

END OF SECTION

PART 1 GENERAL

1.01 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 00 and Division 01 Specification Sections, apply to this Section.

D. Division 23 - Heating, Ventilation, and Air Conditioning (HVAC) Systems.

E. Division 25 - Integrated Automation.

1.02 WORK INCLUDED

A. General Mechanical System Requirements.

B. Mechanical System Motors.

C. Identification and Labeling.

1.03 DEFINITIONS

A. Abbreviations and Terms: Where not defined elsewhere in the Contract Documents, shall be as defined in RS Means Illustrated Construction Dictionary, Fourth Addition and in the ASHRAE Handbook of Fundamentals, latest edition.

B. "As required" means "as necessary to form a safe, neat, and complete working installation (or product), fulfilling all the requirements of the specifications and drawings and in compliance with all codes."

C. "Concealed" means "hidden from view" as determined when areas are in their final finished condition, from the point of view of a person located in the finished area. Items located in areas above suspended ceilings, in plumbing chases, and in similar areas are considered "concealed." Items located in cabinet spaces (e.g. below sinks) are not considered concealed.

D. "Coordinate" means "to accomplish the work with all others that are involved in the work by: directly discussing the work with them, arranging and participating in special meetings with them to discuss and plan the work being done by each, obtaining and completing any necessary forms and documentation required for the work to proceed, reaching agreement on how parts of the work performed by each trade will be installed relative to each other both in physical location and in time sequence, exchanging all necessary information so as to allow the work to be accomplished with a united effort in accordance with the project requirements".

E. "Finished Areas" means "areas receiving a finish coat of paint on one or more wall surface."

F. "Mechanical", where applied to the scope of work, includes all project plumbing systems, HVAC systems, and controls for these systems and all work covered by specification Divisions 23, and 25. Such work is shown on multiple drawings and is not limited to a particular set of sheets, or sheets prefaced with a particular letter.

G. The term "related documents" (as used at the beginning of each specification section), and the Specification Divisions and Sections listed with it, is only an indication of some of the specification sections which the work of that section may be strongly related to. Since all items of work relate to one another and require full coordination, all specification sections, as listed in the Table of Contents, shall be considered as being "related documents", and shall be considered (by this reference) in the same manner as if they had all been listed under the term "related documents" in each specification section.

H. "Work included" (as used at the beginning of each specification section), and the items listed with it, is only an indication of some of the items specified in that Section and is in no way limiting the work of that Section. See complete drawings and specifications for all required work.

I. "Verify" means "Contractor shall obtain, by methods independent of the project Architect/Engineer and Owner, the information noted and the information needed to properly perform the work". Where used as "verify existing" the reference is to all existing items related to the work (i.e. piping systems, duct systems, electrical power, controls, structural conditions, space available, building construction type, etc.); the "verify" definition shall include "Confirm by means independent of any existing field labeling and independent of the Architect/ Engineer and Owner what the existing piping (or duct) system contains, sizes, what the flow direction is, what normal pressures/temperatures are, what other systems and areas the piping (or duct) is interconnected to; what the existing control voltages/signal types are by direct measurement; what the existing electrical power voltages and phases are by direct measurement; and additional field verification and coordination to ensure that compatible products are provided, correct connections made, and all work performed to allow for fully functioning systems." "Means independent of existing field labeling" shall include methods such as: the use of exterior pressurized sources to pressurize piping system lines, use of flow tests with dyes, physical tracing of piping and all connections to, electronic detection methods, electronic/electric line tracing, electrical measurements, physical disassembling of system, excavation or uncovering of concealed systems, use of insertion cameras and similar efforts.

J. "Substitution": As applied to equipment means "equipment that is different than the 'Basis of Design' equipment scheduled on the drawings (or otherwise indicated in the contract documents)".

1.04 GENERAL REQUIREMENTS

A. Scope: Furnish all labor, materials, tools, equipment, and services for all mechanical work. This section applies to all Division 23, 25 specifications and to all project mechanical work. All mechanical equipment and devices furnished or installed under other Divisions of this specification (or by the Owner) which require connection to any mechanical system shall be connected under this division of the Specifications.

B. General: All work shall comply with Division 00, General Conditions, Supplementary Conditions, Division 01, and all other provisions of the Contract Documents.

C. Code:

1. Compliance: All work shall be done in accordance with all applicable codes and ordinances. Throughout the Project Documents, items are shown or specified in excess of code requirements; in all such cases, the work shall be done so that code requirements are exceeded as indicated. Comply with code accessibility requirements.

2. Documentation: Maintain documentation of all permits and code inspections for the mechanical work; submit documentation showing systems have satisfactorily passed all AHJ inspections and requirements.

3. Code Knowledge: Contractor and workers assigned to this project shall be familiar and knowledgeable of all applicable codes and ordinances. Code requirements are typically not repeated in the Contract Documents. By submitting a bid, the Contractor is acknowledging that the Contractor and workers to be utilized on this project have such knowledge.

4. Proof of Code Compliance: Prior to final completion, satisfactory evidence shall be furnished to show that all work has been installed in accordance with all codes and that all inspections required have been successfully passed. Satisfactory evidence includes signed inspections by the local code authority, test lab results, qualified and witnessed field tests, and related acceptance certificates by local code authorities, and field notes by the Contractor as to when all inspections and tests occurred.

D. Complete Systems: Furnish and install all materials, appurtenances, devices, and miscellaneous items not specifically mentioned herein or noted on the drawings, but which are necessary to make a complete working installation of all mechanical systems. Not all accessories or devices are shown or specified that are necessary to form complete and functional systems.

E. Review and Coordination:

1. General: To eliminate all possible errors and interferences, thoroughly examine all the Drawings and Specifications before work is started, and consult and coordinate with each of the various trades regarding the work. Such coordination shall begin prior to any work starting, and continue throughout the project.

2. Suppliers: Suppliers of products shall review the documents to confirm that their products are suitable for the application and that all manufacturers requirements and recommendations have been satisfactorily addressed in the Contract Documents. Where not addressed the supplier shall notify bidders and the Engineer prior to bidding to resolve any issue or include in their bid an adequate amount to resolve the issue.

F. Conflicts and Discrepancies: Notify the Architect/Engineer of any discrepancies or conflicts before proceeding with any work or the purchasing of any materials for the area(s) of conflict until requesting and obtaining written instructions from the Architect/Engineer on how to proceed. Where conflicts occur, the most expensive and stringent requirement (as judged by the Architect/Engineer) shall prevail. Any work done after discovery of such discrepancies or conflicts and prior to obtaining the Architect/Engineer's instructions on how to proceed shall be done at the Contractor's expense.

G. Drawings and Specifications: Drawings and specifications are complementary and what is called for in either is binding as if called for in both. The drawings are diagrammatic and show the general arrangement of the construction and therefore do not show all offsets, fittings and accessories which are required to form a complete and operating installation. Mechanical work is shown on multiple drawings and is not limited to a particular set of sheets, or sheets prefaced with a particular letter.

H. Offsets/Fittings:

1. Piping Systems: Include in bid all necessary fittings and offset to completely connect up all systems, maintain clear access paths to equipment, and comply with all project requirements. Offsets are required to route piping around building structural elements, roof slopes, mechanical systems, electrical systems, and numerous other items. Due to the schematic nature of the plans such offsets are typically not shown. Contractor is responsible to determine the quantity of offsets and fittings required, and the labor involved. No added payment or “extras” will be granted for the Contractor’s failure to correctly estimate the number of offsets and fittings and labor required. Contractor is advised that equipment and fixture connections may require more than 20 elbows per plumbing fixture and coil per pipe line.

2. Duct Systems: Include in bid all necessary fittings, offsets, and transitions to completely connect all systems, maintain clear access paths, and comply with all project requirements. Offsets are required to route ducts around building structural elements, roof slopes, mechanical systems, electrical systems, and numerous other items. Due to the schematic nature of the plans such offsets are typically not shown. Contractor is responsible to determine the quantity of offsets and fittings required, and the labor involved. No added payments or “extras” will be granted for the Contractor’s failure to correctly estimate number of offsets, fittings, transitions and labor required. Contractor is advised that transitions are required at connections to all equipment, to all air inlets/outlets, crossing of beam lines, at crossing with piping, and similar locations.

I. Design: The level of design presented in the documents represents the extent of the design being furnished to the Contractor; any additional design needed shall be provided by the Contractor. All design by the Contractor shall be performed by individuals skilled and experienced in such work, and where required by local code (or elsewhere in the documents) shall be performed by engineers licensed in the State where the project is located. Include in bid the costs of all such project design; including engineering, drafting, coordination, and all related activities and work. Such designs services are required for many building systems; including but not limited to ductwork at equipment,

piping at fixtures and equipment, hanger/support systems, temporary duct/piping systems, mechanical offsets/adjustments to suit other system, seismic anchors, and for methods/means of accomplishing the work. Where design or performance criteria to be met is not stated (or is unclear), develop proposed criteria (based on code, similar projects, and related data) and submit the proposed criteria for review prior to performing full design work.

J. Special Tools: Furnish to the Owner one complete set of any and all special tools such as odd size wrenches, keys, etc. (allen wrenches are considered odd), which are necessary to gain access to, service, or adjust any piece of equipment installed under this contract. Each tool shall be marked or tagged to identify its use. Submit a written record listing the special tools provided, date, and signed by the Owner's representative receiving the tools.

K. Standards and References: Shall be latest edition unless a specific edition, year, or version is cited, or is enforced by the AHJ.

L. Warranties:

1. General: Products and workmanship shall be warranted to be free from all defects, capable of providing satisfactory system operation, and conforming to the requirements of the Contract Documents. Include in the project bid all costs associated with project warranties to ensure that the warranty extends for the required period; possible project delays and failure by others to complete their work may cause the start of the warranty period to be delayed. The Contractor shall be responsible for increasing the warranty dates by corresponding amounts to provide the required warranty periods.

2. Basic Project Warranty: As described in the General Conditions, Supplementary Conditions, and Division 01. See individual specification sections for specific warranty requirements. Start date and duration are as indicated in General Conditions, Supplementary Conditions, and Division 01. Where not indicated otherwise, the basic project warranty shall start at project substantial completion and be for one year.

3. Special Warranties: See individual specification sections for special warranty requirements and extended warranty periods beyond the basic project warranty.

M. Permits and Fees:

1. Obtain and pay for all permits, licenses, fees and inspections as required by the Code and as specified herein (unless noted otherwise).

2. Pay all charges made by any utility company or municipality for material, labor or services incident to the connection of service (unless noted otherwise).

1.05 SUBSTITUTIONS

A. General: See Division 00 and 01 for information and requirements regarding substitutions. Manufacturers not scheduled on the plans or listed as “Acceptable Manufacturers” require prior approval and shall submit a substitution request form (see

Division 01 for requirements and limitations). See Paragraph 2.01 this specification section regarding "Acceptable Manufacturers".

B. Redesign:

1. The Contract Documents show design configurations based on particular manufacturers. Use of other manufacturers' products (i.e. substitutions) from what is shown (or specified) may require redesign of mechanical, plumbing, controls, fire protection, electrical, structural, and general building construction to accommodate the substitution.

2. Review the installation requirements for substitutions and provide redesign of all affected construction. The redesign shall be equal or superior in all respects to the Architect/Engineer's design (as judged by the Architect/Engineer), including such aspects as equipment access, ease of maintenance, utility connection locations, unit electrical requirements, noise considerations, unit performance, and similar concerns.

3. Redesign shall be done by the Contractor and shall meet the requirements and have the approval of the Architect/Engineer prior to beginning work. Apply for and obtain all permits and regulatory approvals.

C. Construction Modifications: Provide all required construction modifications to accommodate the substituted products; this includes all mechanical, plumbing, controls, fire protection, electrical, structural, and general building construction. Construction modification shall comply with code, specifications, and be equal to designed construction.

D. Costs: Cost of redesign, construction costs, and all additional costs incurred to accommodate substituted equipment shall be borne by the Contractor.

E. Submittals: In addition to other required submittals, submit shop drawings showing the redesign for substituted equipment; submittal shall include installation plans and sections, connecting services (i.e. ducts, piping, electrical) locations and routing, required service clearances, and related installation details. Submit data required by other disciplines to allow review of the impact of the substitution (i.e. weights, electrical).

1.06 QUALITY ASSURANCE

A. Experience: All work shall be performed by individuals experienced and knowledgeable in the work they are performing, and experienced with the same type of systems and building type as this project. By virtue of submitting a bid, the Contractor is acknowledging that workers to be utilized on this project have such experience and knowledge. Upon request of the Engineer, submit resumes showing the work history, training, and types of projects worked on, for individuals assigned to this project.

B. Code: Utilize workers experienced and knowledgeable with codes pertaining to their work; verify code compliance through-out the project.

C. ASME: All pressure vessels, pressure vessel safety devices, and pressure vessel appurtenances shall comply with the standards of, and bear the stamp of ASME.

D. Quality Assurance Checks: Prior to ordering products and making submittals, confirm the following for each:

1. General: Product is suitable for the intended purpose and complies with the Contract Documents.

2. Manufacturer: Product's manufacturer is listed as an acceptable manufacturer in the Contract Document's or a substitution request (where allowed) has been submitted and the manufacturer has been listed as acceptable.

3. Electrical (for products requiring electrical power):

   a. Product is for use with the voltage/phase as indicated on the electrical plans (or for the electrical circuit the item will be connected to).

   b. Product's ampacity requirements (MCA) do not exceed that indicated on the electrical plans (or for the electrical circuit the item will be connected to).

   c. Where product is a replacement for an existing product, and is to be re-connected to an existing circuit, the existing voltage/phase has been field verified and product matches voltage/phase available.

4. Weight: Product's weight is no greater than that indicated.

5. Space Verification: Product will fit in the space available, and along the path available to install the item, will have adequate service clearances, and will not impede on any clearances required for other items in the space the item will be located.

6. Installation: A suitable method for installing the product has been selected which meets the project schedule and other requirements.

7. Anchorage/Support: The manufacturers recommended method of anchorage and support is consistent with the method indicated in the Contract Documents, and the item has provisions suitable for such anchorage/support.

8. Lead Time: The product's fabrication, shipping, and delivery period meets the project schedule requirements.

9. Substituted Equipment: Where equipment is not the basis of design confirm all requirements for substituted equipment have been met and shop drawings of construction revisions have been (or are being) prepared.

10. Controls: Item is compatible with the controls it will be connected to and has been coordinated with the firm providing the project control work to provide the specified (or required) sequence of operation.

11. Listing: Item is Listed when required to be as such. And if the item is to be installed as part of a Listed system or assembly, it is compliant with the Listing of the overall system or assembly.

12. Existing Buildings/Systems: Product size, weight, connecting services (i.e. electrical, controls, power, plumbing, etc.) are configured and suitable for existing items they connect to or interface with.

E. Check-Out: The Contractor shall be responsible to verify that proper installation and proper connections have been provided for all mechanical work. Contractor shall provide installation checkout, start-up services, and perform a thorough check of all mechanical systems to verify proper installation and operation. Contractor shall operate all items multiple times under varying conditions to confirm proper operation. Contractor shall submit a checklist listing all equipment, fixtures, and similar items furnished on this project, with a date and initials indicating when the item was checked, a list of what was checked, and by whom. Such check shall, as a minimum utilize documents provided by the equipment manufacturer. Such a check-out is in addition to any commissioning activities specified (unless noted otherwise).

1.07 SUBMITTALS

A. General:

1. See Division 00 and 01 for submittal requirements.

2. By making a submittal (of shop drawings or product data) the Contractor represents that they have reviewed them for compliance with the Contract Documents, including detailed connection and installation features and requirements, and that the submitted item is their proposed method of compliance with the Contract Documents.

3. Perform no portion of the work for which the Contract Documents require a submittal until the respective submittal has been made, the review completed by the Architect/Engineer, and all issues resolved.

4. The Owner and Architect/Engineer are depending on the submittal process as a final review and confirmation of materials and various aspects of the work, and may make changes in the project due to information contained in the submittals and with the understanding that the opportunity to make changes exist until submittals are made and the review is completed. The Contractor is responsible for added costs which may be incurred if work is performed which limits the Owner the opportunity to make such changes (e.g. work done prior to a submittal being made or the submittal review being completed).

5. Submittals shall be logically organized, neat and legible. Submittals to include:

a. Name of project.

b. Owner’s name.

c. Specification section reference and paragraph (or drawing number or detail) submittal is for.

d. Contractor name and contact information.

e. Subcontractor name and contact information.

f. Date of submittal.

B. Quality Assurance: By submitting an item for review, the Contractor is claiming that all "Quality Assurance Checks" (see paragraph 1.06 this specification Section) have been performed and satisfactorily passed and no further comment from the submittal reviewer is required for the "Quality Assurance Checks".

C. Variations: Only variations that are specifically identified as described herein will be considered. Provide with the submittal (in addition to other information required): description of the proposed variation, entity who is proposing the variation, why the variation is being proposed, any cost changes associated with the variation, and any other pertinent data to allow for review. Failure to submit information on the variation as described will result in the submittal review being conducted without considering the variation.

D. Product Submittals - Information Required:

1. Manufacturer's professionally developed documents, containing product description, model number, and illustrations. Mark clearly to identify pertinent information and exact model and configuration being submitted.

2. List of accessories and options provided with product.

3. Product dimensions and clearances required.

4. Product weight.

5. Submittal identified with product name and symbol (as shown on the drawings or written in the specifications) and specification Section and paragraph reference.

6. Performance capacity and characteristics showing compliance with the Contract Documents.

7. Manufacturer's and local manufacturer's representative names, addresses, and phone numbers.

8. For equipment requiring piping or duct connections:

   a. Type of connections required.

   b. Size and locations of connections.

9. For electrically operated equipment:

a. Number and locations of electrical service connections required.

b. Voltage required.

c. Fuse or circuit breaker protection requirements.

d. Motor starter requirements; if motor starter is furnished with the equipment, submit product information on motor starter.

10. For equipment requiring control connections:

a. Type of control signals required.

b. Control communication protocol.

c. Information on control devices furnished with equipment.

d. Location of control connections.

11. Manufacturer's installation instructions.

12. See each specification Section for additional submittal requirements.

13. Edited Content: Submittals shall indicate the equipment and options that are to be provided. Copies of an unedited catalog will be rejected. Pages/items that are not applicable shall be deleted prior to submittal to the Engineer.

E. Shop Drawing Submittals:

1. Shop drawings shall be professionally drafted using AutoCAD, Revit, or an equivalent compatible program (hand sketches are not acceptable). Shop drawings shall be independently developed by the Contractor and not be a copy of the Contract Drawings.

2. Submit electronic files in original drafting format (i.e. *.dwg) and pdf format with as-built documentation.

3. Provide shop drawings for the following systems:

a. HVAC control systems.

b. For any parts of any system which are to be installed differently than as shown on the drawings.

c. Construction revisions to accommodate Substituted Equipment.

d. Other areas/work as noted in the Contract Documents.

e. For those systems requiring shop drawings, reference system's specification Section for additional requirements.

F. Re-Submittals: If submittals are marked 'Rejected' or 'Revise and Resubmit', the Contractor shall revise the submittal to satisfy the comments or conform to project requirements, and submit to the Engineer for review. Only those items that were rejected or required a resubmittal will be reviewed by the Engineer; All other items will not be reviewed. All re-submittals shall be at least one of the following:

1. Provide a 'Re-Submittal Summary Sheet' which indicates how each comment was addressed (it is acceptable to add the responses to a copy of the original submittal review comments).

2. Cloud (or otherwise clearly identify) the revised portions to indicate what is different from the original submittal.

1.08 RECORD DOCUMENTS

A. Field Record Drawings: Maintain a set of full size contract plans at the project site upon which all changes from the as-bid plans are noted. Plans shall be maintained clean, dry and legible; with information recorded concurrent with construction progress. These plans shall also include actual locations (with dimensions) of all underground and concealed mechanical systems. Connection points to outside utilities shall be located by field measurements and so noted on these record drawings. All addenda, change order, field orders, design clarifications, request for information, and all other clarifications and revisions to the plans shall also be made a part of these record drawings. Plans shall be available for weekly review by the Architect/Engineer. Label drawing "As-Builts" with date, name of Contractor, and name of individual overseeing the work.

B. Final Field Record Drawings Submittal: Deliver to the Architect/Engineer the original Field Record drawings and one full size copy.

1.09 PRODUCT HANDLING, PROTECTION AND MAINTENANCE

A. Protection:

1. Protect all products from contamination, becoming unclean, and from damage of any kind and whatever cause; when being handled, in storage, and while installed, until final project acceptance.

2. Completely cover fixtures, motors, control panels, equipment, and similar items to protect from becoming unclean and damage of any kind.

3. Protect premises and work of other trades from damage due to Mechanical work.

B. Openings: Cap all openings in pipe, ductwork and equipment to protect against entry of foreign matter until all work that could cause unclean conditions or damage is complete (including work that has dust or fumes associated with it). Caps shall be of sufficient strength and seal integrity to prevent entry of water or fumes for the most extreme conditions they may be exposed to (i.e. high velocity water spray, high winds, concrete splash, etc.)

C. Storage: Provide properly conditioned and sheltered storage facilities for products to prevent damage of any kind and to maintain new condition. Provide adequate venting arrangements to avoid condensation damage.

D. Operation and Maintenance:

1. General: Inspect products periodically to confirm conditions and maintenance needs. Keep records of inspections and (upon request) forward to the Architect/Engineer prior to project final acceptance. Operation and Maintenance shall be in accordance with manufacturer's written procedures and recognized best maintenance practices. Keep records of maintenance and (upon request) forward to the Architect/Engineer prior to project final acceptance.

2. Stored Products: Provide maintenance (i.e. equipment rotation, lubrication, flush, cleaning, etc.) and inspection on products while stored to maintain new condition.

3. Installed Products: Provide maintenance and inspection of products and operate mechanical systems until substantial completion or specified Owner Instruction has been provided (whichever is later). Maintenance shall include all labor and materials and all manufacturers' recommended maintenance (i.e. strainer cleaning, filter changes, bearing lubrication, belt tensioning, etc.). In addition to scheduled maintenance, review all equipment periodically to allow detection of improper operation or any special maintenance needs; review shall be consistent with best practices for the product but in no case less than a site visit every two weeks. Document all maintenance activities.

E. Damaged Products: Damaged products shall be replaced with new. Where damage is limited to paint (or similar finish), the product may remain if the finish is restored to a new condition (as judged by the Architect/Engineer).

1.10 JOB CONDITIONS

A. Special Requirements:

1. Maintain emergency and service entrance usable to pedestrian and vehicle traffic at all times. Where trenches are cut, provide adequate bridging for traffic.

2. Coordinate startup and shutdown of all mechanical systems and utilities with related trades and the Owner's representative.

3. Coordinate all construction activities with the Owner's Representative and cooperate fully so as to minimize conflicts and to facilitate Owner usage of the premises during construction.

4. Provide temporary services to occupied areas to accommodate Owner's use during construction. All temporary work shall comply with same specifications as for new work and be of same quality.

B. Downtime Restrictions:

1. Contractor shall notify the Owner at least 72 hours in advance of any intended shut-down of any building services or systems and obtain Owner approval prior to proceeding.

2. Electrical power to the building shall not be interrupted at any one time for more than 15 minutes.

C. Schedule of Work: Arrange work to comply with schedule of construction, and so as not to violate any downtime restrictions, and to accommodate the Owner's scheduled use of the premises during construction.

1.11 ENGINEER FIELD REVIEWS AND TEST WITNESSING

A. General: Arrange construction schedule and notifications to the Engineer to accommodate Engineer's schedule and the possibility of review times occurring up to 14 days after notification, and for the possible failure to satisfactorily pass Engineer's reviews requiring revisions and re-reviews.

B. Notification: Notify Engineer at least 7 days in advance of readiness for reviews; arrange mutually agreed upon times for the reviews to occur.

C. Access: Provide ladders, any special tools and safety equipment to allow Engineer's access to areas and equipment. Remove and reinstall ceiling tiles, access panels, and similar items where requested to allow for reviews.

D. Review of Systems with Equipment:

1. Prior to Engineer's review, system's equipment shall have received specified start-up and be substantiated by a written report.

2. Prior to Engineer's review, systems shall have been operating properly for at least five consecutive days prior to the scheduled review date.

3. Personnel shall be present to operate the system's equipment and controls, and to vary system settings as directed by the Engineer to allow for a review of operation over a range of settings.

E. Re-Review Fees: The project budget allows for one review by the Engineer for specified reviews and witnessing. See Division 00 and 01 for compensation to the Engineer for required re-reviews.

PART 2 PRODUCTS

2.01 ACCEPTABLE MANUFACTURERS

A. General: Any reference in the Specifications or on the Drawings to any article, device, product, material, fixture, form or type of construction by manufacturer, name, make, model number, or catalog number shall be interpreted as establishing a standard of quality and shall not be construed as limiting competition. The manufacturers listed as

Acceptable Manufacturers may bid the project for the items indicated without submitting a substitution request; however that does not relieve the products from having to comply with the Contract Documents.

B. Substitutions: Products by manufacturers listed as “Acceptable Manufacturers” (other than those listed as the “Basis of Design”) are considered substitutions and shall comply with the requirements for substitutions. See Paragraph titled “Substitutions” in Part 1 of this specification section.

C. Considerations: In reviewing a manufacturer for acceptance, factors considered (as compared to the specified item) include: engineering data showing item's capacity, performance, proper local representation of manufacturer, likelihood of manufacturer's future local support of product, service availability, previous installations, previous use by Owner/Engineer/Architect, product quality, availability/quality of maintenance and operation data, electrical requirements, capacity/performance, acoustics, physical dimensions, weight, items geometry and access requirements, utility needs, and similar concerns.

D. Limitations of the Term “Acceptable Manufacturer”: The listing of a manufacturer as an Acceptable Manufacturer does not necessarily mean that the products of that manufacturer are equal to those specified. The listing is only an indication of those manufacturers which have represented themselves as being capable of manufacturing, or have in the past manufactured, items equal to those specified. The burden to review products to confirm equivalency with the specified products is on the Contractor. The Architect/Engineer shall be the final judge as to whether an item is equal to that specified.

E. Quality: Products provided by Acceptable Manufacturers shall be equal to or superior to the specified manufacturer's item in function, appearance, and quality, and shall fulfill all requirements of the Contract Documents. The Architect/Engineer shall be the judge as to whether an item meets these requirements or not.

F. Manufacturer: To be considered as being made by a particular manufacturer, the product must be made directly by the manufacturer and have the manufacturer’s name (or nameplate with name) affixed to the product (or on the product container where direct labeling is not possible). Example: manufacture “A” is listed as an acceptable manufacture; manufacturer “B” is not listed as an acceptable manufacturer; manufacturer “A” owns “B”; products from “B” do not qualify as being made by an acceptable manufacturer by virtue of ownership.

2.02 PRODUCTS - GENERAL

A. Standard Products: Products shall be standard products of a manufacturer regularly engaged in the manufacture of such products. The standard products shall have been in satisfactory commercial or industrial use for two years prior to bid opening. The two year use shall include applications of equipment and materials under similar circumstances and of similar size. The two year's experience must be satisfactorily completed by a product which has been sold or is offered for sale on the commercial market through advertisements, manufacturers' catalogs, or brochures. Except that equipment changes made solely to satisfy code requirements, to improve unit efficiency,

or to comply with unique project requirements are not required to have two year prior operation.

B. Latest Design: Products shall be the latest design and version available from the manufacturer, including software. Discontinued products shall not be used.

C. Service Support: Qualified permanent service organizations for support of the equipment shall be located reasonably convenient to the equipment installation and able to render satisfactory service to the equipment on a regular and emergency basis during the warranty period of the contract.

D. Manufacturer's Nameplate: Equipment shall have a manufacturer's nameplate bearing the manufacturer's name, address, model number, serial number, and additional information as required by code. Nameplate shall be securely affixed in a conspicuous place. The nameplate of the distributing agent will not be acceptable. Nameplate shall be of durable construction, easily read, with lettering minimum size 12 font.

E. Compatibility: All components and materials used shall be compatible to the conditions and materials the items will be exposed to. All items exposed to the weather shall be galvanized, or be of stainless steel or similar corrosion resistant material.

F. Sizes: Sizes indicated for products manufactured to standardized sizes (e.g. pipe, pipe fittings, valves, material gauges, etc.) are minimums. During bidding confirm that the sizes are available and meet project requirements. Where indicated sizes are not available provide the next larger available size; confirm this larger size will suit the construction and meet Contract Document requirements prior to ordering. Such size revisions are subject to Engineer’s review; indicate size revisions on the product submittal and why the size is being revised.

G. Non-Specified Items: Materials shown on the drawings but not specified shall be provided as shown and as required to suit the application illustrated and intended and shall be of commercial quality, consistent with the quality of similar type items provided on the project. Not all items shown on the drawings necessarily have a corresponding specification; such items shall be provided per this paragraph and so as to provide complete, finished, fully functioning mechanical systems.

H. Weights: Do not exceed the weights shown unless added structural supports are provided. Such supports shall meet the requirements of the project Structural Engineer. The Contractor shall bear all costs for all redesign and added supports to accommodate heavier equipment. The Contractor shall reimburse the Engineer for all time associated with all review and analyses regarding the use of equipment heavier than that indicated.

I. Temperature/Pressure Rating: All materials and components furnished shall be suitable for the temperature and pressures they will be exposed to. Contractor shall consider possible operating modes to ensure proper material ratings.

J. Standardization: All products of the same type shall be by the same manufacturer and have the same characteristics and features to allow for Owner's standardization.

K. Model Numbers: Any reference to a manufacturer's "model number" is a reference to a manufacturer's series number or type of product, and is not a complete "model number" in having all the necessary numbers/letters to convey all of the features, accessories, and options that are required. These series numbers are only meant to convey a type of product that may meet the project requirements. Where conflicts or discrepancies occur regarding a listed manufacturer's series or "model" number and specified capacities or features, the more stringent and expensive shall prevail.

L. Application and Suitability: Products shall be designed and intended for: institutional application, for the use indicated, and be suitable for the operating conditions they will be exposed to. Firms supplying the products shall review the documents and related site and environmental data to confirm compliance. By making product submittals and using products they are being represented as appropriate for the project and application shown.

2.03 ELECTRICAL

A. General: All electrical devices, wiring, products, and work shall comply with the Division 26 specifications and code. See drawings for building occupancy type, types of construction, and areas which may require special wiring methods or other electrical work.

B. Equipment: All equipment requiring power shall be factory wired to an equipment mounted junction box (or an accessible compartment with power terminals or electrical device) arranged to allow for connection of electrical power.

C. Overcurrent protection: Circuit breakers, circuit breaker disconnects, fuses, and other current limiting devices indicated to be provided, shall be rated to suit the maximum overcurrent rating of the item served, and have other ratings, as required by code. Circuit breakers for HVAC and refrigeration unit equipment shall be UL listed by HACR type.

D. Short Circuit Current Rating (SCCR): All equipment (or components) requiring the use of electrical power shall have a SCCR value to comply with code. The minimum rating shall be 25,000 Amps RMS Symmetrical unless a lower value is indicated on the plans or allowed by code. Where the Contractor wishes to utilize equipment having a lower rating, the Contractor shall be responsible to provide calculations substantiating that a lower SCCR is acceptable (and complies with code), or make revisions to the electrical system to accommodate the proposed equipment (or components).

E. Product Certification (Listing): Products which require connection to electrical power shall be certified (i.e. listed) by a Nationally Recognized Testing Laboratory (NRTL) and be labeled (in a conspicuous place) with such certification (or certification mark). Certification shall comply with code, OSHA Standards, and Authority Having Jurisdiction (AHJ) requirements. NRTL's shall be recognized as such by OSHA and the AHJ. Certification shall be for the complete assembly (approval of individual components is not acceptable). Field evaluations to obtain certification shall be performed by accredited product testing laboratories acceptable to the AHJ and Engineer, be performed in accordance with code, NFPA 791, recognized practices, and be labeled to identify the certification. Certification is not required where the AHJ does not require it.

2.04 MOTORS

A. General: Where a piece of equipment specified includes an electric motor, the motor shall be factory installed and mounted. Motor starters and motor electrical disconnect switches shall be provided by the Contractor doing the work of the Section where the item was specified, unless specifically shown to be provided by Division 26 (or another Division). Wiring from the motor to motor starters and to electrical disconnects shall be by the Contractor doing the work of the Section where the item was specified, unless specifically shown to be provided by Division 26.

B. Acceptable Manufacturers: General Electric, TECO-Westinghouse, Reliance, Gould, Century, Baldor, U.S. Motors, Marathon, and acceptable manufacturers for the equipment (see individual specification sections).

C. Type: Motor type shall comply with code and applicable standard requirements and be configured to suit the application. Motors located indoors shall be open frame, drip-proof type, unless indicated otherwise. Motors located outdoors exposed to weather shall have corrosion resistant finish and shall be totally enclosed fan cooled (TEFC) or totally enclosed non-ventilated (TENV) type, unless indicated otherwise.

D. Listing: All motors shall be UL listed.

E. Efficiency: Motor efficiencies shall comply with code. Fractional horsepower motors shall be the electronically commutated (EC) type with speed control where noted and where non-EC motors are not available which comply with code efficiency requirements. Motor power factor shall comply with code, local utility requirements, and as indicated. Provide added power factor correction devices as necessary to comply.

F. Sizing: Motors shall not be smaller than indicated and of adequate size to start and drive the respective equipment when handling the quantities specified without exceeding the nameplate full load current at the conditions indicated and for the expected operating conditions. If it becomes evident that a motor furnished is too small to meet these requirements as a result of the Contractor using substituted equipment or having revised the system arrangement, the Contractor shall replace it with a motor of adequate size at no additional cost to the Owner. Contractor shall also arrange with the Electrical Contractor to increase the size of the wiring, motor starter and other accessories as required to serve the larger motor at no additional cost to the Owner.

G. Service Factor: Minimum 1.15.

H. Variable Frequency Drive (VFD) Applications: Motors used with Variable Frequency Drives (VFD's) shall be rated for such use per IEEE standards and have shaft grounding protection.

I. EC Motors (ECM):

1. General: Electronically commutated type with integral inverter to convert AC power (of voltage/phase indicated) to DC power, and solid state circuitry to vary output power and speed of motor. Motor shall have permanently lubricated

bearings with an L10 life of 100,000 hours at expected operating conditions. Motor shall have rotor position and rotation detection as required for operation.

2. Speed Range: Motor speed shall be controllable down to 25% of full speed.

3. Manual Speed Control: Provide with manual speed adjustment dial for motor speed control. Dial shall be motor mounted unless indicated otherwise, operable by a screwdriver or by hand. Motor mounted controls shall be factory wired. Remote mount dials shall be hand operable (i.e. no tools required), shall be for mounting on a standard 2 x 4 electrical junction box, and be able to be located up to 100 feet remote from the motor. Motor control wiring for remote mount dials shall be factory wired from the motor to an equipment mounted junction box (with field supplied wiring from this J-box to the remote dial).

4. EMCS Control: Motor speed shall be adjustable via a remote 0-10V input signal (unless noted otherwise) from the building EMCS. Control wiring shall be factory wired from the motor to an equipment mounted junction box. EMCS control is not required where not indicated to be provided or where not utilized as part of the control sequence.

2.05 IDENTIFICATION AND LABELS

A. General: All piping, valves, and mechanical equipment shall be labeled. Labels in concealed accessible spaces shall be reviewed and verified by Architect/Engineer prior to being concealed.

B. Piping:

1. Type: Self-sticking colored identification markers, lettered to identify the pipe contents, and banded at each end with arrow tape indicating the direction of flow. Markers shall be similar and equal to Brady "System 1" and Seton "Opti-Code" markers. Spray painted stencil labeling is not acceptable. Some labels may be special order.

2. Identification Colors: Comply with ASME A13.1, and as follows:

Conveyed Material/System	Background	Letters
Hydronic Systems	Yellow	Black

3. Lettering: Lettering shall identify the material conveyed in each pipe and shall match the designation used on the plans, but without abbreviations. Systems which have supply and return piping shall have piping labeled as such (i.e. heating water return, heating water supply, etc.). Systems that have different pressures shall be labeled to indicate such (i.e. Steam-Low Pressure, Steam-Medium Pressure, Natural Gas-Low Pressure, Natural Gas-Medium Pressure, etc.).

4. Size: Size of letters and color field shall comply with ASME A13.1, repeated here for convenience:

Outside Diameter of	Length of

Pipe or Covering	Color Field	Size of Letters
3/4 to 1-1/4 Inches	8 Inches	1/2 Inches
1-1/2 to 2 Inches	8 Inches	3/4 Inches
2-1/2 to 6 Inches	12 Inches	1-1/4 Inches
8 to 10 Inches	24 Inches	2-1/2 Inches
Over 10 Inches	32 Inches	3-1/2 Inches

5. Applications: Install on all exposed piping adjacent to each shut-off valve, at branches to indicate changes of direction, where pipes pass through walls and floors, on 20 foot centers or at least one in each room on each pipe. Markers shall be installed on all concealed accessible piping (i.e., piping above suspended ceilings, behind access doors, in accessible chases, etc.) near the point of access. For piping above suspended ceilings, markers shall be installed the same as if the piping was exposed (i.e., same as if the suspended ceiling was not in place). Markers shall be installed so as to be easily read by a person standing on the floor. Provide additional flow arrows at each pipe connection at valves having more than 2 ports (i.e. 3-way control valves).

6. Other Requirements: See other specification Sections for additional requirements.

C. Valves:

1. Labels: Laminated plastic or phenolic material, at least 1/16-inch thick, with black surface layer and white (unless other color indicated) sub-layer for letter engraving to expose sub-layer. Labels shall not be less than 3" x 1" in size. Label shall be pre-drilled at one end for attachment to valve. Attach to valve with No. 6 polished nickel-steel jack chain of sufficient length to allow label to hang free.

2. Lettering: Engrave label with valve size, name of system served (cold water, heating water supply, chilled water supply, etc.) and purpose of valve. Lettering size 3/16-inch, except where needed to be smaller to fit label size.

3. Application: Labels shall be installed on all valves except valves at hydronic system coils and equipment where the valve purpose is readily obvious.

D. Equipment:

1. Labels: Laminated plastic (or phenolic) material, 1/16-inch thick, with black surface layer and white (unless other color indicated) sub-layer, with engraving through to expose white sub-layer. Minimum 2-inch high (unless indicated otherwise or required due to equipment size) with length to contain required lettering. Label shall be pre-drilled and be mechanically fastened to the equipment. Prior to making labels, submit a list of all proposed labels.

2. Lettering: All caps, engraved on label, with equipment designation (same designation as used on Contract Drawings; e.g. HVAC-101, EF-22, CP-1A). Air handling equipment (i.e. VAV terminal units, fans, etc.) labels shall include the room names and numbers or area of building served (use final installed room

designations). Where systems serve portions of the building (i.e. wings or floors), include on label the area served. Lettering shall be in multiple rows, with equipment label on top row. Equipment lettering to be 5/8-inch high; area served lettering to be 3/8-inch high (except that smaller lettering may be used if necessary to fit label size).

3. Application: All scheduled mechanical equipment shall be labeled. The label shall be located on a side of the equipment so as to be easily read, with the marking visible to a person standing at the access level near the equipment (assuming any necessary access to a concealed unit has been made).

PART 3 EXECUTION

3.01 GENERAL

A. Workmanship: Furnish and install products to provide complete and functioning systems with a neat and finished appearance. If, in the judgment of the Architect/Engineer, any portion of the work has not been installed in accordance with the Contract Documents and in a neat workmanlike manner, or has been left in a rough, unfinished manner, the Contractor shall be required to revise the work so that it complies with the Contract Documents, at no increase in cost to the Owner.

B. Coordination: Coordinate the work with all trades that may be affected by the work to avoid conflicts, allow proper maintenance access, provide required clearances, and to allow for an organized and efficient installation of all systems.

C. Submittals: Perform no portion of the work for which the Contract Documents require a submittal until the respective submittal has been made, the review completed by the Architect/Engineer, and all issues resolved.

D. Examination and Preparation: Examine installation conditions and verify they are proper and ready for the work to proceed. Verify compatibility of materials in contact with other materials, and suitability for conditions they will be exposed to. Do not proceed with the work until unsatisfactory conditions have been corrected. Prepare area to accept the work and prepare products for the installation.

E. Field Conditions: Check field conditions and verify all measurements and relationships indicated on the drawings before proceeding with any work. In verifying existing conditions, the Contractor shall verify by direct physical inspection, complete tracing out of systems, by applying test pressures, by excavation and inspection, use of pipeline cameras, and other suitable absolute certain methods to confirm the actual physical conditions that exist.

G. Openings and Cutting and Patching in Existing Construction:

1. Openings--General: Provide all openings and cutting as needed to accommodate all work. Provide patching to restore all damaged and disturbed areas to pre-construction conditions (or better). The Contractor or subcontractor requiring the opening shall be responsible for making that opening. The opening shall be

made by skilled labor experienced in providing openings in the material being penetrated.

2. Areas To Be Cut and Patched: Wherever floors, walls, ceilings, plates, firestops and framing members are cut, these openings shall be substantially reinforced and sealed so as to maintain the strength and sealing ability of the element equal to that as if it had not been cut. All reinforcement/sealing shall satisfy the Architect/Engineer and comply with the governing codes. Such cut areas shall be patched and restored to a finished condition, equal to adjacent final finished areas that have not been cut.

3. Cutting of Structural Features: Make no cuts or alterations to any structural framing members without explicit consent of the Engineer, and then only under his direction. Locate cuttings so they will not weaken structural components. Cut carefully and only the minimum amount necessary. All required cutting to install material shall be accomplished with the use of saw cutting equipment.

4. Patching Materials: Patching shall be with materials of like kind and quality of the adjoining surface by skilled labor experienced in that particular trade.

H. Cleaning: Clean all products (whether exposed to view or not) of all construction debris, and other materials; grease and oil spots shall be removed with appropriate cleaning agents and surfaces carefully wiped clean. Where cleaning cannot restore items to new conditions, the item shall be replaced with new.

3.02 INSTALLATION

A. General: Work shall be in accordance with manufacturer's written installation instructions, code, applicable standards, and best construction practices.

B. Space Verification: Prior to ordering materials verify that adequate space exists to accept the products, along the installation path, and to allow for proper maintenance access. Select products that will fit the space available; some optional materials (i.e. valve types, fitting types, substitutes manufacturer’s etc.) may not be suitable. Verification shall be by direct field measurement of the actual space available and use of manufacturer’s final submittal dimensions. Where the project involves new construction and long lead items and a time schedule not allowing for such direct field measurements, confirm in writing with all trades associated with building the space that adequate room is available. Review maintenance and service access space required and confirm requirements will be met. No submittals shall be made until such space verification work has been performed, and confirmed that adequate space is available. By virtue of making a submittal that Contractor affirms he has completed this verification.

C. Installation Locations:

1. General: Unless dimensioned locations for items are shown, select the precise location of the item in accordance with the Contract Documents, coordinated with other trades and item connection locations, and subject to the Architect/Engineer's review. No allowances will be granted for failure to obtain

the Architect/Engineer's review, failure to coordinate the work, and failure to comply with Contract Document requirements.

2. Manually Operated Components: Valves, damper operators, on/off switches, keypads, controls, and other devices which are manually adjustable or operated shall be located so as to be easily accessible by a person standing on the floor adjacent to the item. Any such items which are not in the open shall be made accessible through access doors in the building construction. See individual specification sections for additional requirements.

3. Monitoring Components: Gauges, thermometers, instrumentation, and other components which display visual information (i.e. operating conditions, alarms, etc.), shall be located and oriented so as to be easily read by a person standing on the floor. Provide necessary brackets, hangers, remote read devices and accessories as needed. Equipment control panels and graphic displays furnished with equipment (or integral to equipment) shall be located to be easily accessible by a person standing on the floor adjacent to the equipment, and be located between 4-feet and 6-feet above the finished floor.

4. Installation Issues: If circumstances at a particular location make the accessible installation of an item difficult or inconvenient, the situation shall be discussed with the Architect/Engineer before installing the item in a location that will result in poor access.

5. ADA Accessibility: Locate items which are required to be ADA accessible in accordance with code (including but not limited to IBC, ICC A117.1 and local amendments) for accessibility; verify accessibility requirements with the AHJ.

D. Replacement and Maintenance: Install mechanical equipment to permit easy access for normal maintenance, and so that parts requiring periodic replacement or maintenance (e.g. coils, heat exchanger bundles, sheaves, filters, bearings, etc.) can be removed. Relocate items which interfere with access or revise item installation location, orientation, or means of access.

E. Building Access Doors: Provide access doors where indicated and where needed to provide access to valves, drains, duct access doors, and similar items requiring service or access that would otherwise be inaccessible. Consult architectural drawings and coordinate location and installation of access doors with trades which are affected by the installation. Access doors are typically not shown on the drawings. The Contractor shall review all construction details and types and locations of items requiring access to determine quantity and sizes of access doors required.

F. Rotating Parts: Belts, pulleys, couplings, projecting setscrews, keys and other rotating parts which may pose a danger to personnel shall be fully enclosed or guarded in accordance with Code, and so as not to present a safety hazard.

G. Dissimilar Metals: Provide separations between all dissimilar metals. Where not specified in another way, use 10 mil plastic tape wrapped at point of contact or plastic centering inserts.

H. Electrical Offsets: Provide offsets around all electrical panels (and similar electrical equipment) to maintain space clear above and below electrical panels to structure, and clearance of 3.5 feet directly in front of panel, except where indicated otherwise or required by code to be more. Such required offsets are typically not shown on the plans but are to be provided per this paragraph. Include in bid offsets for all systems near electrical panels.

I. Piping Through Framing: Piping through framing shall be installed in the approximate center of the member. Where located such that nails or screws are likely to damage the pipe, a steel plate at least 1/16-inch thick shall be installed to provide protection. At metal framing, wrap piping to prevent contact of dissimilar metals. At metal and wood framing, provide plastic pipe insulators at piping penetrations through framing nearest each equipment connection and on at least 32-inch centers.

J. Safety Protection: All ductwork, piping and related items installed by this Contractor that present a safety hazard (i.e., items installed at/near head height, items projecting into maintenance access paths, etc.) shall be covered (at hazardous area) with 3/4" thick elastomeric insulation and reflective red/white self-sticking safety tape. All sharp corners on supports and other installed items shall be ground smooth.

K. Equipment Access: Access to equipment is of utmost importance. Contractor shall apply extra attention to the location of pipe and duct routings and in coordinating all work so that equipment access and a clear maintenance pathway to equipment is maintained. Poor maintenance access will not be accepted.

L. Pressure Tests: Maintain documentation of all pressure (and leakage) tests performed on systems and submit with project closeout documents. Records shall contain (as a minimum): date of test, system name, description portion of system being tested, method of test, initial and final test pressures (or of measured leakage rates, as applicable), indication of test pass or fail, name and signature of individual performing (or documenting) the test, initials of independent witness of test.

3.04 PENETRATION PROTECTION

A. Exterior and Watertight Penetrations: Where any work pierces the building exterior (or construction intended to be watertight) the penetration shall be made watertight and weatherproof. Provide all necessary products (e.g. caulking, flashing, screens, gaskets, backing materials, siding, roofing, trim, etc.). Where not detailed or indicated how to install submit shop drawings of the proposed methods. Flashing arrangements shall be per SMACNA Architectural Sheet Metal Manual unless noted otherwise. Caulking alone is not an acceptable means of sealing penetrations.

B. Equipment: Equipment or products located outdoors shall be watertight (except for provisions designed to intentionally accept water and having drain provisions) and shall be designed and intended by the manufacturer to be used outdoors at the project location. Where any work pierces the unit casing exposed to the outdoors the penetration shall be made watertight and weatherproof; provide all necessary products (e.g. caulking, flashing, gaskets, backing materials, etc.).

3.05 START-UP

A. General: Provide inspections, start-up and operational checks of all mechanical systems and equipment. Maintain documentation of all start-up work and submit with project closeout documents. See individual specification Sections for additional requirements.

B. Personnel: Inspection and start-up services shall be done by individuals trained in the operation, and knowledgeable with, the systems being started-up. Equipment start-up shall be by the manufacturer's authorized service representative where indicated (see individual specification Sections).

C. Scheduling and Agenda: Submit a proposed detailed start-up schedule with proposed dates and times at least 30 days prior to the earliest proposed system start-up. Revise dates and times as mutually agreed upon with trades involved, and witnesses, before submitting a final start-up schedule.

D. Witnessing: Start-up may be witnessed by the Engineer and Owner's representative (at their option). Notify the Engineer and Owner 7 days prior to the proposed start-up time.

3.06 OWNER INSTRUCTION

A. General: Provide instruction to the Owner on the operation and maintenance of all installed mechanical systems.

B. Personnel: Instruction on the operation and maintenance of products shall be by individuals trained and experienced in the installation, operation and maintenance of these products. Instruction shall be by the product manufacturer's authorized service representative where indicated (see individual specification Sections).

END OF SECTION

PART 1 GENERAL

1.01 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 00 and Division 01 Specification Sections, apply to this Section.

B. Requirements of Section 23 05 00 apply to this Section.

1.02 WORK INCLUDED

A. Protection of Items from Damage.

B. Maintaining Utilities and Building Services.

C. Cleaning.

D. Temporary Systems.

E. Review of Existing Conditions.

F. Cutting and Patching.

G. Deactivation and Cap-off of Systems.

H. Mechanical Demolition and Disposal.

I. Salvage and Reinstallation.

1.03 DEFINITIONS

A. “Remove”, "demo", and "demolish" mean "Remove and legally dispose of item and item accessories; except where indicated to be reinstalled, salvaged, or some other required work is indicated."

B. “Salvage” means to "carefully remove, clean, pack for movement (drain of fluids, seal and protect from damage), and relocate to Owner’s designated storage area (assume located within 5 miles of site, with 100 feet travel through facility storage area)."

C. “Salvage and Reinstall (or Reinstallation)" means to "carefully remove, clean, pack for movement (drain of fluids, seal and protect from damage) and relocate to Contractor’s selected (and suitable) storage area; reinstall as indicated after other work has been completed and as required by project schedule."

PART 2 PRODUCTS

2.01 GENERAL

A. Materials: All materials used for capping, temporary piping, repairs, reconnecting, reinstalling, and related work shall be same as specified for new systems.

PART 3 EXECUTION

3.01 GENERAL

A. Protection: Existing items not being demolished shall be protected against damage. Where necessary to prevent damage or necessary to accomplish other work, items shall be disconnected and moved to a suitable protective storage location during the project and then reinstalled to their original location.

B. Utilities and Building Systems: Maintain existing utilities and building systems in service (unless indicated otherwise) and protect from damage during project. Where utilities or building systems must be shut-off to accomplish the work, see drawing notes, Section 20 05 00, and Division 01 for downtime limitations and Owner coordination and notification requirements; coordinate interruptions with other trades.

C. Cleaning: All existing items that remain during construction and were affected by the construction shall be cleaned to a like new condition.

D. Equipment and System Contents: Equipment and systems contain fluids that are typical for such items (e.g. HVAC units contain refrigerant, oils; hydronic systems contain ethylene glycol, corrosion control chemicals, etc.) and require special removal methods and disposal.

E. Existing Items:

1. Information and Field Verification: Routing, locations, and identification of existing items on plans are approximate and are limited. The relative location of systems shown on plans has not been verified, and is schematic only. Field verify locations, contents, and flow direction of all piping and ducts prior to performing any work associated with such systems (see also Section 20 05 00). Do not rely on existing labeling of systems; such labeling shall be considered wrong until verified by other physical evidence.

2. Work Around: Existing building cavities (ceiling spaces, walls, etc.) contain a multitude of systems (e.g. conduit, wiring, fire suppression, light fixtures, low voltage system components, piping, ducts, etc.) typical for buildings of the type of this project. Added effort is required to identify and locate these systems, to work around such systems, and to temporarily disconnect and reconnect (and possibly remove and store) various building components to accommodate the work. Existing building elements will also require the work to be installed in smaller sections (i.e. shorter pipe or duct lengths) than normally possible, and to make system connections in awkward or cramped locations.

3. Revisions: Revise existing systems as needed to accommodate project work and new finishes. Work shall include adjusting locations of items to suit new ceiling heights, revisions to building element locations, revisions to finishes, and other

changes.

4. Electrical: Verify voltage, phase, horsepower, panel circuits, and other electrical parameters of existing items prior to beginning work and ordering replacement products. Electrical data listed on the drawings for such items has not been field verified.

5. Hydronic Systems: Unless noted otherwise, work on hydronic systems will require complete system drain down and re-filling to accomplish the work. Re-filling shall restore the system to pre-construction chemical concentration conditions, as indicated by the latest Owner's chemical test results. Systems that contain glycol may have the glycol salvaged and reused in refilling the system provided the fluid to be reused is filtered through a 20 mesh strainer.

6. Controls: Verify existing communication protocol, existing component manufacturers, and model numbers, LAN type(s), software, location of devices, quantity of system points, methods used in terminating communication wiring, overall system performance, and sequences.

F. Cutting: Provide all cutting and openings as necessary to accomplish the work indicated. No structural members shall be cut unless Structural Engineer's approval is obtained first. Assume all building members are "structural" unless clearly evident otherwise. See Section 20 05 00 and Division 01 for additional requirements.

G. Patching: Patch all wall/floor/ceiling/roof openings left by removal of existing items where wall/floor/ceiling/roof is to remain. Patch with materials and workmanship so as to match finish of adjacent undisturbed area, and to provide conditions equivalent to the original new construction.

H. Disposal: Dispose of all demolished items and all waste materials off site in accordance with code and legal requirements.

I. Owner's Salvage: Owner has first right to all items shown to be demolished. All items not wanted by Owner, and not indicated to be salvaged for reuse, shall be removed by the Contractor.

3.02 REVIEW OF EXISTING CONDITIONS

A. General: Provide field investigation of all systems and existing conditions to confirm extent of demolition, routing of existing systems, existing building materials of construction, mechanical system types and materials involved, areas where cutting and patching is required, site access, sizes of existing system components, and all other aspects of existing building and systems and their relationship to the Work.

B. Review Timing: Review existing conditions prior to bidding, again prior to commencing any work or ordering materials, and continually throughout the project.

C. Review for Space and Routing:

1. Review existing conditions (including dimensions) where equipment must be

moved through to confirm adequate space and path.

2. Review existing conditions (including dimensions and locations of existing systems) where work will occur to determine impact on the locations and routing of new systems; include time to develop shop drawings and revisions to routing shown on the design drawings to accommodate existing conditions.

D. Existing Record Drawings: Existing record drawings located at the Engineers office Owner's facilities office are available for review.

E. Construction Thickness: Where needed to perform the work, and to prevent damage to adjacent construction, verify the thickness of existing concrete floors and other elements by selective drilling or saw cutting.

3.03 EXISTING CONSTRUCTION

A. Hydronic Systems: Volume of each existing hydronic systems shall be assumed to be 1 gallon per building square foot (unless noted otherwise).

B. Ceiling Construction: All ceiling construction shall be assumed to be two layers of 5/8" type X GWB installed over 2 x 6 20 gauge steel stud framing on 16" centers (unless noted otherwise).

3.04 DEMOLITION

A. General: Review site conditions and identify all demolition work; include in bid all costs for demolition and disposal. Coordinate all demolition work with other trades. Confirm items to be salvaged or reused, and overall demolition scope.

B. Scope: Not all items to be demolished are necessarily shown on the drawings, but are covered by notes and specifications. In addition to demolishing items indicated, demolish all associated items (unless indicated otherwise); this includes such items as supports, insulation, piping, drains, control wiring/conduit, power wiring/conduit, unions, valves, and similar accessories. Demolish all utilities serving demolished items completely or back to active mains where mains are to remain active; assume such utilities extend at least forty feet from the demolished items (unless indicated otherwise). Demolish all mechanical items located in building elements which are being demolished (i.e. located in walls, chases, roof assemblies, etc.). Demolish items as required to accomplish the work.

C. Prevent Damage: Where existing building systems are to be reused to serve new items, carefully execute the demolition work to prevent damage to items to be reused and to prevent the demolition of items that are intended for reuse.

D. Depth: Abandoned items, anchors, inserts, and other projections embedded in existing construction and not being concealed by new construction shall be removed to 1" below the adjacent finished surface, and the disturbed area patched.

E. Cap-Offs and Terminations:

1. Permanent: Provide cap-off of all existing utilities and systems that are cut or served demolished items. All cap-offs shall occur in concealed locations (unless indicated otherwise). Cap-off's shall be of equivalent material as the item being capped and be insulated where the connected system was insulated or where doing so will reduce energy consumption or prevent condensation.

2. Temporary: Provide temporary cap-off of all existing utilities and systems to allow continued use of all systems until the final system components are installed and connected.

3. Wiring Terminations: Terminate all control wiring and electrical power connections in a manner that complies with code and allows remaining items to function as intended.

F. Equipment Services Reuse: Where equipment is being demolished and replaced with new at the same location, but new control or power devices (or other utility services) are not indicated to be provided; salvage and reuse the existing utility services (i.e. control devices, wiring, disconnects, starter, plumbing, etc.) that served the demolished item to serve the new item. Carefully remove items to prevent damage, and in a manner to allow reuse. Clean items that are going to be reused and all accessories to like new condition. Revise utility services as needed to serve the new equipment.

3.05 REUSED AND SALVAGED ITEMS

A. General: Where indicated to be reused or salvaged, comply with the following.

B. Removal: Carefully remove items to prevent damage and in a manner to allow for reinstallation. Remove all related items to the extent needed to allow for project work.

C. Clean: Clean item and all accessories to like new condition.

D. Package: Package item to allow for transport and storage without damaging. Label packaging to identify contents; include unique identifier number, brief description, and location (room number) item was removed from.

E. Documentation: Compile a list of all salvaged items and documentation to allow for their reuse.

F. Storage: Store items in secure and protective area until Owner (or project) is ready to receive.

G. Reuse: For items indicated to be reused:

1. Reinstall items and accessories as completion of other work allows. Provide all necessary connections and services to allow item to function properly; not all such connections are illustrated on the plans.

2. Provide new fasteners, supports, anchors, gasketing, seals, pipe connectors, unions and related items to allow for complete and proper connections and operation of reinstalled items.

3.06 HAZARDOUS MATERIALS

A. Hazardous Materials Discovery: If materials containing hazardous materials (other than those indicated) are discovered, do not disturb. Notify Owner to allow review and determine resolution. Assume in bidding and scheduling that there will be two occurrences of finding such materials, causing a 5 day project work stoppage each occurrence.

END OF SECTION

PART 1 GENERAL

1.01 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 00 and Division 01 Specification Sections, apply to this Section.

B. Requirements of Section 20 05 00 apply to this Section.

1.02 WORK INCLUDED

A. Domestic Water Piping.
B. Non-Potable Water Piping.
C. Valves.
D. Backflow Preventers.
E. Water Meters.
F. Testing and Inspection.

1.03 SUBMITTALS

A. General: Submittals shall comply with Section 20 05 00.

B. Product Data: Submit product information on all items to be used.

C. Tests: Submit documentation showing systems have satisfactorily passed all pressure tests and code inspections.

D. Backflow Preventers: Submit backflow test certificate to AHJ and to Engineer; use form as required by the AHJ.

1.04 REFERENCES

A. ASME B 16.3: Malleable Iron Threaded Fittings.

B. ASME B 16.15: Cast Bronze Threaded Fittings: Classes 125 and 250.

C. ASME B 16.18: Cast Copper Alloy Solder Joint Pressure Fittings.

D. ASME B 18.22: Wrought Copper and Copper Alloy Solder Joint Pressure Fittings.

E. ASME B 18.24:Cast Copper Alloy Pipe Flanges and Flanged Fittings: Classes 150, 300, 400, 600, 900, 1500, and 2500.

F. ASTM A 53: Pipe, Steel, Black and Hot Dipped, Zinc Coated, Welded and Seamless.

G. ASTM A 312: Seamless, Welded, and Heavily Cold Worked Austenitic Stainless Steel Pipes.

H. ASTM A 403: Wrought Austenitic Stainless Steel Piping Fittings.

I. ASTM A 530: General Requirements for Specialized Carbon and Alloy Steel Pipe.

J. ASTM A 774: As-Welded Wrought Austenitic Stainless Steel Fittings for General Corrosive Service at Low and Moderate Temperatures.

K. ASTM A 778: Welded, Un-annealed Austenitic Stainless Steel Tubular Products.

L. ASTM B 16.18: Seamless Copper Water Tube.

M. ASTM B 32: Solder Metal.

N. ASTM F876: Standard Specification for Cross-linked Polyethylene (PEX) Tubing.

O. ASTM F877: Standard Specification for Cross-linked Polyethylene (PEX) Plastic Hot and Cold Water Distribution Systems.

P. ASTM F1960: Standard Specification for Cold Expansion Fittings with PEX Reinforcing Rings for Use with Cross-linked Polyethylene (PEX) Tubing.

Q. AWS A 5.8: Filler Metals for Brazing and Braze Welding.

PART 2 PRODUCTS

2.01 ACCEPTABLE MANUFACTURERS

A. Products shall comply with Section 02 05 00, 2.01, Acceptable Manufacturers.

B. Pipe and Fittings: Domestic Manufacturers only; US Steel, Pioneer Pipe, Mueller, Cerro, Anvil International.

C. Valves: Conbraco/Apollo, Nibco, Stockham, Walworth, Milwaukee, Kitz, Red-White, Watts, Hammond.

D. Pressure Reducing Valves: Conbraco/Apollo, Watts, Cla-Val, Bell & Gossett, Wilkins.

E. Backflow Preventers: Conbraco/Apollo, Febco, Watts, Ames.

F. Balancing Valves: Taco, Armstrong.

G. Additional manufacturers are as listed for each individual item.

2.02 PIPE AND FITTINGS - MATERIALS

A. Copper Pipe and Fittings:

1. Pipe: Seamless copper water tube, hard temper (unless noted otherwise), type K or L as indicated, per ASTM B 88.

2. Fittings:

a. Solder-Joint: Wrought copper and bronze fittings per ASME B 16.22 and cast copper alloy fittings per ASME B 16.18, cast bronze threaded fittings per ASME B 16.15.

b. Flanged: Cast bronze fittings per ASME B 16.24.

c. Solder Material: 95/5 tin-antimony solder per ASTM B 32 or “Silvabrite 100" (95.5 tin/4 copper/0.5 silver) solder; lead free.

d. Brazing Material: AWS A5.8, BCuP-5.

2.03 PIPE AND FITTINGS - APPLICATIONS

A. Domestic Water Piping - Above Ground: Type L copper tubing with solder or flanged joints; except where run exposed in finished areas shall be stainless steel, or be chrome plated copper, or be copper piping with a chrome plated sleeve.

B. Non-Potable Water Piping: Type L copper tubing with solder or flanged joints.

2.04 VALVES

A. Ball Valves:

1. 2 Inches and Smaller: 125 psi-swp bronze body, full port, 2 piece construction, anti-blowout stem, reinforced TFE seats, stainless steel or chrome plate brass ball, extended stem, solder or threaded connections as required. Provide with extended lever handle where valve is installed in systems with insulation thickness greater than 0.5 inch. Nibco S-585, T-585 (or approved).

2. 2-1/2 Inches and Larger:

a. Stainless: Class 150 stainless steel body, split-body full bore design, anti-blowout stem, carbon filled TFE seats, stainless steel ball, stainless steel trim. Nibco F-515-S6-F-66-FS (or approved).

b. Cast Iron: Class 125 cast iron body, split-body full port, anti-blowout stem, PTFE seats, stainless steel ball. Conbraco/Apollo IBV-125 Series (or approved).

B. Check Valves:

1. 2 Inches and Smaller:

a. Horizontal: 125 psi-swp bronze body horizontal swing check valve, regarding type, y-pattern, renewable seat and disc, solder or threaded connection. Nibco S-413 or T-413 (or approved).

b. Vertical: 125 psi-swp bronze body vertical inline check valve, stainless steel or bronze disk holder, Buna-N disk, stainless steel spring actuated, solder or threaded connection. Nibco S-480 or T-480 (or approved).

2. 2-1/2 Inches and Larger:

a. Horizontal: 125 psi-swp iron body vertical inline “silent” check valve, wafer or flanged style, renewable seat and disk, stainless spring actuated, bronze disk. Nibco W-910 (or approved).

b. Vertical: 125 psi-swp iron body vertical inline “silent” check valve, wafer or flanged style, renewable seat and disk, stainless spring actuated, bronze disk. Nibco W-910, F-910 (or approved).

C. Balancing Valves: Calibrated balance valve, ball or globe type, bronze body, with brass readout valves with integral EPT insert and check valve to minimize fluid loss during balancing. Valve shall have calibrated nameplate and memory stop. Rated for 200 psig working pressure at 250 degrees F. Valve shall be same size as pipe installed in. Bell & Gossett "Circuit Setter" (or approved).

D. Drain Valves: Bronze ball valve, minimum 125 psi-swp, anti-blowout stem, stainless steel or chrome plated brass ball, reinforced TFE seat, solder or threaded inlet connection, male 3/4 inch hose thread outlet connection, with brass cap and chain. Nibco S-585-70-HC, T-585-70-HC (or approved).

E. Pressure Reducing Valves:

1. 2 Inches and Smaller (Type A): Bronze body construction, renewable nickel alloy or stainless steel seat, lead free, with integral strainer and union inlet connections. Adjustable range 25 to 75 lbs, suitable for inlet pressures up to 300 psi. Watts Series U5 (or approved).

2. 2-1/2 Inches and Larger (Type B): Ductile iron or bronze body, bronze trim, 150 pound pressure class, with flanged or screwed ends. Valve shall be globe type, with adjustment range from 15 to 75 psi. Valve shall be a hydraulically operated, diaphragm-actuated pressure reducing valve. Diaphragm shall consist of a nylon fabric bonded with a synthetic rubber and shall not be used as a seating surface. Packing glands and/or stuffing boxes are not permitted, and there shall be no pistons operating the valve or pilot controls. All necessary repairs shall be possible without removing valve from the line. The pilot control shall be a direct-acting, adjustable, spring-loaded, normally open, diaphragm valve, designed to permit flow when controlled pressure is less than the spring setting. The control system shall include a fixed orifice, flow strainer, and speed control. Cla-Val Series 90-01 (or approved).

2.05 BACKFLOW PREVENTERS

A. General: Reduced pressure type, Washington State approved, with air gap drain fitting and resilient seated full flow shutoff valves and test cocks. Same size as connecting pipe. Configuration to suit application. Conforming to AWWA C 511.

B. 2 Inches and Smaller: Bronze body, stainless steel springs, bronze ball valves, 175 psi working pressure, threaded end connections.

2.06 WATER METERS

A. Non-Potable Water Meter: Magnetic drive turbine meter, with bronze outer cases, high impact resistant plastic register lid and clamp band, plastic inlet hub, rotor and strainer. Bottom plate shall be of bronze or enamel coated cast iron, with thick rubber liner for protection, and attached to meter housing with stainless steel bolts and washers. Register shall be magnetically driven and hermetically sealed between a glass dome and metal housing. Register shall read in U.S. gallons, minimum 10,000,000 gallon capacity, and with 10 gallons/sweep hand revolution. The clamp band shall allow for positioning the register in the most convenient reading position. Meter shall be suitable for up to 175 psig and 32 to 130 degree F temperatures. Hersey Model MVR (or approved).

B. Non-Potable Water Meter-Electric Contact Type: Magnetic drive oscillating piston or turbine type. Shall be of bronze construction, with repeatability plus or minus 1%, accurate to plus or minus 1.5% over entire flow range, and suitable for 150 psi operating pressure. Meter shall have register reading in U.S. gallons, minimum 10,000 gallon capacity with sweep hand. Meter shall have electrical contacting register, with normally open "dry contacts," rated for 10 amps at 250 volts A.C.; contacts shall close at preset gallons/contact setting. Size as shown on the drawings. Carlon Model JSJ (or approved).

PART 3 EXECUTION

3.01 GENERAL

A. Installation of all items shall comply with code, best professional practices, and manufacturers written installation instructions.

B. Provide all piping as indicated and as required to allow supply connections to each fixture and equipment item requiring water supply.

C. Coordinate installation of items with all trades that are affected by the work to avoid conflicts.

D. Provide piping connections to equipment furnished by others in accordance with Section 20 05 00.

3.02 PIPE AND FITTINGS

A. All piping in finished areas shall be installed concealed unless specifically noted otherwise.

B. Install piping at such heights and in such a manner so as not to obstruct any portion of windows doorways, passageways, or access to any items requiring routine service, maintenance, or inspection. Offset of reroute piping as required to clear any interferences which may occur.

C. Consult all drawings for location or pipe spaces, ducts, electrical equipment, ceiling heights, door openings, window openings, and other details and report discrepancies or possible conflicts to Architect/Engineer before installing pipe.

D. Allow sufficient clearances for installation of pipe insulation in thickness specified. If interferences occur, reroute piping to accommodate insulation.

E. Slope all piping to low points to allow the system to be drained. Provide added drain valves where system cannot be drained through fixtures.

F. Provide escutcheons where exposed pipe passes through walls, floors, or ceilings.

G. Install all piping parallel to the closest wall and in a neat, workmanlike manner. Horizontal exposed straight runs of piping shall not deviate from straight by more than 1/4-inch in ten feet. Vertical piping shall not deviate from plumb by more than 1/8-inch in ten feet.

H. Do not run any piping above electrical panels (and similar electrical equipment). Provide offsets around such panels as necessary.

I. Prior to the joining of any section of pipe to a pipe run, the section shall be thoroughly cleaned inside and out, the ends shall be reamed to remove any cutting burrs and piping prepared as recommended by piping and fitting manufacturer.

J. Threaded Connections: Cut piping carefully, ream, thread and work into place without springing. Use TFE tape or lead and graphite lubricant (on male threads only).

K. Soldered Connections: Polish contact surfaces of fittings and pipes with emery cloth before fluxing male and female surfaces of joints. Steel wool and sandpaper not permitted for polishing.

L. Unions: Install unions in pipe connections to valves, coils, and any other equipment where it may be necessary to disconnect the equipment or piping for repairs or maintenance; and as indicated. Where flanged connections occur at equipment additional unions are not required unless indicated otherwise.

M. Insulating Unions: Install dielectric insulating connectors between all connections of copper piping and steel piping of steel equipment. Where flanged connections occur use insulating type flanges.

3.03 VALVES

A. Type: Ball type only; except valves indicated to be a specific type shall be the type as noted.

B. Provide isolation valves as shown on the drawings. In addition to those shown, provide added valves to allow for the isolation of each group of fixtures, all water heaters, and all individual equipment items (e.g. dishwashers, heat exchangers, etc.).

C. Install valves so as to be easily accessible and oriented to permit ease of operation. Valve stem shall be directed toward operator in either the vertical or horizontal direction. Provide access doors for valves not otherwise accessible.

D. Provide pressure reducing valves as shown on drawings, complete with by-pass line,

isolation valves, unions, and pressure gauges. Set initial pressure and adjust as required so that all fixtures/devices served have sufficient water pressure.

E. Provide drain valves at piping low points where the piping cannot be drained through fixtures, hose bibs, or equipment drains.

3.04 ACCESSORIES

A. Provide backflow preventers as indicated in the Contract Documents and as required by code. Backflow preventers with threaded connections shall be installed with unions for ease of removal. Locate to be accessible for testing and service. Pipe air gap drains to nearest floor drain or point of drainage.

B. Backflow devices shall be installed, inspected, and tested in accordance with code, applicable regulations of the Washington State Department of Social and Health Services, and the AHJ. Provide testing of the backflow devices by a certified backflow preventer testing agency, using form(s) required by the AHJ.

C. Provide water meters of type, and in locations, as shown on the drawings.

D. Install heat tracing as shown on drawings and in accordance with manufacturer's instructions and code requirements.

3.05 TESTING AND INSPECTION

A. All piping shall be tested, inspected, and approved by the local authority having jurisdiction prior to being concealed or covered.

B. Testing shall be witnessed by the plumbing inspector and the Architect/Engineer (at his option). Notify Architect/Engineer minimum 72 hours prior to date of testing, and mutually agreed upon times arranged.

C. Piping shall be hydrostatically tested for a period of 2 hours (or as required by local authority having jurisdiction), during which time no drop in pressure or leakage shall occur.

D. Test pressure shall be not less than 150 percent of the maximum to which the pipe will ordinarily be subjected; but in no case less than 75 psig.

E. Any leaks or defective piping disclosed by testing and inspection shall be repaired with new materials and the system re-tested.

F. Provide documentation to the Engineer indicating that the system has been completely pressure tested, and all portions inspected and accepted by the local authority having jurisdiction.

END OF SECTION

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 00 and Division 01 Specification Sections, apply to this Section.

B. Requirements of Section 23 05 00 apply to this Section.

1.02 WORK INCLUDED

A. Thermometers.

B. Pressure Gauges.

C. Strainers.

D. Unions.

E. Flexible Connectors.

F. Test Ports.

1.03 SUBMITTALS

A. General: Comply with Section 23 05 00.

B. Product Data: Submit product information data for all items to be used.

1.04 REFERENCES

A. ANSI Z21.24: Connectors for Gas Appliances.

B. ASME B16.18: Cast Copper Alloy Solder Joint Pressure Fittings.

C. ASME B16.39: Malleable Iron Threaded Pipe Unions: Classes 150, 250, and 300.

D. ASME B40.100 - Pressure Gauges and Gauge Attachments.

E. IFGC: International Fuel Gas Code.

F. IMC: International Mechanical Code.

G. UPC: Uniform Plumbing Code.

PART 2 - PRODUCTS

2.01 ACCEPTABLE MANUFACTURERS

A. Products shall comply with Section 23 05 00, Paragraph 2.01, Acceptable Manufacturers.

B. Thermometers: Trerice, Weiss, Winters.

C. Pressure Gauges: Trerice, Weiss, Winters.

D. Strainers: Watts, Keckley, Mueller, Sarco, Taco, Paco, Bell & Gossett, Armstrong, Wilkins.

E. Unions: Anvil, Nibco, Watts, Epco, Victaulic, Ward, Jefferson Union.

F. Dielectric Connecters: Victaulic Precision Plumbing Products, Elster Perfection.

G. Flexible Connectors: Universal, Mason, Dormont, OPW, Unisource, Twin City Hose.

H. Test Ports: Autoflow, Flowset, Peterson Equipment.

2.02 THERMOMETERS - INDUSTRIAL

A. Type: 7 inch scale, adjustable angle, red reading mercury, industrial thermometer.

B. Construction: Aluminum or polyester case, acrylic plastic or heavy glass window, aluminum face, stem of brass or aluminum construction, with separate brass socket (i.e. thermowell). Bulb chambers tapered to match taper in thermowell to give metal to metal contact. Scale case adjustable over a minimum 180° range, with locking fastener.

C. Stem Length: Stem insertion length approximately one-half of pipe diameter. Where installed on tanks, minimum insertion length is 5". Where installed on insulated piping systems, provide a longer stem thermometer and extended neck socket (thermowell) to extend thermometer base past the insulation.

D. Display: White background with bold black numerals and Fahrenheit degree markings, red or blue reading spirit.

E. Accuracy: Plus or minus 1% of full scale.

F. Ranges: Plus or minus 50% of systems normal operating temperature (at point of measurement), with figure intervals approximately 1/20th of range. For systems with multiple operating temperatures wider ranges may be used to allow the same thermometer type through-out the system.

2.03 PRESSURE GAUGES

A. General: 4-1/2" round dial, stem mounting, black impact resistant phenolic (or fiberglass reinforced polypropylene) flangeless case, white face with black numerals, phosphor bronze bourdon tube rated to minimum 250 psi, brass socket, acrylic window, and 1/4" npt (or 1/2" npt) bottom connection. Shut off cock not allowed (use ball valve). Rated for use with the system pressures and temperatures to be exposed to, but be rated for no less than 250° F. Accuracy shall be 0.5% per ASME B40, 100 Grade 2A.

B. Liquid Fill: Gauges used on pumps and where vibration or pulsation are present shall be liquid filled and be provided with a snubber. Liquid fill shall be suitable for ambient temperatures from 0 to 150° F, and for system temperatures to be encountered.

C. Pressure Gauge Ranges: 0 to 1.5 times systems normal operating pressure (at point of measurement), with numeral figures on 5 psig for gauges reading to 100 psi, and 10 psig on gauges reading to higher values.

2.04 STRAINERS

A. Water Systems:

1. Copper Piping Systems 2-1/2” and Smaller: Bronze body, “Y” type, screwed or solder type end connections, 125 lb class (rated 125 psi steam working pressure at 350 deg F minimum) and 400 psi (WOG) rated working pressures at 210 deg F, stainless steel 20 mesh wire screen, and gasketed retainer cap. Reinforce wire mesh with perforated stainless steel sheet for sizes 2" and 2-1/2". Ratio of net free area of screen to pipe free area greater than 3.5. Provide with blowdown valve, ball type, with 3/4" NPT male end connection. Valve manufacturer shall be listed as an “Acceptable Manufacturer” in the hydronic piping system specification section.

2. Copper Piping Systems 3" and Larger: Bronze or ductile iron body, “Y” type, flanged end connections, 150 lb class (rated 150 psi steam working pressure at 400 deg F minimum), brass or stainless steel screen with 3/64" perforations for 3" and 3/32" perforations for larger sizes; with gasketed threaded retainer cap. Ratio of net free area of screen to pipe free area greater than 3. Provide with blowdown valve, ball type, with 3/4" NPT male end connection. Valve manufacturer shall be listed as an “Acceptable Manufacturer” in the hydronic piping specification section.

3. Steel Piping Systems: Ductile iron, cast iron, or carbon steel construction, “Y” type, 250 lb class (rated 250 psi steam working pressure at 450°F minimum), with stainless steel screen. Screen shall be 20 mesh for strainers up to 2" in size, and have 3/32" perforations on larger sizes. Sizes 2-1/2 inch and less shall have threaded end connections; larger sizes shall have flanged end connections. Provide with bolted and gasketed strainer cap on flanged strainers; provide threaded gasketed retainer cap on threaded strainers. Provide with blowdown valve, ball type, with 3/4" NPT male end connection. Valve manufacturer shall be listed as an “Acceptable Manufacturer” in the hydronic piping system specification section.

B. Pump Suction Diffusers: Cast iron body, angle type, with steel straightening vanes, steel orifice cylinder (shall be stainless steel on open cooling tower systems), 16 mesh bronze start-up strainer, and permanent removable magnet. Orifice cylinder shall be designed to withstand differential equal to pump shutoff head (maximum 75 psi) and shall have a free area equal to 5 times cross section area of pump suction opening. Straightening vanes shall extend the full length of the orifice cylinder and shall be replaceable. Unit shall be rated for 175 psi service up to 250 degrees F. Suction diffuser inlet shall match system piping (or next pipe size to), outlet shall match pump inlet. Unit shall have an adjustable

foot support and minimum 3/4-inch NPT blowdown tapping and 1/4-inch NPT gauge tapping.

2.05 UNIONS

A. Dielectric Unions: Shall not be used. Provide “dielectric connector” with standard union where union is required at connection point of dissimilar materials.

B. Unions on Copper Pipe:

1. General: Pressure and temperature ratings to match (or exceed) piping system being installed in; minimum Class 125.

2. 2-Inch Pipe and Smaller: Wrought copper solder joint copper to copper union, complying with ASTM B16.18.

3. 2-1/2-Inch Pipe and Larger: Brass flange unions.

C. Unions on Steel Pipe:

1. General: Pressure and temperature ratings to match (or exceed) piping system being installed in; minimum Class 150.

2. Threaded: Malleable iron union, threaded connections, with ground joints, complying with ASME B16.39. Provide with brass-to-iron seat (except provide iron-to-iron seat where the conveyed material is detrimental to brass).

3. Welded and Flanged: Flange unions; see individual system specification sections.

D. Dielectric Connector: Schedule 40 steel pipe nipple, zinc electroplated, with internal thermoplastic lining which is NSF/FDA listed and meeting all code requirements for potable water applications. Suitable for continuous use up to 225 deg F and 300 psi. "Clearflow" dielectric waterway (or approved). For systems operating at temperatures greater than 225 deg F provide flanged connections with insulating gaskets.

2.06 FLEXIBLE CONNECTORS

A. Pump Flexible Connectors: Twin sphere type, constructed of peroxide cured EPDM with Kevlar tie cords, multilayered. Embedded solid steel rings shall be used at raised face flanged ends. Shall have an external ductile iron reinforcement ring between spheres. Rated minimum 225 psi at 230°F. Control rods shall be used as recommended by the manufacturer for the application; rods shall have 1/2-inch thick neoprene bushings, washers and accessories sized to accommodate system loads and conditions. Same size as pipe installed end, with end connections to suit connecting piping. Mason Industries “SafeFlex” SFDEJ Series, and SFDCR Series.

B. Piping Flexible Connectors:

1. Fuel Gas Piping 1-1/4 inch and Smaller: Factory fabricated flexible gas

connector, constructed of type 304 stainless steel tubing, corrugated, with brass or stainless steel threaded end fittings, and heavy PVC coating. Listed for use in fuel gas piping systems; complying with ANSI Z21.24 and IFGC. Size flexible connector to match pipe size shown on plan, with reducer after the flexible connector to match the equipment connection size (where connecting to equipment). Length as required to accommodate equipment movement relative to piping; minimum 18-inch length for sizes 1/2-inch diameter and less; minimum 24-inch length for larger sizes. Where used on appliances that require to be moved for cleaning or servicing, provide type listed for mobile appliance application, with adequate length to allow for appliance movement, and with a restraining cable and mounting hardware to prevent strain applied to gas connector.

2. Fuel Gas Piping Larger than 1-1/4 inch: Factory fabricated flexible gas piping connector, constructed of series 304 or 321 stainless steel, with braided exterior, carbon steel (or stainless steel) threaded or flanged end connections, rated for 350 psig working pressure, For use with fuel gas piping systems and complying with IFGC. Size flexible connectors to match pipe size shown on plan, with reducer after the flexible connector to match the equipment connection size.

2.07 TEST PORTS

A. Temperature/Pressure Type: Test port for installation in tee in piping allowing insertion of probe for measurement of pressure and/or temperature. Valve shall be of brass construction, have 1/4-inch or 1/2-inch NPT male connection, with dual valves to prevent leakage and gasketed cap with attachment to test port. Rated for minimum 500 psi and 275 deg F. Provide extended length on insulated piping systems so that insulation does not cover the test port.

2.08 ESCUTCHEONS

A. Type: Circular metal collar to seal pipe penetrations at building elements (i.e. walls, floors, cabinets, and ceilings); one piece type except that split hinge type may be used for applications on existing piping.

B. Construction: Constructed of chrome plated brass or polished stainless steel, sized to tightly fit pipe exterior surface (or pipe insulation where insulated) and to fully cover the building element penetration.

C. Projection: Shallow face type with maximum projection from wall not to exceed 1.2 times inner diameter of escutcheon.

D. Special Applications: For sprinkler heads and similar special applications see items' specification Section.

PART 3 - EXECUTION

3.01 INSTALLATION

A. Thermometers: Install thermometers and thermal wells in piping at locations indicated, and so as to be easily read.

B. Pressure Gauges: Install pressure gauges at inlet and outlets of all pumps; at each side of pressure reducing valves; and as indicated. Provide with ball-type isolation valves.

C. Unions: Install unions in pipe connections to control valves, coils, regulators, reducers, all equipment, and where it may be necessary to disconnect the equipment or piping for repairs or maintenance; and as indicated. Where flanged connections occur at equipment additional unions are not required unless indicated otherwise. Dielectric unions shall not be used.

D. Dielectric Connectors: Install connectors between all connections of copper and steel piping (or equipment), and other dissimilar metals. Where flanged connections occur use insulating type flanges. Dielectric unions shall no be used.

E. Flexible Connectors - Pumps: Install at all suction and discharge connections (except not required on pumps 1 HP and less).

F. Flexible Connectors - Piping: Install at pipe connections to equipment with rotating elements (except not required at hydronic heating/cooling coils unless specifically noted), at building expansion joints, where required for seismic isolation, per code, and where indicated. Provide flexible connector in gas piping connections to all equipment; size flexible connectors to match pipe size shown on plan, with reducer after the flexible connector to match the equipment connection size.

G. Test Ports: Install at locations shown on drawings and where needed by Balancer to allow measurements for flow adjustments.

END OF SECTION

PART 1 GENERAL

1.01 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 00 and Division 01 Specification Sections, apply to this Section.

B. Requirements of Section 23 05 00 apply to this Section.

1.02 WORK INCLUDED

A. Pipe Hangers and Supports.

B. Duct Hangers and Supports.

C. Mechanical Equipment Anchors and Supports.

1.03 QUALITY ASSURANCE

A. Pipe Hanger Standards: Manufacturers Standardization Society (MSS) Standards SP-58, SP-89, SP-69, and SP-90.

B. General: All methods, materials and workmanship shall comply with Code; including IBC, IMC, UPC, NFPA Standards, and ASME standards.

1.04 SUBMITTALS

A. General: Submittals shall comply with Section 23 05 00.

B. Product Data: Submit product data for all hangers, supports, and anchors. Data to include finish, load rating, dimensions, and applicable agency listings. Indicate application for all items by system type, size, and other criteria as appropriate to project.

1.05 GENERAL REQUIREMENTS

A. Seismic: Provide adequate hangers, supports, anchors, and bracing to serve as seismic restraints. Seismic restraints shall comply with Section 23 05 48. Provide seismic restraint calculations and information per Section 23 05 48 and as required by code.

B. Design and Manufacture: All pipe hangers and supports shall be designed and manufactured in accordance with MSS-SP 58.

1.06 REFERENCES

A. ADC: Air Duct Council - Flexible Duct Performance and Installation Standard, 5th Edition.

B. ASHRAE-F: American Society of Heating, Refrigeration, and Air Conditioning Engineers, Handbook of Fundamentals.

C. ASME B31.1: Power Piping.

D. ASME B31.9: Building Services Piping.

E. ASTM A36: Standard Specification for Carbon Structural Steel.

F. ASTM A108: Standard Specification for Steel Bar, Carbon and Alloy, Cold - Finished.

G. ASTM A123: Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products.

H. ASTM A153: Standard specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware.

I. ASTM A653: Standard Specification for Steel Sheet, Zinc Coated (Galvanized) or Zinc Iron Alloy-Coated (Galvannealed) by the Hot Dip Process.

J. ASTM A907: Standard Specification for Steel, Wire, Epoxy - Coated.

K. ASTM A924: Standard Specification for General Requirements for Steel Sheet, Metallic-Coated by the Hot Dip Process.

L. IBC: International Building Code.

M. IMC: International Mechanical Code.

N. Federal Spec QQ-W-461H: Wire, Steel, Carbon (Round, Bare, and Coated).

O. Mason SRG: Mason Industries Seismic Restraint Guidelines for Suspended Piping, Ductwork, Electrical Systems and Floor Mounted Equipment, 6th Edition.

P. MSS SP-58: Pipe and Hangers and Supports - Materials, Design and Manufacture.

Q. MSS SP-69: Pipe and Hangers and Supports - Selection and Application.

R. MSS SP-89: Pipe Hangers and Supports - Fabrication and Installation Practices.

S. MSS SP-90: Guidelines on Terminology for Pipe Hangers and Supports.

T. SMACNA-DCS: HVAC Duct Construction Standards, 3rd Edition.

U. SMACNA SRM: Seismic Restraint Manual Guidelines for Mechanical Systems, 2nd Edition.

V. UPC: Uniform Plumbing Code.

PART 2 PRODUCTS

2.01 ACCEPTABLE MANUFACTURERS

A. Products shall comply with Section 23 05 00, Paragraph 2.01, Acceptable Manufacturers.

B. Hangers and Supports: Grinnell, B-Line Systems, Unistrut, Erico, PHD, Basic-PSA, Pate, Caddy, Unisource, Metraflex, American Insulation Sales, Thermal Pipe Shields, Miro Industries.

C. Anchors: Rawplug, Phillips, Hilti, Michigan, Simpson, Fastenal, Red Head, Grinnell, B-Line Systems, Unistrut, PHD, Basic-PSA, Metraflex.

2.02 GENERAL

A. Finish:

1. Indoor Applications: Electro-plated zinc in accordance with ASTM B 633, or hot-dip galvanized after fabrication in accordance with ASTM A 123; except that hanger straps may be formed from pre-galvanized steel.

2. Outdoor Applications: Hot-dip galvanized after fabrication in accordance with ASTM A 123, ASTM A 153, or ASTM A 653 (as applicable to item).

B. Identification: Steel pipe hangers and supports shall be stamped with the manufacturer's name, part number, and size.

C. Hanger Rods: Threaded hot rolled steel. Hanger rods shall be sized so that the total load imposed (including pipe or duct, insulation, hangers, and fluid) does not exceed the following:

Nominal Rod Diameter	Maximum Load
1/4 Inch	240 Pounds
5/16 Inch	440 Pounds
3/8 Inch	610 Pounds
1/2 Inch	1130 Pounds
5/8 Inch	1810 Pounds
3/4 Inch	2710 Pounds
7/8 Inch	3770 Pounds
1 Inch	4960 Pounds

D. Hanger Straps: Galvanized steel, minimum 1" x 22 gauge (except where required by Code to be heavier or noted otherwise), of lock-forming grade conforming to ASTM A924, G90 (minimum) galvanized coating conforming to ASTM A 653. Minimum yield strength of 30,000 psi. Straps shall be sized so that the total load imposed does not exceed the following:

Strap Size	Maximum Load
1" x 22 Gauge	230 Pounds
1" x 20 Gauge	290 Pounds
1" x 18 Gauge	380 Pounds
1" x 16 Gauge	630 Pounds
1-1/2" x 16 Gauge	990 Pounds

E. Beam Attachments: Constructed of malleable iron or steel, MSS standard types designed for clamping to building structural support beam. "C" clamp type shall have cup point set screws with locknuts and retaining straps. Center loaded type beam clamps shall have horizontally adjustable clamping bolt (or rod with nuts).

F. Concrete Anchors: Wedge type expansion anchors, with hex nut and washer, and stainless steel split expansion rings. Tested to ASTM E 488 criteria, UL listed, with exposed anchor head stamped with code to identify anchor length.

G. General Anchors (Screws, Nuts, Bolts, Fasteners):

1. General: Constructed of materials suitable for the conditions exposed to and materials being joined, with minimum 50 year service life. Stainless steel construction where exposed to corrosive conditions. Configuration, size and grade to suit application, accommodate expected forces, and provide anchoring to structural element (or allow for proper fastening of items). Minimum safety factor of 2.5 (or as required by code, whichever is greater). Comply with ASTM A307, SAE J429, SAE J78, or ASTM A 563; bolts and nuts shall have unified inch screw threads (course, UNC).

2. Test Reports: Provide independent test report indicating fastener strength (pullout and shear) as installed in the materials and applications of this project (when required by the Engineer or AHJ).

3. Finish: In finished areas, the portion of fastener exposed to view shall match the exposed finish of item being fastened.

H. Manufactured Strut Systems:

1. Channels: Minimum 12 gauge, 1-5/8 x 1-5/8" (unless noted otherwise), with slots/holes to suit application.

2. Accessories: Channel nuts press formed, machined and hardened with gripping slot, fabricated from steel conforming to ASTM A 108 or ASTM A 36. Fittings fabricated from steel in accordance with ASTM A 907.

3. End Caps: Vinyl cap, capable of withstanding high temperatures without degradation, manufactured specifically for use with manufactured strut. Unistrut Series P2859 or P2860 (or approved).

I. Steel: Structural steel per ASTM A 36.

J. Wood: Only allowed to be used where building structural elements are of wood construction same type, grade used for building structural members. Where located outdoors shall be the pressure treated type; with all cut portions of wood painted with wood preservative.

K. Field Galvanizing Compound: Brush or spray applied galvanizing treatment; consisting of a premixed ready to apply liquid organic zinc compound, with 95% metallic zinc content by weight in dry film. ZRC worldwide "ZRC Cold Galvanizing Compound".

L. Rooftop Pipe Supports: Designed for rooftop support of piping to distribute load evenly over roof surface; factory fabricated. Shall be constructed of thermoplastic, polycarbonate, or polyethylene material, with attached strut support for anchoring of pipe, pipe attachment hardware, and sized to suit piping used with and so that pressure on roof does not exceed 150 pounds per square foot. Provide style with height to match pie height requirements above the roof. Strut and hardware shall be hot-dipped galvanized or have electro-galvanized finish. Plastic materials shall have UV stabilizers to resist UV deterioration. For piping systems subject expansion and contraction, provide roller type support allowing pipe movement, having a foam bottom to minimize roof abrasion. Caddy "Pyramid ST", Pyramid 50", "Pyramid 150", Pyramid RL".

M. Rooftop Equipment Sleepers: Factory fabricated sleepers, constructed of minimum 18 gauge galvanized steel, all joints fully welded, with integral base plate pressure treated top wooden nailer, and integral top flashing having side turndown over wood nailer. Size to suit equipment supported, with minimum height above roof as indicated, and configuration to suit roof and roof insulation used with. Pate Co. "es-Equipment Supports", Thybar "TEMS", (or approved equal).

2.03 PIPE HANGERS AND SUPPORTS

A. Copper Pipe: All hangers used directly on copper pipe shall be copper plated or have a factory applied 1/16-inch thick (minimum) plastic coating on all contact surfaces.

B. Cushion Clamps: Pipe clamps with a vibration dampening insert between the pipe and clamp, with a nylon inserted lock-nut on clamp. Insert shall be constructed of a thermoplastic elastomer, designed to tightly fit and match pipe size and clamp used with; suitable for system temperatures.

C. Type: Shall be MSS type selected in accordance with MSS-69; except that MSS type 24, 26, and 34 shall not be used.

D. Trapeze Hangers: Shall be constructed of carbon steel angles, manufactured strut channels, or other structural shapes with flat surface (or installed saddle) for pipe support. Provide steel washer where hanger rod nuts bear on trapeze hanger. Pipe anchors shall be two piece clamp type designed for use with trapeze style (i.e. inserted into strut channel opening) or one piece type designed for welded or bolted attachment to trapeze; shaped to match pipe size (or pipe size plus insulation thickness on insulated systems). Pipe guides shall comply with paragraph titled "Alignment Guides"; or be steel angles with vertical leg height equal to pipe diameter (or pipe diameter plus insulation thickness on insulated systems); or be two piece clamp type pipe anchors sized and installed to serve as a guide.

E. Insulated Pipe Supports:

1. Insulation material at pipe support shall consist of expanded perlite, calcium silicate or high density phenolic. Where located outdoors or used on chilled water piping, insulation material, shall be water resistant. Insert shall have a flame resistant jacket of nylon reinforced kraft paper bonded to aluminum foil cover on insulation, with galvanized steel shield. Insulation material shall have no more than 5% deformation at 100 psi and a thermal conductivity no more than 0.32 Btu/hr-sf-deg F-inch (rated at 75 deg F). Insulation shall be suitable for

temperatures and conditions it will be exposed to without degradation over a 30 year life.

2. All insulation and materials shall have a fire hazard rating not to exceed 25 for flame spread and 50 for smoke development, as tested by ASTM E84.

3. Insert shall be same thickness as adjoining pipe insulation, sized to match pipe diameter used on.

4. Minimum insulation and shield lengths, and minimum shield gauge:

Nominal Pipe Diameter In Inches	Insulation Length In Inches	Shield Length In Inches	Minimum** Shield Gauge
1/2 to 1	*	4	20
1-1/4 to 2	6	4	20
2-1/2 to 6	6	4	18
Larger Sizes	9	6	16

* Insert not required; shield at insulation is acceptable.
** Provide with 360° shield where pipe is clamped (or has a 360° anchor).

2.04 DUCT HANGERS AND SUPPORTS

A. Hangers: As shown in SMACNA-DCS except that wire shall not be used and all materials used shall comply with these specifications.

B. Vertical Duct Supports at Floor: 1-1/2" x 1-1/2" x 1/8" (minimum) galvanized steel angle and to support ducts, maximum 12 foot on center, and as shown in SMACNA-DCS. For ducts over 30 inches wide provide riser reinforcing with hanger rods between the riser support and riser reinforcing.

C. Vertical Duct Supports at Wall: 1-1/2" x 1/8" (minimum) strap or 1-1/2" x 1-1/2" x 1/8" (minimum) angle bracket and as shown in SMACNA-DCS.

D. Hanger Attachments to Structure: As shown in SMACNA-DCS to suit building construction and as allowed on structural drawings. Provide washers at all fasteners through hanger straps (regardless of SMACNA-DCS allowances). Where C-clamps are provided, retainer clips shall be used. Friction beam clamps shall not be used.

E. Hanger Attachments to Ducts: As shown in SMACNA-DCS except that wire shall not be used as any form of support or attachment for ducts.

F. Flexible Duct Strap: Woven polypropylene hanging strap, minimum tensile strength of 400 lbs, minimum 1.75-inches wide, designed and intended for flexible duct support.

G. HVAC Support Wire: Steel, minimum 12 gauge, soft-annealed wire, complying with Federal Specification QQ-W-461H, and IBC for support of ceilings and accessories installed in ceilings.

PART 3 EXECUTION

3.01 INSTALLATION - GENERAL

A. General: Provide all necessary bolts, nuts, washers, fasteners, turnbuckles, hanger rods, rod connectors, stanchions, wall/roof/floor backing and attachments, bridging between structural members, and any other miscellaneous accessories required for the support and anchoring of all pipes, ducts, and mechanical equipment. All supports, whether from floor, walls, or hung from structure, are Contractor's responsibility. Anchors and supports shall be adequate to accommodate forces equipment will be exposed to. Any field cut pieces of galvanized materials shall be hot-dip galvanized after cutting; or be solvent and wire brushed clean and receive field applied galvanizing treatment. This field applied galvanizing (only allowed with prior permission for minor localized cuts) shall use multiple coats to provide as near equal protection as possible to factory (or hot-dip) applied coatings.

B. Backing: Install steel or wood backing in walls (anchored to studs) and in ceiling (anchored to joists or trusses), as required to provide support for items.

C. Installation: Install all inserts, anchors, and supports in accordance with manufacturer's instructions, code requirements, and best professional practices. The most restrictive criteria governs.

D. Welded Assembly Finish: All welded steel support assemblies shall have a power wire brush and primer paint finish where installed indoors and be have factory applied hot-dip galvanized finish where installed outdoors (or subject to moisture); unless another finish is specified.

E. Attachments: Attach to anchoring element (i.e. building structure, concrete pads, etc.) as shown on drawings (reference structural drawings). Where not detailed on the drawings, the Contractor shall design and submit shop drawings of proposed attachment methods to the Engineer for review.

F. Application:

1. Where not detailed on the drawings (or otherwise indicated), the selection and design of supports is the Contractor’s responsibility, in compliance with code and Contract Document requirements; subject to submittal review and acceptance by the Engineer.

2. Exposed supports in finished areas shall be arranged to minimize their visibility; be free of dents, scratches and labels, and be configured in a manner to match the decorum and finish of the room they are installed in. Exposed supports in finished areas shall be cleaned to allow for field painting (unless a chrome, stainless steel, or similar finish has been indicated).

3. HVAC Support wire and flexible duct strap shall only be used for support of ceiling air inlets and outlets, or at flexible duct supports.

G. Manufactured Strut ("Unistrut"): Provide end caps on all strut ends at the following locations:

1. Where exposed to view in finished areas.

2. Where near maintenance access paths.

3. Where personnel injury could occur if the ends were not covered.

H. Seismic: Provide bracing and added supports to restrain movement in a seismic event. Items serving as seismic restraints shall comply with Section 23 05 48.

3.02 INSTALLATION OF PIPE HANGERS AND SUPPORTS

A. General: Aboveground pipe shall be anchored to the structure to prevent sagging, to keep pipe in alignment, and to resist the forces the pipe will be exposed to; piping shall be supported independent of equipment so that no loads bear on the equipment.

B. Adjustment: All pipe supports shall be provided with a means of adjustment for the aligning and leveling of the pipe after installation.

C. Applications: Selection, sizing, and installation of pipe supports and accessories shall be in accordance with the manufacturers recommendations, standards MSS SP-89 and MSS SP-69, UPC, and IMC. Refrigerant piping and similar piping subject to vibration (i.e. high pressure tubing) shall be installed with cushion clamps.

D. Support Spacing: Provide piping support spacing according to the most restrictive of the following: UPC, IMC, ASME B31.1, B31.9, local codes, manufacturers recommendations or Contract Documents specific requirements. Provide supports at each change in direction of piping and at each side of concentrated loads (such as in-line pumps, valves greater than size 5", and similar items).

E. Trapeze Hangers: Four or more pipes running parallel may be supported on trapeze hangers provided the slopes of such pipes allow use of common trapeze. Suspend trapeze hanger from the building structure using hanger rods; attach to the building structure using concrete inserts, beam clamps, or other approved methods. Where trapeze width exceeds 30 inches, and where building attachment restrictions require more anchor points, provide three (or more) hanger rod supports. Provide pipe anchors to secure piping to trapeze on minimum 20 foot spacing; size and install pipe anchor to allow longitudinal movement of pipe (unless noted otherwise) with minimal vertical and transverse movement; where pipe is subject to expansion/contraction provide anchoring and alignment guides per paragraph titled "Thermal Expansion/Contraction".

F. Vertical Piping Supports: Support piping at each floor line with pipe clamps and at intermediate points as required so that hanger spacing does not exceed allowable spacing and as required to prevent excessive pipe movement and so as to comply with the maximum spacings cited above. Support all pipe stacks at their bases with a concrete pier or suitable support. For vertical pipe drops which occur away from a wall or similar anchoring surface, provide angled bracing from nearest structure on two sides of drop to provide rigid anchoring of pipe drop.

G. Pre-Insulated Pipe Supports: Protect all insulated pipe at point of support with pre-insulated pipe supports. Such supports shall be in place at time of installing pipe.

3.03 INSTALLATION OF DUCT HANGERS AND SUPPORTS

A. General: Provide anchors and supports for all ductwork. Supports and hangers shall comply with SMACNA-DCS, except that hanger spacing and hanger maximum loads shall be governed by whichever is more restrictive between these specifications or SMACNA-DCS.

B. Hanger Spacing -- Rectangular Duct:

Duct Area	Maximum Spacing
Up to 4 Square Feet	8 Feet
4.1 to 10 Square Feet	6 Feet
10 Square Feet and Up	4 Feet

C. Hanger Spacing -- Round Duct:

Duct Area	Maximum Spacing
Up to 24 Inch Diameter	8 Feet
25 Inch to 48 Inch Diameter	6 Feet
49 Inch Diameter and Up	4 Feet

D. Hanger Spacing - Flexible Duct: 4 feet, and at changes of direction as needed to maintain duct elevation and smooth airflow.

E. Vertical Ducts: Support at each floor level, but in no case less than on 12 foot intervals.

F. Flexible Duct: Support with methods shown in ADC. Metal strap in contact with the flexible duct shall have minimum 1.5-inch width.

G. Fittings: Provide supports at each change in direction of duct for ducts with 4 square foot area or more, or for ducts larger than 24 inch diameter. Locate hangers at inside and outside corners of elbows--or at each end of fitting on each side.

H. Concentrated Loads: Provide additional supports at each side concentrated loads such as modulating dampers (24" x 24" and larger), duct heaters (18" x 18" and larger), sound attenuators (all sizes), and similar items.

I. Exterior Duct: Provide supports for exterior ductwork as shown in SMACNA-DCS; spacing as specified herein.

J. End of Duct: At end of duct run, hangar shall be located no more than 1/2 the allowed hangar spacing from the end of the run.

3.04 CEILING SERVICES

A. Less than 20 Pounds: Ceiling mounted services, air inlets/outlets, and accessories weighing less than 20 pounds shall be positively attached to the ceiling suspension main

runners (or ceiling support members) or to cross runners with the same carrying capacity as the main runners (or support members).

B. 20 to 56 Pounds: Ceiling mounted services, air inlets/outlets, and accessories weighing 20 pounds but not more than 56 pounds, in addition to the above, shall have two No. 12 gauge wire hangers (or minimum 1" x 22 gauge hangar straps) connected from the terminal or service to the ceiling system hangers or to the structure above. These added hangers may be slack.

C. Greater Than 56 Pounds: Ceiling mounted services, air inlets/outlets, and accessories weighing more than 56 pounds shall be supported directly from the building structure by approved hangers.

3.05 MECHANICAL EQUIPMENT ANCHORS AND SUPPORTS

A. General: Provide anchoring and supports for all mechanical equipment. All equipment shall be anchored to (or supported from) the building structure. In lieu of anchoring to the building, anchor outdoor equipment to the concrete pad serving the equipment.

B. Suspended Equipment: Support as indicated on the plans. Where not indicated use the methods shown (or consistent with) Mason SRG and SMACNA-DCS; submit shop drawings of the proposed methods to the Engineer for review.

C. Roof Mounted Equipment: Install on roof curbs or roof sleepers as indicated. Anchor equipment to the curb (or sleeper), with the curb (or sleeper) in turn anchored to the building structure.

D. Vibration Isolation: Equipment shall be supported and anchored in such a way so that no equipment vibration is transmitted to the building structure.

E. Seismic: Coordinate with requirements of Section 23 05 48; provide anchors and bracing to resist seismic forces.

END OF SECTION

PART 1 GENERAL

1.01 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 00 and Division 01 Specification Sections, apply to this Section.

B. Requirements of Section 23 05 00 apply to this Section.

1.02 WORK INCLUDED

A. Pipe Sleeves.

B. Duct Closure Collars.

C. Firestop Seals.

D. Non-Firestop Seals.

1.03 DEFINITIONS

A. Firestop System: Specific firestop materials or combination of materials installed in a specific way in openings in a specific rated assembly to restore (or maintain) the fire rating and smoke passage resistance properties of the assembly.

B. Firestop Seal: Same as “Firestop System”.

C. Rated Assembly: Wall, floor, roof, ceiling, roof/ceiling or other construction which is required (by code or the Contract Documents) to have a fire-resistance rating, be a smoke barrier, or to limit the passage of smoke.

1.04 SUBMITTALS

A. General: Shall comply with Section 23 05 00.

B. Product Data: Provide product data on all material to be use. Provide MSDS for all sealants, caulks and similar materials.

C. Shop Drawings – General: Shop drawings of proposed sealing/flashing assembly for roof and exterior wall penetrations.

D. Shop Drawings – Firestop: Provide firestop system shop drawings showing:

1. Listing agency’s detailed drawing showing opening, penetrating items, and firestop materials. Drawing shall be identified with listing agency’s name and number or designation, fire rating achieved, and date of listing for each firestop system.

2. Identify where each firestop system is to be used on the project.

3. Manufacturer's installation instructions.

4. For proposed systems that do not conform strictly to the listing, submit listing agency's drawing marked to show modifications and stamped approval by the firestop system manufacturer's fire protection engineer.

5. Other data as required by the AHJ.

1.05 REFERENCES

A. ASTM A 36: Standard Specification for Carbon Structural Steel.

B. ASTM C534: Standard Specification for Preformed Flexible Elastomeric Cellular Thermal Insulation in Sheet and Tubular Form.

C. ASTM E 84: Standard Test Method for Surface Burning Characteristics of Building Materials.

D. ASTM E 814: Standard Test Method for Fire Tests of Through-Penetration Fire Stops.

E. UL 1479: Standard for Fire Tests of Through-Penetration Firestops.

F. UL 723: Surface Burning Characteristics of Building Materials.

G. SMACNA-DCS: SMACNA HVAC Duct Construction Standards, 3rd Edition.

H. SMACNA-ARCH: SMACNA Architectural Sheet Metal Manual, 7th Edition.

1.06 GENERAL REQUIREMENTS

A. Corrosion Protection: All sleeves exposed to water, moisture, chemicals, or subject to corrosion shall be constructed of corrosion resistant materials suitable for the exposure. Steel sleeves shall be hot dip galvanized after assembly. Provide additional coatings as noted or as required to resist corrosion.

PART 2 PRODUCTS

2.01 ACCEPTABLE MANUFACTURERS

A. Products shall comply with Section 23 05 00, Paragraph 2.01, Acceptable Manufacturers.

B. Firestop Seal Materials: 3M, Dow Corning.

C. Non-Firestop Seal Materials: 3M, GE, Dow Corning, Tremco, Pecora, Sonneborn, Pipeline Seal & Insulator.

2.02 PIPE SLEEVES

A. Diameter:

1. Aboveground: Inside diameter of aboveground pipe sleeves shall be at least 1-inch larger than the outside diameter of the pipe or pipe covering (for covered piping systems), so as to allow free movement of piping.

2. Large Movement: Provide larger sleeves where a larger space around pipe exterior is required by code, where specifically noted, where pipe movement will occur (i.e. expansion/contraction or seismic), at expansive soils, other unusual conditions are present, and where required to accommodate large piping movement.

B. Length: Horizontal sleeves through finished areas (where sleeve is exposed to view) shall be sized to be flush with finished surfaces; other horizontal sleeves may terminate flush to 2-inches past the element being penetrated. Vertical sleeves shall be sized to extend one inch above the final floor elevation.

C. Type: Fabricated from 18 gauge galvanized sheet metal or 22 gauge spiral seam galvanized steel duct. Provide with galvanized steel angle tabs, collars, or similar to allow for anchoring where sleeve cannot be retained in place by element being penetrated.

2.03 DUCT CLOSURE COLLARS

A. General: Closure collars shall provide closure of opening between duct and opening in element penetrated and shall abut tight up to and overlap duct and shall consist of rolled angle material (for round ducts) and welded framed angles (for rectangular and round ducts).

B. Size: Closure collars shall be sized to match duct and opening applied to and shall have minimum 2-inch overlap on duct side and 2-inch overlap at opening/penetrated element side but shall completely cover opening in element penetrated with minimum 1-inch overlap to undisturbed element (i.e. wall, floor, etc.).

C. Material: Closure collars shall be fabricated of 20 gauge galvanized steel for ducts 15 inches diameter and less and shall be fabricated of 18 gauge galvanized steel duct for all larger ducts and all square and rectangular ducts.

2.04 FIRESTOP SEALS

A. General: Commercially manufactured through-penetration and membrane-penetration firestop systems to prevent the passage of fire, smoke and gases, and to restore the original fire-resistance rating of the barrier penetrated.

B. Listing: Firestopping shall be listed by UL in “Fire Resistance Directory” (category to match the application), or be qualified by another independent agency acceptable to the AHJ.

C. Rating: Firestop system and devices shall be tested in accordance with ASTM E 814 or UL 1479, with “F” and “T" ratings as required to maintain the fire-resistance rating of the barrier penetrated, and as required by code.

D. Fire Hazard: Materials shall have a flame spread of 25 or less, and a smoke development rating of 50 or less; when tested in accordance with ASTM E 84 or UL 723.

E. Cabling Applications: Firestop systems used with loose electrical cabling shall be the type that allows for removal of the cable or installation of new cables without damage to the firestop system, or the need to replace or repair firestop materials.

F. Insulation: Firestop system shall be applicable to insulated systems to allow the insulation to run continuous through the firestop system (unless noted otherwise).

2.05 NON-FIRESTOP SEALS

A. Indoor Sealants:

1. Smoke or Sound Sealant Applications: For use where a firestop seal is not required, but smoke or sound seal is required. Single component, elastomeric or acrylic latex type sealant with STC ratings per ASTM E90. Sealants shall be of the following types, or approved equal:

a. 3M “Smoke and Sound Sealant SS100”.

b. Tremco “Tremstop”.

2. Other Areas - Dry (Not Normally Exposed to Water/Moisture): Single component, latex sealant complying with requirements of ASTM C834. Sealants shall be of the following types, or approved equal:

a. Tremco Corporation “Tremflex 834”.

b. Pecora Corporation “AC-20 Arylic Latex”.

c. Sonneborn Building Products “Sonolac”.

3. Other Areas - Wet (Exposed to Water/Moisture): Single component, mildew resistant silicone sealant complying with requirements of ASTM C920, Type S, Grade NS, Class 25. Color white. Sealants shall be of the following types, or approved equal:

a. Dow Corning “786 Mildew Resistant Silicone”.

b. Pecora Corporation “898 Silicone Sanitary Sealant”.

c. Tremco “Tremsil 200”.

B. Outdoor Sealants:

1. General: Single component, non-sag, low modulus, silicone elastomeric sealant conforming to requirements of ASTM C920, Type S, Grade NS, Class 100/50. Sealant shall be of the following types, or approved equal.

a. Dow Corning “790 Silicone Building Sealant”.

b. Pecora Corporation “890 Silicone”.

c. Tremco “Spectrem 1”.

2. Adjacent to Aluminum: Single component, non-sag, medium modulus, silicone elastomeric sealant conforming to requirements of ASTM C920, Type S, Grade NS, Class 50. Sealant shall be primer-less type for use in joints adjacent to fluoropolymer coatings. Sealants shall be of the following types, or approved equal:

a. Dow Corning “795 Silicone Building Sealant”.

b. GE Silicones, Momentive, SCS2000 and SCS7000.

c. Pecora “895 Silicone”.

d. Tremco “Spectrem 2”.

C. Expanding Foam Sealant:

1. General: Single component, polyurethane insulating sealant with flame spread index of 25 or less and smoke development rating of 50 or less. Shall expand and fully cure within 24 hours to a semi-rigid, closed cell, water and air resistant foam. Sealant shall be of the following types, or approved equal.

a. DAP “Kwik Foam”.

b. Fomo Products “Handi-Foam”.

c. Todol Products “EZ Flo Gun Foam”.

D. Specialty: Packed fiberglass or wool insulation; with silicone sealant rated for use with temperatures and other conditions encountered.

E. Grout: ASTM C 1107, Grade B, post-hardening and volume-adjusting, dry, hydraulic-cement grout. Nonshrink; recommended for interior and exterior applications. Design mix shall provide 5000-psi, 28-day compressive strength. Premixed and factory packaged.

PART 3 EXECUTION

3.01 PIPE SLEEVES

A. General: Provide sleeves for all piping passing through walls, floors, partitions, roofs, foundations, footings, grade beams, and similar elements. Except that sleeves are not required at core drilled penetrations through solid concrete or where formed openings equivalent to a core drilled opening are provided.

B. Installation: Set sleeves plumb or level (or sloped as required for sloped pipes) in proper position, tightly fitted into the work. Set sleeves properly in element for specified

projection past adjacent surfaces (see sleeve product specification); cut ends of sleeve as necessary.

C. Insulation: Insulation shall run continuous through sleeves (unless noted otherwise).

3.02 DUCT CLOSURE COLLARS

A. General: Closure collars shall be provided for all exposed ducts on each exposed penetration where the duct passes through any floors, walls, ceilings, roofs, partitions, and similar elements. Closure collars shall additionally be provided where so noted on the drawings and at all duct penetrations into mechanical rooms, boiler rooms, and rooms housing mechanical equipment (on both sides of the penetration).

B. Installation: Collar shall be installed tight against surfaces and shall fit snugly around the duct or duct covering. Sharp edges of the collar around insulated duct shall be ground smooth to preclude tearing or puncturing the insulation covering or vapor barrier of insulated ducts. Collars shall be anchored to element penetrated, with fasteners appropriate to material fastening to, on maximum 6 inch centers.

3.03 FIRESTOP SEALS

A. General: At each through-penetration and membrane-penetration in rated assemblies, where required to limit the passage of smoke, and as required by code or in the Contract Documents, provide a firestop system. Firestop system shall be installed in accordance with the manufacturer's instructions and listing.

B System Selection: Contractor is responsible to select the firestop systems to be utilized, corresponding to the construction of the assembly penetrated, and types of penetrations. Contractor shall submit proposed firestop systems to be utilized, shall also review such systems with the AHJ and obtain AHJ approval.

C. Preparation: Prepare surfaces as recommended by firestop material manufacturer. Examine and confirm that conditions are acceptable to proceed with the installation. Provide maskings and temporary coverings to prevent contamination or defacement of adjacent surfaces.

D. Installation Review:

1. Notify Architect/Engineer when firestopping work is complete and ready for review. Provide minimum 7 days notice to allow scheduling of review. An independent testing agency may be utilized to perform an inspection.

2. Notify AHJ when firestopping work is complete and ready for inspection. Provide sufficient advance notice to allow scheduling of the inspection without adversely impacting project schedule.

3. Do not cover or conceal firestopping until all inspections have been satisfactorily completed.

3.04 NON-FIRESTOP SEALS

A. General: Provide seals around all ducts, conduit, and piping passing through sleeves, walls, floors, roofs, foundations, footings, partitions, and similar elements. Seals shall be watertight where the penetration may be exposed to water or moisture. Provide type of sealant to suit the application. Provide smoke and sound type at all penetrations of rooms which contain mechanical equipment on both side of element penetrated to a depth of 5/8-inch (unless noted otherwise).

B. At Sleeves:

1. Between Sleeve and Penetrated Element: Fill openings around outside of pipe sleeve with same material as surrounding construction, or with material of equivalent fire and smoke rating and properties that allow a tight seal between the sleeve and the surrounding construction. Seal full depth of sleeve for vertical penetrations.

2. Between Pipe and Inside of Sleeve: Provide sealant between outside of pipe or pipe covering (for covered piping systems) and inside of sleeve. Seal depth shall be minimum 1-inch each side. Provide Link Seal type for belowground penetrations, vault wall penetrations, and slab-on-grade penetrations (not required where flexible type sleeves are used).

C. Preparation: Remove loose materials and foreign matter impairing adhesion of seal. Perform preparation in accordance with recognized standards and sealant manufacturers recommendations. Protect elements surrounding area of work from damage or disfiguration due.

D. Installation: Install sealants immediately after joint preparation. Install sealants free of air pockets, foreign embedded matter, ridges, and sags. Tool exposed joint surface concave and with a neat finished appearance.

END OF SECTION

PART 1 GENERAL

1.01 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 00 and Division 01 Specification Sections, apply to this Section.

B. Requirements of Section 23 05 00 apply to this Section.

1.02 WORK INCLUDED

A. Vibration Isolation.

B. Seismic Restraints.

1.03 DEFINITIONS

A. "Equipment" is defined to mean any item with power connections (fans, HV units, AHU units, etc.), and also to include all hoods; but does not include pumps less than 3 hp.

B. "Equipment Requiring Vibration Isolation" is defined to be any equipment (as defined above) with rotating components (e.g. pumps, fans, etc.).

1.04 SUBMITTALS

A. General: Submittals shall comply with Section 23 05 00.

B. Product Data:

1. Submit product data on all items to be used.

2. Submit calculations showing vibration isolation selection for all isolation devices provided under this specification section (i.e. where isolation is not furnished integral with the equipment or by the manufacturer of the equipment).

C. Shop Drawings: Submit shop drawings for all fabricated support assemblies.

D. Submit calculations showing seismic restraint calculations, restraint selection, proposed locations of all seismic control bracing, and details of bracing construction.

1.05 GENERAL REQUIREMENTS - VIBRATION ISOLATION

A. General:

1. Select and provide all vibration isolation devices for all equipment requiring vibration isolation so as to provide complete installed mechanical systems free of the transmission of vibration and vibration generated noise to the structure.

2. Vibration isolation is shown on the drawings for various items but is not shown for all items requiring isolation. Provide all isolation as indicated and specified herein.

B. Supplier: Where not provided by the equipment manufacturer, all vibration isolation devices and support assemblies shall be supplied as a coordinated package by a single vibration isolation manufacturer, under this specification section.

C. Equipment Manufacturer Items: Isolation devices furnished by equipment manufacturer shall comply with this specification section and be selected by the manufacturer to suit, and provide satisfactory performance, for the applications of this project.

1.06 GENERAL REQUIREMENTS - SEISMIC RESTRAINTS

A. General: Mechanical equipment, piping, and ductwork seismic restraints are typically not shown on the drawings but are to be provided as specified herein. Contractor is responsible to select and provide all seismic anchoring devices for all mechanical equipment, all piping, and all ductwork.

B. Seismic Restraint Systems:

1. The Contractor shall retain a specialty consultant or equipment manufacturer to develop seismic restraint systems and perform seismic calculations in accordance with code and requirements specified in this section. Calculations, restraint selections, and installation details shall be done by a professional engineer experienced in seismic restraint design and installation and licensed in the State where the project is located.

2. The seismic design, consisting of calculations, restraint selection, installation details, and other documentation, shall be submitted. This submittal shall be signed and sealed by a professional Engineer.

3. The seismic restraint design shall clearly indicate the attachment points to the building structure and all design forces (in X,Y, and Z direction) at the attachment points. The seismic restraint engineer shall coordinate all attachments with the building's structural engineer of record, who shall verify the attachment methods and the ability of the building structure to accept the loads imposed.

4. The seismic restraint design shall be based on actual equipment data (dimensions, weight, center of gravity, etc.) obtained from submittals or the manufacturers. The equipment manufacturer shall verify that the attachment points on the equipment can accept the combination of seismic, weight, and other loads imposed.

5. Analysis should include calculated dead loads, static seismic loads, wind loads, and the capacity of materials utilized for the connection of the equipment or system to the structure. Analysis should detail anchoring methods, anchoring materials, anchor sizes, embedment, and related details. All seismic restraint

devices should be designed to accept, without failure, the calculated seismic forces.

6. Forces shall be calculated in accordance with accepted engineering practice and code requirements, using appropriate seismic "zone" and other factors for the building type, systems involved, and project location.

7. This project's building is considered a "non-essential" facility, Risk Category III.

1.07 REFERENCES

A. IBC: International Building Code.

B. IMC: International Mechanical Code.

C. MASON: Mason Industries Seismic Restraint Guidelines for suspended piping, Ductwork, Electrical Systems and Floor Mounted Equipment, 2005 6th Edition.

D. OSHPD: Office of Statewide Health Planning and Development, State of California, Fixed Anchorage.

E. SMACNA/SRM: Seismic Restraint Manual Guidelines for Mechanical Systems, 2nd Edition.

F. UPC: Uniform Plumbing Code.

PART 2 PRODUCTS

2.01 ACCEPTABLE MANUFACTURERS

A. Products shall comply with Section 23 05 00, Paragraph 2.01, Acceptable Manufacturers.

B. Products: Mason, Peabody, Kinetics Noise Control, Vibration Eliminators, VMC Group.

C. Expansion Devices/Flexible Connectors: Unisource Manufacturing, Twin City Hose, and as specified in Section 23 05 19 and 23 33 00.

2.02 NEOPRENE ISOLATORS

A. Isolation Pads: Oil resistant bridge bearing neoprene pads, minimum 3/4-inch thick, with cross-ribbed or waffle design. Size pads for not more than 50 psi or as recommended by vibration isolator manufacturer. Provide load distribution plates (minimum 3/8" plate steel) to evenly load pads. Mason Type SW (or approved).

2.03 SPRING ISOLATORS

A. General: The load carried by each isolator shall be carefully calculated and isolators selected so that the static deflection will be the same and the supported equipment will remain level. Isolators shall be so designed that the ends of the springs will remain

parallel during and after deflection to operating height. At operating height, springs shall have additional travel to complete (solid) compression equal to at least 50 percent of the operating deflection. Suspension isolator springs shall have a static deflection not less than 1-inch (unless noted otherwise), except that for units with components rotating at 1000 rpm and less, the static deflection shall be not less than 2 inches (unless noted otherwise). Floor isolator springs shall have deflection of not less than 1 inch. All isolators shall provide at least 95% isolation efficiency. Deflections other than these may be used where circumstances warrant and more optimum isolation results can be achieved; provided that a written explanation is submitted for Engineer review and approval.

B. Floor Type Spring Isolators: Open spring type with ratio between spring diameter divided by compressed spring height no less than 0.8. A ribbed neoprene acoustical friction pad shall be bonded to the underside of the isolator. Shall have bolted connections for rigid attachment to equipment, configured to allow for equipment leveling by bolt adjustment. Provide with height saving bracket. Mason Series SLF (or approved).

C. Floor Housed Type:

1. Ductile Iron: Housed spring isolator with ductile iron housing, base plate with mounting holes, spring inspection ports, neoprene cushion, adjustable upward rebound plate. OSHPD pre-approved. Provide with mounting brackets to suit equipment connected to. Mason Series SSLFH (or approved).

2 Welded Steel: Housed spring isolator with welded steel housing, steel base plate with mounting holes, number of springs to suit application, neoprene vertical limit stops, spring bottom neoprene acoustical cups, bottom non-skid neoprene friction pad, and equipment attachment configuration to suit equipment served. OSHPD pre-approved. Provide with mounting brackets to suit equipment connected to. Mason Series SLR or SLRSO (or approved).

D. Suspension Type Spring Isolators: Shall consist of a rigid steel frame with a stable steel spring in the bottom part of the frame, and double deflection neoprene (or rubber) isolating pad at the top of the frame. Where supporting rods pass through the frame, a clearance of not less than one-half rod diameter shall be provided all around the rod and neoprene bushings provided to prevent steel to steel contact. Mason Series DNHS or Series 30N (or approved).

2.04 SEISMIC RESTRAINTS

A. General: Comply with code, SMACNA-SRM and MASON.

B. Materials:

1. Steel shall be per ASTM A36; hangers and other devices shall be per Section 23 05 29 and as shown in SMACNA-SRM or MASON. Sheet metal used for bracing shall be no less than 16 gauge. Material for straps shall be galvanized steel, no less than 18 gauge.

2. Cabling: Cables shall be minimum 1/8" diameter, 7 x 19 strand, galvanized steel with clear vinyl coating. Provide with galvanized thimble, clamps, and accessories. End termination and clamping/application shall comply with SMACNA-SRM.

C. Flexible Connectors:

1. Piping Systems:

a. Flexible Connectors: As specified in Section 23 05 19.

b. Seismic “V” Connectors: "V" design connector with braided hose and attachment fittings. Shall be constructed of type 321 stainless steel hose and braid with carbon steel elbows and ends (for steel piping systems); and bronze hose and braid with copper elbows and ends (for copper piping systems). Unit shall allow for 2" movement in all planes, and have minimum 150 psi working pressure at the system temperature installed. Unisource Manufacturing (or approved).

2. Ductwork: Flexible connectors as specified in Section 23 33 00.

PART 3 EXECUTION

3.01 VIBRATION ISOLATION

A. Isolators shall be of the type indicated; except where not shown, type shall be as selected by vibration isolation manufacturer (or equipment manufacturer) to provide adequate isolation.

B. Installation: Install all vibration isolators in accordance with isolator manufacturer's instructions and isolated equipment manufacturer's recommendations.

3.02 SEISMIC RESTRAINTS

A. General: Provide seismic restraints as required by code and as specified. Comply with SMACNA-SRM, MASON, and code referenced standards for seismic provisions. Anchoring system and restraints shall be able to withstand anticipated seismic forces. Coordinate with equipment manufacturers for proper equipment anchor attachments to withstand anticipated forces. Coordinate with project structural engineer for attachment of seismic restraints to building.

B. Piping: Longitudinal and transverse bracing shall be required for all piping 2-1/2-inch diameter and larger and on all fuel gas piping 1-inch and larger. Bracing shall be applied as follows:

1. Transverse bracing shall occur at maximum intervals of 40 feet, except on fuel gas piping on maximum intervals of 20 feet.

2. Longitudinal bracing shall occur at maximum intervals of 80 feet, except on fuel gas piping on maximum intervals of 40 feet. Transverse bracing for one pipe section may also act as a longitudinal bracing for a pipe section connected perpendicular to it, if the bracing is installed within 2 feet of the elbow or tee of similar size. Piping conveying fluids at 100 degrees F and higher shall have expansion devices provided in-between longitudinal braces to allow for thermal expansion.

3. Bracing may be omitted when the top of the pipe is suspended 12 inches or less from the supporting structural member and the pipe is suspended by an individual hanger, per code.

C. Ductwork: Longitudinal and transverse bracing shall be required for all round ducts 28 inches in diameter and larger, for rectangular ducts 6 square feet and larger, and on all duct systems used for life safety and smoke control installed in either the horizontal or vertical position. Bracing shall be applied as follows:

1. Transverse bracing shall occur at maximum intervals of 30 feet (20 feet for essential facilities), at each duct turn and at the end of a duct run.

2. Longitudinal bracing shall occur at maximum intervals of 60 feet (40 feet for essential facilities). Transverse bracing for one duct section may also act as longitudinal bracing for a duct section connected perpendicular to it, if bracing is installed within 4 feet of the intersection and sized and installed on the larger duct.

3. Groups of ducts may be combined in a larger size frame using overall dimensions and maximum weight of ducts. At least two sides of each duct must be connected to the angles of the brace.

4. Walls, including non-bearing fixed partitions which have ducts running through them, may replace a transverse brace.

5. Bracing may be omitted when the top of the duct is suspended 12 inches or less from the supporting structural members and on roof top ductwork.

D. Equipment:

1. Equipment Not Requiring External Vibration Isolation:

a. General: Shall be rigidly connected to the structure per Section 23 05 29. Restraints (where required) shall utilize welded steel frames, steel braces, straps, or cables. Provide elastomeric (or neoprene) pads (1/4" thick) between seismic straps and equipment.

b. Base Mounted Equipment:

1) Provide anchorage per Section 23 05 29 and bracing as needed to maintain equipment anchorage with anticipated seismic forces.

2) All equipment shall have seismic bracing where the height of the equipment is 3 or more times the smallest base dimension and where the equipment anchorage alone is not adequate to maintain equipment anchorage with anticipated seismic forces.

3) All water heaters shall have seismic bracing. Equipment which utilizes (or contains) flammables, combustibles, or hazardous materials shall have seismic bracing where the equipment anchorage alone is not adequate to resist anticipated seismic forces.

c. Other Equipment: All equipment located 31" or more from the point of attachment to the supporting structure shall have seismic bracing. Equipment which utilizes (or contains) flammables, combustibles, or hazardous materials shall have seismic bracing.

2. Equipment with External Vibration Isolation:

a. General: Restraints shall not impede operation of vibration isolators, and shall use methods complying with SMACNA-SRM or MASON.

b. Base Mounted Equipment:

1) All equipment shall have seismic bracing where the height of the equipment is 3 or more times the smallest base dimension and where the equipment vibration isolation components are not adequate to maintain equipment in place with anticipated seismic forces.

2) Provide housed spring isolators, seismic snubbers, padded welded steel angle restraint assembly (with minimum 1/4" clearance between pad and equipment), or slack cable restraints.

c. Other Equipment:

1) All equipment located 31" or more from the supporting structure shall have seismic bracing. Equipment which utilizes (or contains) flammables, combustibles, or hazardous materials shall have shall have seismic bracing.

2) Utilize slacked cable bracing to accommodate equipment movement due to vibration isolator operation but installed so as to prevent more than 2-inch movement in any direction.

E. Bracing Arrangements:

1. Do not use branch ducts or piping to brace main runs or consider as braces for equipment.

2. Do not brace items to dissimilar parts of a building or dissimilar building systems that may respond in a different mode during an earthquake. (Examples: wall and roof, solid concrete wall and lightweight roof, existing building structure and new isolated building structure.)

F. Building Expansion Joints: At building expansion joint crossings, provide seismic "V" connectors in piping allowing at least 1 inch movement in all directions and flexible connectors in ductwork (on both sides of expansion joint) allowing at least 1/2 - inch movement in all directions. Provide multiple connectors as required. Provide flexible connectors in ductwork in four places, and of sufficient length to allow relative duct movement (i.e. from one side of building expansion joint to the other) of at least 1-inch in all directions; provide hanger types that will not hinder such movement.

3.03 TEST AND INSPECTION

A. Field Inspections: Prior to initial operation, the vibration isolators and seismic devices shall be inspected for conformance to drawings, specifications, and manufacturer's data and instructions. Check all flexible connectors/expansion devices for proper location, guiding, and end anchoring.

B. Vibration Isolator Inspection: After installation of isolators and seismic restraint devices, remove all shipping blocks and other items that may prevent proper isolator operation. Inspect isolators to verify that the machinery moves freely on its spring isolators within limits of stops or seismic restraint devices. Eliminate or correct interferences.

C. Tests: Check for vibration and noise transmission through connections, piping, ductwork, foundations, and walls. Adjust, repair, or replace isolators as required to reduce vibration and noise transmissions to specified levels. Re-balance, adjust, or replace machinery with noise or vibration levels in excess of those given in the machinery specifications or machinery manufacturer's data. Check for proper operation of expansion devices and associated items during system warm-up.

END OF SECTION

PART 1 GENERAL

1.01 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 00 and Division 01 Specification Sections, apply to this Section.

B. Requirements of Section 23 05 00 apply to this Section.

1.02 WORK INCLUDED

A. Air Balancing.

B. Hydronic Balancing.

C. Report.

1.03 SUBMITTALS

A. General: Comply with Section 23 05 00.

B. Company: Submit name of Company proposed to do the balancing and sample balancing forms. Where the Company has not been pre-qualified, and substitutions are allowed after bidding (see Division 00 and 01), submit information regarding firm qualifications.

C. Personnel: Submit list of personnel that will be assigned to the project and their qualifications, and list of past projects.

D. Reports: Preliminary and final balancing reports.

1.04 REFERENCES

A. AABC-NS: Associated Air Balance Council, National Standards for Field Measurements and Instrumentation.

B. ASHRAE: Handbook of Fundamentals.

C. ACGIH-IV: American Conference of Governmental Industrial Hygienists, Industrial Ventilation, A Manual of Recommended Practice.

D. NEEB-PS: National Environmental Balancing Bureau Procedural Standard for Testing, Adjusting and Balancing Environmental Systems.

1.05 GENERAL REQUIREMENTS

A. General: Balancing shall be done by a company which specializes in this type of work and is totally independent and separate from the Company which has installed the systems to be balanced.

B. Balancers Qualifications:

1. General: Work of this Section shall be performed by balancing firms meeting the following and having prior approval from the Engineer:

   a. Professional Affiliation: Firm shall be an Associated Air Balance Council (AABC) member balancer or National Environmental Balancing Bureau (NEBB) certified balancer.

   b. Experience: Firm shall have satisfactorily completed the balancing work for at least 5 similar projects in the last 3 years. Similar is defined to mean: within 10% of the same quantity of units and air inlets/outlets, involve same type of systems, be the same type of facility (i.e. school, hospital, etc.). The lead field balancer (i.e. the individual who will be on site directing and participating in the balancing efforts) shall have at least 5 years of experience performing balancing work on similar projects.

   c. References: Have five references for similar projects which have been completed in the last three years that will give a good or better performance rating. References shall be engineers, architects, or building owners. As part of the qualification process at least three of these references will be contacted and a rating obtained for the following: timeliness of work (i.e. able to complete work on schedule), cooperative nature of balancer's staff (i.e. ability to work well as a team with other project trades and professionals), overall quality of balancing work, quality of balancing report. Each item will be rated on a scale of 1 to 5 (5 being excellent), with the result averaged, score must be of 4 or better.

2. Pre-Qualified Balancers: As a convenience to the Contractor, the following balancing firms have been pre-qualified. This is not in any way intended to limit competition or prevent other firms from submitting qualifications, but is intended as an aid to Contractors by identifying firms that have been confirmed as meeting the qualification requirements.

   a. Hardin and Sons

   b. Test Comm

   c. Advanced Mechanical Services

   d. Testing and Commissioning (TAC) Services

   e. AccuABC

   f. Neudorfer

3. Qualification Process: Firms not pre-qualified who desire to perform the balancing work shall submit a substitution request form in accordance with Contract Document requirements (reference Division 00 and 01). In addition to

the information required on the substitution request form, submit: Company information, resumes of staff to be assigned, lists of projects, and references (with name of project, staff assigned to project, and contact name and phone number).

C. Balancing Issues: Notify the Engineer in writing of all problems or discrepancies between actual conditions and what design documents show as work proceeds.

D. Engineer's Authority: The Balancer shall be directly responsible to the Engineer and shall perform this work and make system adjustments as directed by the Engineer.

E. Lead Balancer: The Balancer shall assign an individual as “lead balancer” to work in the field to directly supervise the balancing work and field technicians. This lead field balancer shall have at least 5 years of experience performing balancing work on similar projects.

F. Added Site Visits:

1. Trade Coordination Purposes: The Balancer shall include in his bid one extra site visit (beyond those otherwise included) and associated added time to assess system readiness for balancing, resolve system issues, coordinate balancing work, and perform other activities related to balancing and commissioning.

PART 2 PRODUCTS

2.01 GENERAL INSTRUMENTATION

A. General: Balancing equipment shall comply with Associated Air Balance Council recommendations for field measurement instrumentation.

B. Calibration: All measuring instruments shall be accurately calibrated and maintained in good working order. Calibration dates and certifications shall be available at Engineer's request.

C. Instruments: Shall be capable of:

1. Air velocity instruments, direct reading in feet per minute with 2% accuracy.

2. Static pressure instruments, direct reading in inches water gauge with 2% accuracy.

3. Tachometers, direct reading in revolutions per minute with 1/2% accuracy; or revolution counter accurate with 2 counts per 1,000.

4. Thermometers, direct reading in degrees Fahrenheit with 1/10 of a degree accuracy.

5. Pressure gauges, direct reading in feet of water or psig with 1/2% accuracy.

6. Water flow instruments, direct reading in feet of water or psig with 1/2% accuracy suitable for readout of balancing valve provided.

PART 3 EXECUTION

3.01 GENERAL

A. Workmanship: All measurements and adjustments shall be in accordance with AABC-NS, NEEB-PS, and ACGIH-IV and recognized best balancing procedures. Measurements and adjustments of equipment shall be executed in a manner consistent with the manufacturer's recommendations.

B. Flow Rates:

1. General: All air and water systems shall be completely balanced and adjusted to provide the flow rates indicated (within tolerances indicated in this specification Section), and to produce an even heating and cooling effect and control response and to produce even water circulation.

2. Balancer Determined: Where flow rates have not been indicated the balancer shall determine such flow rates using acceptable practices in accordance with AABC-NS, NEEB-PS, and ASHRAE standards and submit the proposed flow rates to the Engineer for review.

3. Confirmation: Prior to beginning balancing confirm any flow rate changes since design with the submittals and flow rates indicated therein, and with the Engineer to confirm changes made since design. Assume that new flow rates will be issued.

C. Controls: Consult and coordinate with the Control Contractor for the adjustment and setting of all control devices to allow for the balancing work, and for proper system operation and proper flow rates. Set all controls and valves as required to maintain design flow rates and temperatures as shown on the drawings. Make measurements and provide data to the Control Contractor to allow for proper control of items.

D. Comfort Adjustments: Make final adjustments for flow rates in order to optimize each space's comfort, including such considerations as temperature, drafts, noise, pressurization, and air changes. Where variances are made from design values, state reasons in report (e.g., "too noisy", "too drafty," etc.). All such variances are subject to approval by the Architect/Engineer.

E. Deficiency Reports: Submit deficiency reports where the work does not allow balancing to occur or balancing issues develop. Indicate date, system and equipment involved, location, description of deficiency, and related information to allow for diagnosing the problem. Provide suggestions for resolution where possible.

3.02 AIR BALANCING

A. Pre-check of System: Prior to beginning balancing, perform, as a minimum, the

following:

1. Verify that clean filters have been installed, that system is free from debris, and that all inlets/outlets are not obstructed.

2. Check all fans and equipment to verify that proper start-up and system preparation has been done by the installing contractor.

3. Check all door/window and similar building opening status to insure building is ready and proper pressurization can be obtained.

4. Open all dampers to full flow position, check positions and operation of all motorized dampers to allow full system flows.

5. Review controls and sequences of operation.

B. Tolerances: All air flow rates (supply, return, and exhaust) shall be adjusted to within plus 5 percent and minus 5 percent of the values shown in the contract documents, except that relative space-to-space pressure relationships shall always be maintained (e.g., restrooms shall be negative relative to other areas, general offices shall be positive, etc.).

C. Draft and Noise Adjustments: All diffusers, grilles, and registers shall be adjusted to minimize drafts and to eliminate objectionable noise.

D. Filters: Air balancing shall be done with new, clean air filters installed. Adjust air deliveries so that design quantities will be obtained when filters are half dirty. This condition shall be simulated by covering a portion of the filter area.

E. Fan Speeds and Drives:

1. Adjust fan speeds and fan drives (adjustable sheaves) as required to produce design flow rates.

2. Where new sheaves are required, calculate sizing of new sheave and coordinate requirements with the Division 23 Contractor; Division 23 Contractor to furnish new sheaves. Replace existing sheave with new one furnished by the Division 23 Contractor; include bid costs for sheave replacements on all of belt driven fans.

3. Adjust belts for proper tension.

F. Marking: Upon completion of flow readings and adjustments permanently mark the balanced position of all balancing valves by stamping the indicator plate of the valve.

G. Duct Traverse: Rectangular duct traverses shall measure the center of equal areas in the air flow stream, with centers not more than 6 inches apart. Round duct traverses shall measure at least 20 locations, with locations being the centers of equal annular area. Reference ACGIH Industrial Ventilation Manual.

H. One Open Run: Balance each branch run so that there is at least one wide open run; balance branches relative to one another so that at least one branch damper is wide open

(except that where unique conditions exist, and the Engineer gives prior approval, one open damper on runs or branches is not required).

I. Data: Data to be measured/recorded and provided in report for all air handling systems and equipment:

1. Floor plans clearly showing and identifying all diffusers, grilles, OA louvers, ducts and all other items where air flow rates were measured.

2. Identify manufacturer, model number, size, and type of all air inlets/outlets.

3. Initial, trial, and final air flow measurements for all diffusers, grilles, OA louvers, ducts, and all other items where air flow rates were measured.

4. Design air flow rates and percentage final air flow rates are of design values.

5. Final damper (or other balance device) final position (as a percentage of full open).

6. The connected voltage and corresponding nameplate full load amps, and the initial and final amperages of all fan motors.

7. Initial and final RPMs of all fans.

8. Static pressures on inlet and outlet of all fans.

9. Fan initial and final CFMs.

10. Outdoor air CFMs (record minimum and maximum values).

11. Entering and leaving air temperatures across coils with coils operating at 100% capacity.

12. Static pressure drop across each filter bank and coil.

13. Final position of any speed controls (as percent of full).

14. In addition to data noted elsewhere, provide the following for all equipment which are part of balanced systems:

    a. Equipment name and number (as used on drawings).

    b. Service.

    c. Equipment manufacturer and model number.

    d. Sheave and belt sizes (where applicable).

    e. Filters sizes and quantities (where applicable).

    f. Motor manufacturer and complete nameplate data.

g. Design operating conditions.

h. Actual operating conditions (flows, pressure drops, rpm, etc.).

3.03 HYDRONIC BALANCING

A. Pre-check of System: Prior to beginning balancing, perform, as a minimum, the following:

1. Verify that all strainers have been cleaned.

2. Examine fluid in system to verify system treatment and cleaning.

3. Check for proper rotation and operation of all pumps.

4. Verify that expansion tanks are not air bound and properly charged and that system is full of fluid.

5. Verify that all air vents at high points in the fluid system are properly installed and are operating freely. Verify that all air has been removed from the circulating system.

6. Open all valves to full flow position, close any bypass valves, and open fully balancing valves. Set temperature controls so that automatic valves are open to full flow.

7. Check operation of automatic bypass valves and similar flow/pressure controls.

8. Check and set operating temperature of equipment to design requirements when balancing by temperature drop.

9. Check equipment for proper start-up and system preparation by installing contractor.

10. Review controls and sequences of operation.

B. Tolerances: All water flow rates shall be adjusted to within plus 5 percent and minus 5 percent of the values shown in the contract documents.

C. Control Valve Bypass: Adjust control valve bypass valves so that pressure drop is the same for full flow-through bypass valve as for full flow-through control valve and controlled equipment.

D. Marking: Upon completion of flow readings and adjustments permanently mark the balanced position of all balancing valves by stamping the indicator plate of the valve.

E. Requirements for All Hydronic Systems: Data to be measured/recorded and provided in report:

1. Floor plans or schematics showing and identifying all valves, coils, pumps and other items where temperatures, pressure drops, or water flow rates were

measured.

2. Identify manufacturer, model number, size and type for all balancing devices.

3. Initial, trial, and final water flow measurements (pressure drops, temperatures, and GPMs) for all items where measurements were made.

4. Design water flow rates, and percentage final water flows are of design values.

5. The connected voltage and corresponding nameplate full load amps, and the initial and final amperages of all pump motors.

6. Pump operating suction and discharge pressures and final total developed head.

7. Pump initial and final GPMs.

8. Entering and leaving fluid temperatures at coils and major equipment.

9. GPM flow of each coil and major equipment.

10. Pressure drop across each coil and major equipment.

11. Pressure drop across bypass valve.

12. Final position of all valves (percent open or setting position on valve).

13. Final position of any speed controls (as percent of full).

14. In addition to data noted elsewhere, provide the following for all equipment which are part of balanced systems:

    a. Equipment name and number (as used on drawings).

    b. Service.

    c. Equipment manufacturers and model number.

    d. Equipment capacities.

    e. Motor manufacturer and complete nameplate data.

    f. Design operating conditions.

    g. Actual operating conditions (flows, pressure drops, etc.).

3.04 BALANCING REPORT

A. General: A balancing report shall be submitted as specified herein, documenting all balancing procedures and measurements.

B. Report Organization: The report shall be divided into logical sections consistent with the

building or system layout (i.e. by floors, building wings, air handling units, or other convenient way). Tabulate data separately for each system. Describe balancing method used for each system.

C. Preliminary Report: Two preliminary review copies of the balancing report shall be submitted to the Architect/Engineer when the balancing work is 90% complete (or as near 90% complete as possible due to uncompleted work of other trades). In addition to containing all the information required of the final report, the preliminary report shall contain a list of all the work required of other trades in order to allow the balancing work to be completed. The Architect/Engineer will review the preliminary report and inform the Contractor of any additional items or revisions required for the final report. Preliminary reports may be omitted where the Architect/Engineer grants approval.

D. Final Report: Shall be included in the Operation and Maintenance Manual. Submit reports to Contractor for inclusion in Manuals (or, when manuals have been already sent to Engineer, send report to Engineer who will insert report into Manual). Provide number of reports as required to match quantity of O&M Manuals, but in no case less than five.

E. Format: 8-1/2" x 11" size, neat, clean copies, drawings accordion folded. Report shall be typed, shall have a title page, table of contents, and divider sheets with identification tabs between sections. Information shall be placed in a three hole notebook, with the front cover labeled with the name of the Job, Owner, Architect/Engineer, Balancing Contractor, and Report Date.

F. Electronic Copy: Provide copy of reports in *.pdf format; submit final report with closeout documents per Divisions 00 and 01. Provide two CD’s with each having an electronic copy of the report in pdf file format. Label CD neatly same report labeling. Provide electronic pdf files to others for inclusion in electronic record documents.

G. General Balancing Information Required:

1. At the beginning of the report, include a summary of problems encountered, deviations from design, remaining problems, recommendations, and comments.

2. List of instruments used in making the measurements and instrument calibration data.

3. Names of personnel performing measurements.

4. Explanation of procedures used in making measurements and balancing each system.

5. List of all correction factors used for all diffusers, grilles, valves, venturi meters, and any other correction factors used.

6. Areas where difficulties were encountered in obtaining design flow rates, or where unstable operating conditions may exist.

7. Note any parts of the system where objectionable drafts or noises may be present and efforts made to eliminate same and why they may still be present.

8. Note where variances from design values occur; explain why.

9. All specified measurements, balancing data, any additional recorded data, and observations.

END OF SECTION

PART 1 GENERAL

1.01 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 00 and Division 01 Specification Sections, apply to this Section.

B. Requirements of Section 23 05 00 apply to this Section.

1.02 WORK INCLUDED

A. Duct Insulation.

B. Pipe Insulation.

C. Equipment and Specialties Insulation.

1.03 DEFINITIONS

A. R: Thermal resistance of insulation, in units of hr-sf-deg F/Btu.

C. Subject to Damage: Items installed exposed less than 8 feet above the walking surface (i.e. floor, platform, roof, grade, etc.) adjacent to the item.

D. Cold Surfaces: Surfaces that will have operating temperatures below the temperature of the surrounding air by at least 5 deg F or more; includes chilled water piping, cooling condensate piping, air conditioning ductwork, outdoor air ductwork, and similar systems. Surfaces shall be considered a cold surface unless specifically indicated otherwise.

1.04 QUALITY ASSURANCE

A. All insulation and materials shall have a fire hazard rating not to exceed 25 for flame spread and 50 for smoke development, as tested by ASTM E 84, NFPA 255, and UL 723.

1.05 SUBMITTALS

A. General: Comply with Section 23 05 00.

B. Product Data: Provide product data on all insulation materials to be used. Indicate thicknesses to be used.

1.06 GENERAL REQUIREMENTS

A. Code Compliance: Contractor shall insulate all systems with the materials and thicknesses as required by code, but in no case shall the insulation be less than that specified herein. In some cases the specified insulation exceeds code, and shall be provided as specified. Not all systems requiring insulation by code are specified, but shall be provided with insulation where required by code.

B. Insulation at Hangers: Insulation shall be continuous through hangers on all insulated systems (except ductwork). Inserts at hangers are specified in Section 23 05 29 and are considered as part of the hanger and support system. Inserts are required to be installed at the time of pipe installation and are intended to be installed by the Contractor installing the pipe hangers/supports. See Section 23 05 29.

1.07 REFERENCES

A. ASTM A 653: Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot Dip Process.

B. ASTM B 209: Standard Specification for Aluminum and Aluminum-Alloy Sheet and Plate.

C. ASTM C 411: Standard Test method for Hot-Surface Performance of High Temperature Thermal Insulation.

D. ASTM C 547: Standard Specification for Mineral Fiber Pipe Insulation.

E. ASTM C 1136: Standard Specifications for Flexible, Low Permeance Vapor Retarders for Thermal Insulation.

F. ASTM C 1290: Standard Specification For Flexible Fibrous Glass Blanket Insulation Used to Externally Insulate HVAC Ducts.

G. ASTM E 84: Standard Test Method for Surface Burning Characteristics of Building Materials.

H. NCIIS: National Commercial & Industrial Insulation Standards, published by Midwest Insulation Contractors Association, 5th Edition.

I. NFPA 255: Standard Method of Test of Surface Burning Characteristics of Building Materials.

J. UL 723: Tests for Surface Burning of Building Materials.

PART 2 PRODUCTS

2.01 ACCEPTABLE MANUFACTURERS

A. Products shall comply with Section 23 05 00, Paragraph Part 2.01, Acceptable Manufacturers.

B. Insulation: Johns Manville, Armacell, Owens-Corning, Knauf, Rubatex, Aeroflex, Pittsburgh Corning, GLT, Halstead, Gilsulate, Manson.

C. Accessories: Johns Manville, Armacell, Owens-Corning, Knauf, Rubatex, Aeroflex, Pittsburgh Corning, GLT, Halstead, Duro Dyne, Gustin Bacon, Childers, RPR, Tee Cee, Lewco Specialty Products, JPS, Buckaroos, Manson.

2.02 DUCT INSULATION

A. Type: Flexible blanket type, constructed of inorganic glass fibers bonded by a thermosetting resin, complying with ASTM C 1290, Type III. Johns Manville "Microlite" (or approved).

B. Jacket: FSK type, vapor proof, consisting of an aluminum foil cover reinforced with glass fiber mesh, and laminated to kraft. Water vapor permeance shall not exceed 0.05 perms. Provide with joint sealing tape, minimum 2 inches wide, constructed of jacket material with adhesive to seal all joints.

C. Thermal Conductivity: Shall not exceed 0.27 Btu-in/hr-sq ft-deg F at 75 deg F.

D. Operating Limits: 40 degrees F to 250 deg F.

E. Duct Insulation Thickness:

1. General: Provide insulation densities and thicknesses to achieve the R values cited below. R values are for the insulation only, in their installed thickness, considering installed duct wrap stretch and in accordance with code.

2. Lining: Where ducts have internal lining, the insulating properties of the lining may be credited toward meeting the required insulation R value; use R-3.65 per inch of installed liner.

3. Supply Air Ductwork:

a. Inside Building and Within Building's Thermal Envelope: R-3.3 (except where ran exposed in conditioned spaces, no insulation is required).

b. Inside Building But Not Within Building's Thermal Envelope: R-7.3.

4. Return Air Ductwork:

a. Inside Building and Within Building's Thermal Envelope: No insulation required; except where duct contains air that may vary by 10 deg F or more from the space the duct passes through, R-3.3 insulation shall be provided.

b. Inside Building But Not Within Building's Thermal Envelope: R-7.3.

2.03 PIPE INSULATION

A. Glass Fiber:

1. Type: Rigid molded type, constructed of glass fibers bonded by a thermosetting resin, complying with ASTM C 547 Type I. Insulation factory molded to match pipe size applied to. Johns Manville "Micro-Lok" (or approved).

2. Jacket: ASJ type, vapor proof, consisting of a white kraft paper cover reinforced with glass fiber and bonded to aluminum foil, with longitudinal self sealing closure system. Provide with butt strips constructed of jacket material with adhesive to seal all joints. Water vapor permeance shall not exceed 0.02 perms.

3. Thermal Conductivity: Shall not exceed 0.24 Btu-in/ hr-sq ft-deg F at 75 deg F.

4. Operating Temperatures: 0 deg F to 850 deg F.

B. Pipe Fittings: Shall be covered using any one of the following methods of the Contractor's choice:

1. Prefabricated segments of pipe insulation of same materials and thickness as the adjoining pipe insulation, formed to match pipe fitting.

2. Pre-cut fiberglass insulation and pre-molded high impact, gloss white, UV resistant, minimum 20 mil thick, PVC covers suitable for the pipe size and insulation thickness application, PVC cover shall be Johns Manville "Zeston 2000 PVC" (or approved).

3. Insulating plastic cement brought up the full height of the adjacent covering.

4. Except, where colored PVC jacketing is applied to piping, fittings shall use PVC covers of the same thickness and color as the PVC jacketing specified for the piping.

C. Metal Jacket: Aluminum roll jacketing, factory formed to match pipe size and insulation application, with smooth surface, manufactured from 3003 or 5005 aluminum alloy, H-14 temper, conforming to ASTM B 209. Shall be minimum 0.020 inches thick, with an integrally bonded interior 1 mil thick heat bonded polyethylene moisture barrier over the entire surface in contact with the insulation. Fitting covers shall be fabricated of same material as pipe runs, factory formed to match fitting.

D. Pipe Insulation Thickness:

1. General: Provide minimum piping insulation thickness indicated, in inches.

INSULATION THICKNESS (INCHES)

Nominal Pipe Diameter (Inches)					
Fluid Design Operating Range, deg F	<1	1 to <1-1/2	1-1/2 to <4	4 to <8	≥8
Above 350	4.5	5.0	5.0	5.0	5.0
251 - 350	3.0	4.0	4.5	4.5	4.5
201 - 250	2.5	2.5	2.5	3.0	3.0
141 - 200	1.5	1.5	2.0	2.0	2.0
61 - 140	1.0	1.0	1.5	1.5	1.5
40 - 60	0.5	0.5	1.0	1.0	1.0
Below 40	0.5	1.0	1.0	1.0	1.5

2. Varying Temperatures: Where a system operates over temperature ranges calling for different insulation thicknesses, the thicker insulation requirements shall be met.

3. Outdoor Piping: Piping exposed to outside air or, located outside the building/thermal envelope, shall have insulation thickness increased by 0.5 inch from that indicated above.

2.04 EQUIPMENT AND SPECIALTIES INSULATION

A. Flexible Glass Fiber:

1. Type: Flexible blanket insulation, constructed of inorganic glass fibers bonded by a thermosetting resin, complying with ASTM C 553, Type III. Johns Manville "812 Spin-Glas" (or approved).

2. Jacket: FSK type, vapor proof, consisting of an aluminum foil cover reinforced with glass fiber mesh, and laminated to kraft. Water vapor permeance shall not exceed 0.05 perms. Provide with joint sealing tape constructed of jacket material with adhesive to seal all joints.

3. Thermal Conductivity: Shall not exceed 0.24 Btu-in/ hr-sq ft-deg F at 75 deg F.

4. Operating Temperature Limits: 40 deg F to 450 deg F.

5. Density: 1.5 lb/cu ft.

B. Elastomeric:

1. Type: Flexible cellular elastomeric insulation, complying with ASTM C 534, Type II.

2. Thermal Conductivity: Shall not exceed 0.30 Btu-in/ hr-sq ft-deg F at 75 deg F.

3. Water Vapor Transmission: Water vapor permeance shall not exceed 0.08 perms.

4. Operating Temperatures: -200 deg F to 220 deg F; shall be able to withstand 250 deg F temperatures for 96 hours per ASTM C 411 with damage or deformation.

5. Weather Protection: Where installed outdoors provide with metal jacketing to protect from UV and weather exposure.

C. Removable Insulation Blankets:

1. Type: Flexible blanket insulation pads, for insulating valves, unions, strainers and similar items. Constructed of exterior fabric enclosure sewn around interior insulation, held in position with a closure system that allows for removal of the blanket. Contractor or factory fabricated.

2. Enclosure - Cold Application: Silicone impregnated glass fiber cloth; chemical and oil resistant; water proof; flame and abrasion resistant; minimum 20 ounce/square yard weight. Lewco Specialty Products 3000 SA-2 (or approved).

3. Insulation: Thermal insulating wool, 1-inch thick, complying with ASTM C 553. Maximum thermal conductivity 0.22 Btu-in/ hr-sq ft-deg F at 75 degrees F. Provide in layers to give equivalent R value to the adjacent insulated piping. Owens Corning “Fiberglas Brand TIW, Type II”.

4. Closure System: Velcro, zipper or steel lacing. Steel lacing anchors shall have spindles and self-locking washers, fabricated of minimum 14 gauge stainless steel, with stainless steel wire ties. AGM Industries “Series NLA” (or approved). Closure shall be configured to allow for complete coverage and closure of the insulation around the object being insulated. Closure for cold surfaces (surfaces that operate below ambient air temperature) shall provide a sealed vapor barrier so that no surfaces are exposed to ambient air and so that no condensation can occur; overlap enclosure ends (or any vapor barrier penetrations, as caused by suing steel lacing anchors) with an added vapor barrier cover, minimum 2-inches past the vapor barrier penetration; with Velcro (or equivalent) closure.

D. Corner Angles: 0.016 inch thick aluminum, alloy 3003 or 5005, with factory applied Kraft backing, complying with ASTM B 209.

E. Metal Jacket:

1. Steel: Minimum 24 gauge galvanized steel complying with ASTM A 653. Provide with longitudinal slip joints and 2-inch laps.

2. Aluminum: Minimum 0.020-inch thick aluminum, alloy 3003 or 5005, complying with ASTM B 209. Provide with longitudinal slip joints and 2-inch laps.

F. Equipment and Specialties Insulation Types and Thickness:

1. Unless a specific type of insulation is specified or noted, any of the insulation materials specified in this specification section may be used provided such application is in conformance with NCIIS.

2. Insulation Thickness: Insulation thickness shall be the same as that specified for the piping or ductwork connected to the item, or as specified for the system the item is installed in (unless noted otherwise). Insulation thickness shall in no case be less than 1 inch thick.

3. Valves:

a. 2 Inches and Smaller: Insulate with same material as piping system.

b. 2-1/2 Inches and Larger: Removable blanket insulation.

4. Control Valves: Removable blanket insulation.

5. All equipment and specialties where access is required shall have removable insulation blankets; other removable insulation materials per NCIIS may be used where pre-approved by the Engineer. Items requiring such removable insulation include, but are not limited to, the following:

   a. Strainers.

   b. Pumps.

   c. Balancing valves.

   d. Pressure/temperature/flow measuring devices.

   e. Pump suction diffusers.

2.05 ACCESSORIES

A. Adhesive, Caulks, Mastics, and Coatings: As recommended by insulation material manufacturer and suited for the application.

B. Bands: 1/2-inch wide, of stainless steel, galvanized steel, or aluminum construction, to match with materials used with.

C. Weld-Attached Anchor Pins and Washers: Copper-coated steel pin for capacitor-discharge welding and galvanized speed washer. Pin length shall be as required for insulation thickness used with. Welded pin holding capacity 100 lb, for direct pull perpendicular to the attached surface. Style and type to suit application.

D. Adhesive-Attached Anchor Pins and Speed Washers: Galvanized steel plate, pin, and washer manufactured for attachment to duct and plenum with adhesive. Pin length sufficient for insulation thickness used with. Adhesive as recommended by the anchor pin manufacturer as appropriate for surface temperatures and materials used with, and to achieve a holding capacity of 100 lb for direct pull perpendicular to the adhered surface. Style and type to suit application.

PART 3 EXECUTION

3.01 GENERAL

A. Pre-Insulation Review: No covering materials shall be applied until systems to be covered have had all tests satisfactorily completed, have had all required inspections, and have been satisfactorily reviewed by the Architect-Engineer. All systems shall be examined by the Contractor to confirm cleanliness and other conditions are appropriate to allow for insulation installation.

B. Insulation Work Review: No insulated items shall be concealed in the building structure or buried until the insulation work has been satisfactorily reviewed by the Architect-Engineer, and has had all required inspections.

C. Standards: Materials shall be installed in accordance with manufacturer's written instructions, NCIIS, and shall comply with materials and methods specified herein. The more stringent requirements govern.

D. Joints/Seams: Joints shall be staggered on multi layer insulation. Locate seams and joints in least visible location.

E. Insulation Protection: Insulation shall be kept clean and dry and shall be protected from dirt, damage, and moisture. Insulation that becomes dirty, damaged, or wet and cannot be restored to like new condition will be rejected, and shall immediately be removed from the jobsite.

F. Insulation Interruptions: Insulation shall be neatly finished at all supports, protrusions and interruptions. Provide adhesive and tape seal to maintain vapor barrier integrity.

G. Equipment and Floor Protection: Cover existing equipment and finished floors to protect such items from insulation fiber and dust. Keep all such existing areas in a "broom clean" condition at the end of each day. Take precautions in these areas to prevent glass fiber and insulation dust from entering ventilation systems or areas adjacent to the work.

H. Glass Fiber Insulation - General:

1. Finish all insulation ends with joint sealing tape or vapor barrier mastic, no raw edges allowed.

2. Joints: Tightly butt adjacent insulation sections together without any voids. Provide overlap of jacket material over all joints.

I. Items To Be Insulated: Provide insulation on all ductwork, all piping, all items installed in these duct and piping systems, all air and liquid energy conveying systems and components, all air and liquid energy storage, all equipment, and all energy consuming devices, except where such insulation has been specifically excluded.

3.02 DUCT INSULATION INSTALLATION

A. Types and Thickness: Insulate all ducts with insulation type and thickness (to provide the required R value) as specified in "Part 2 - Products".

B. General: Insulation shall be firmly butted at all joints. All longitudinal seams for flexible insulation shall overlap a minimum of 2 inches. All joints and seams shall be finished with appropriate joint sealing tape. Installation shall provide a continuous sealed vapor barrier over all surfaces; seal all jacket penetrations with vapor barrier mastic or vapor barrier jacket tape.

C. Attachment: For rectangular ducts over 24 inches wide, duct insulation shall be additionally secured to the bottom of the ductwork with mechanical fasteners on 18 inch centers to reduce sagging. Washers shall be applied without compressing the insulation. Protruding ends or fasteners shall be cut off flush after washers are installed. All seams, joints, penetrations, and damage to the facing shall be sealed with joint sealing tape or vapor retardant mastic or appropriate joint sealing tape.

3.03 PIPE INSULATION INSTALLATION

A. Types and Thickness: Insulate all piping with insulation type and thickness as specified in “Part 2 - Products”. All piping shall be insulated except where specifically excluded.

B. General: All ends shall be firmly butted together and secured with joint sealing tape. All jacket laps and joint sealing tape shall be secured with outward clinch staples at 4 inch spacing, or by use of a suitable adhesive. Installation shall provide a continuous sealed vapor barrier over all surfaces; seal all jacket penetrations with vapor barrier mastic or vapor barrier jacket tape.

C. Pipe Hangers: Provide insulation tight up to pre-insulated pipe supports at pipe hangers, seal all joints with joint sealing tape. Pre-insulated pipe supports are specified in Section 23 05 29.

D. Pipe Sleeves: Run insulation continuous full size through sleeve. Coordinate work with fire seals and confirm fire seal system is approved for use with insulated pipes; see Section 23 05 30.

E. Metal Jacketing: Provide metal jacket over piping insulation for outdoor exposed piping.

3.04 EQUIPMENT AND SPECIALTIES INSTALLATION

A. Types and Thickness: All equipment and items installed in insulated duct and piping systems shall be insulated except where specifically noted not to be; reference paragraph 3.01. Insulation type and thickness shall be as specified in “Part 2 - Products”.

B. General: Apply insulation as close as possible to equipment by grooving, scoring, and beveling as necessary. As required, secure insulation to equipment with studs, pins, clips, adhesive, wires or bands. Fill joints, cracks, seams, and depressions with bedding compound to form smooth surface. Comply with NCIIS.

C. Removable: All equipment and specialties where access is required for maintenance, repair, service, or cleaning shall have insulation installed so that it can be easily removed and reinstalled without being damaged and without requiring new insulation. Removable insulation shall completely cover the item being insulated with an overlap over adjacent insulation to cover all joints. Insulation on cold surfaces shall provide a sealed vapor barrier so that no surfaces are exposed to ambient air and so that no condensation can occur; overlap enclosure ends minimum 2-inches.

D. Nameplates: Do not insulate over nameplates or ASME stamps; bevel and seal insulation around.

E. Jacketing: Provide all equipment insulation with vapor retardant jackets.

END OF SECTION

PART 1 GENERAL

1.01 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 00 and Division 01 Specification Sections, apply to this Section.

B. Requirements of Section 23 05 00 apply to this Section.

1.02 WORK INCLUDED

A. Commissioning of Mechanical Systems.

B. Documentation.

1.03 SUBMITTALS

A. General: Comply with Section 23 05 00.

B. Qualifications: Submit qualifications of the firm proposed to perform the commissioning work and for the individuals that will be assigned.

C. Commissioning Data:

1. Commissioning plan.

2. Commissioning preliminary report.

3. Commissioning final report.

1.04 GENERAL REQUIREMENTS

A. General: Commissioning shall be done by a Company which specializes in this work and independent and separate from the Companies installing the systems to be commissioned.

B. Company Experience: The Company providing the commissioning work shall be experienced in commissioning HVAC control systems, and have commissioned at least five similar projects in the last three years. Company shall be certified for such work by AABC, NEBB, AEE, BCA, or ASHRAE.

C. Individual Experience: The individuals performing the commissioning work shall have at least five years experience in commissioning, with the individual in the field in charge or the work having commissioned at least five similar projects in the last three years.

D. Deferred Test: Tests may be deferred to allow for proper climatic or other conditions.

1.05 REFERENCES

A. AABC: Associated Air Balance Council.

B. AEE: Association of Energy Engineers.

C. BCA: Building Commissioning Association.

D. NEBB: National Environmental Balancing Bureau.

PART 2 PRODUCTS

NOT USED

PART 3 EXECUTION

3.01 GENERAL

A. General: Provide commissioning as required by code and as specified herein.

B. Building Occupancy: Building or portions thereof, required by code to be commissioned, shall not be considered ready for occupancy until such time that the Engineer and building official determine that the preliminary commissioning report required by this Section has been completed.

3.02 HVAC SYSTEMS

A. General: HVAC equipment and HVAC control systems shall be tested to ensure that control devices, components, equipment and systems are calibrated, adjusted and operate in accordance with approved plans and specifications.

B. Sequences: Sequences of operation shall be functionally tested to ensure they operate in accordance with approved plans and specifications.

C. Conditions: Testing shall affirm operation during actual or simulated winter and summer design conditions and during full outside air conditions.

D. HVAC Equipment: Equipment functional performance testing shall demonstrate the installation and operation of components, systems, and system-to-system interfacing relationships in accordance with approved plans and specifications such that operation, function, and maintenance serviceability for each of the commissioned systems is confirmed. Testing shall include all modes and sequence of operation, including under full-load, part-load and the following emergency conditions:

1. All modes as described in the sequence of operation.

2. Redundant or automatic back-up mode.

3. Performance of alarms.

4. Mode of operation upon a loss of power and restoration of power.

E. HVAC Controls: HVAC control systems shall be tested to document that control devices, components, equipment, and systems are calibrated, adjusted, and operate in accordance with approved plans and specifications. Sequence of operation shall be functionally tested to document they operate in accordance with approved plans and specifications.

F. Economizers: Air economizers shall undergo a functional test to determine that they operate in accordance with manufacturer's specifications.

3.03 DOCUMENTATION

A. Format:

1. Hard Copy: Provide reports in 8-1/2 x 11 format, in 3 ring notebooks, with labeled cover and spine, clean legible, and logically organized with table of contents, divider tabs, and names of companies involved in the project, commissioning company name, commissioning personnel, and contact information. Provide 3 copies per Divisions 00 and 01.

2. Electronic: Provide copy in *.pdf format; submit with closeout documents per Divisions 00 and 01.

B. Test Plan: Prepare a written commissioning test plan and submit for approval prior to beginning commissioning work. Test plan to include:

1. Equipment and systems to be tested.

2. Roles and responsibilities of individuals performing the commissioning and of others involved in the project.

3. Functional test procedures and forms.

4. Conditions under which the test shall be performed (for example, winter design conditions, full outside air, etc.).

5. Expected systems' response or acceptance criteria for each procedure.

6. Time schedule for performance of the work; including any deferred tests.

7. Forms as required by the WSEC or AHJ.

C. Preliminary Commissioning Report:

1. General: A preliminary report shall be issued to identify issues preventing the commissioning work from being completed. If all commissioning work can be fully completed and the final report completed, a preliminary report is not required.

2. Report: Compile all system and commissioning data; including all reviews, inspections, test procedures, and tests. Report shall include field notes of

commissioning activities, equipment and system data, test procedures, tests performed, actual results as compared to expected (or specified) results, WSEC and any AHJ required commissioning forms (completed to the extent possible).

3. Items to Complete: The preliminary report shall identify items needed in order to complete the commissioning, including:

   a. Deficiencies found during testing required by this Section, which have not been corrected at the time of report preparation.

   b. Deferred tests which cannot be performed at the time of report preparation due to climatic (or other) conditions.

   c. Climate (or other) conditions required for performance of the deferred tests, and the anticipated date of each deferred test.

   d. Proposed schedule for completion of report.

D. Final Commissioning Report: Complete all commissioning work not previously completed and included in the preliminary report. Provide a complete final report with all systems and commissioning data; including test plan, all reviews, inspections, test procedures, tests, and results. Final report shall include all documentation required for the preliminary report and documentation regarding resolution of previous cited deficiencies.

END OF SECTION

PART 1 GENERAL

1.01 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 00 and Division 01 Specification Sections, apply to this Section.

B. Requirements of Section 23 05 00 apply to this Section.

1.02 WORK INCLUDED

A. Thermowells.

B. Control Tubing.

C. Control Damper Installation.

D. Control Valve Installation.

1.03 SUBMITTALS

A. General: Comply with Section 23 05 00.

B. Product Data: Submit product data for all items to be used.

1.04 GENERAL REQUIREMENTS

A. General: The control system is specified in Division 25. The Division 23 contractor is required to coordinate the work with the control systems work to allow installation of items required for the HVAC control system, and to install the control items indicated.

B. Control Dampers: Furnished under Division 25 and installed under this specification section.

C. HVAC Control Valves: Furnished under Division 25 and installed under this specification section.

1.05 REFERENCES

A. ASTM B88: Standard Specification for Seamless Copper Water Tube

PART 2 PRODUCTS

2.01 ACCEPTABLE MANUFACTURERS

A. Products shall comply with Section 23 05 00, Paragraph 2.01, Acceptable Manufacturers.

B. Thermowells: Trerice, Ashcroft, IPS, RTD, Texas Thermowell, Thermometrics.

2.02 THERMOWELLS

A. Series 300 stainless steel or brass construction, with 2 inch lagging neck and extension type well. Diameter and insertion length to suit application.

2.03 TUBING

A. Soft Copper tubing, per ASTM B 88; with soldered or flared/screwed type fittings.

PART 3 EXECUTION

3.01 INSTALLATION

A. General: Install items in accordance with manufacturer's instructions and control system requirements. Coordinate all work requirements with Division 25.

B. Thermowells: Provide all HVAC system piping thermowells required for Division 23 work and by the control system. Install thermowells in accessible locations, to allow for visual observation of control devices, and to allow for proper control system operation.

C. Tubing: Provide all control tubing necessary to properly connect all control devices (e.g. differential pressure sensors, gauges, etc.).

D. Control Dampers: Install all control dampers furnished by Division 25 and as necessary for proper functioning HVAC systems. Verify damper sizes, locations, orientation, accessibility, and other installation requirements.

E. Control Valves: Install all control valves furnished by Division 25 and as necessary for proper functioning HVAC systems. Verify valve sizes, locations, porting arrangements, and other installation requirements. Provide unions at connections to valves (except not required on flanged valves).

END OF SECTION

PART 1 GENERAL

1.01 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 00 and Division 01 Specification Sections, apply to this Section.

B. Requirements of Section 23 05 00 apply to this Section.

1.02 WORK INCLUDED

A. Natural Gas Piping.

B. Natural Gas Valves.

C. Natural Gas Regulators.

D. Natural Gas Accessories.

1.03 SUBMITTALS

A. General: Provide submittals in accordance with Section 23 05 00.

B. Product Data: Submit manufacturer's product data for all items to be used.

1.04 REFERENCES

A. ASME B 6.5: Steel Pipe Flanges and Flanged Fittings.

B. ASME B16.9: Steel Butt - Welding Fittings.

C. ASME B16.11: Forged Steel Fittings, Socket Welding and Threaded.

D. ASTM A53: Pipe, Steel, Black and Hot Dipped, Zinc Coated, Welded and Seamless.

E. ASTM A105: Carbon Steel Forgings for Piping Applications.

F. ASTM A234: Piping Fittings of Wrought Carbon Steel and Alloy Steel for Moderate and High Temperature Service.

G. ASTM B88: Seamless Copper Water Tube.

H. ASTM B280: Seamless Copper Tube for Air Conditioning and Refrigeration Field Service.

I. IFGC: International Fuel Gas Code.

PART 2 PRODUCTS

2.01 ACCEPTABLE MANUFACTURERS

A. General: Products shall comply with Section 23 05 00. See Section 23 05 00, Paragraph 2.01 for Acceptable Manufacturer requirements.

B. Pipe and Fittings: US Steel, Anvil International, Wheatland Tube, Weldbend, Exltube.

C. Valves: Milwaukee, Flowserve (Nordstrom), Stockham, Conbraco/Apollo, Nibco, Resun, ASCO.

D. Regulators: Fisher, American Meter, Equimeter.

2.02 PIPE AND FITTINGS - ABOVEGROUND

A. Pipe: Black steel pipe conforming to ASTM A 53, Grade A or B, Type E or S. Schedule 40 unless indicated otherwise.

B. Fittings:

1. 2 Inches and Smaller - Exposed: Black malleable iron threaded type, Class 150 conforming to ASME B 16.3 and ASTM A 234.

2. 2 Inches and Smaller - Concealed: Steel butt weld type, conforming to ASTM A 234, ASME B 16.9; or steel socket weld type, conforming to ASTM A 105 and ASME B 16.11.

3. 2-1/2 Inches and Larger: Steel butt weld type, conforming to ASTM A 234, ASME B 16.9; or steel socket weld type, conforming to ASTM A 105 and ASME B 16.11.

4. Flanges: Steel socket or welding neck type, Class 150, conforming to ASME B 16.5.

C. Vent Pipe: Same as gas piping; except where routed exposed in mechanical rooms, may be hand drawn or annealed seamless copper conforming to ASTM B 280 or UNS number C12200 copper conforming to ASTM B 88, with wrought copper fittings, bronze fittings, and soldered joints.

2.03 VALVES

A. General: Valves shall be designed for use on natural gas system and suitable for the pressures and temperatures to be encountered. Valves shall be UL listed (or CSA certified) for fuel gas use.

B. Ball Valves: Bronze body, two piece body, blowout proof stem, full port, reinforced TFE seats, chrome plated brass ball, threaded connections, UL listed for LP gas and natural gas shut-off, 250 psi non-shock LP or natural gas working pressure. Nibco T-585-70-UL (or approved).

2.04 ACCESSORIES

A. Piping Specialties: See Section 23 05 19.

B. Pressure Regulator: Cast iron body, die cast aluminum alloy diaphragm case, Buna-N diaphragm disc, 125 psi maximum pressure rating with over pressure positive tight lock-up, internal relief valve, and gray polyester paint finish. Regulator shall be sized by manufacturer based on inlet pressure, desired outlet pressure, and flow requirements. Regulators with vent openings located within 20 feet of ventilation air intakes or where the venting of gas would be unsafe shall be equipped (and labeled for use with) a vent limiting device.

C. Flexible Connectors: See Section 23 05 19. Size flexible connectors to match pipe size shown on plan, with reducer after the flexible connector to match the equipment connection size.

PART 3 EXECUTION

3.01 GENERAL

A. General: Comply with Section 23 05 00. Install in accordance with manufacturer's written installation instructions, code, and best construction practices.

B Complete System: Provide all piping as indicated and as required to allow connections to all equipment requiring gas connections, and to provide complete and operational gas piping systems.

C. Coordination: Coordinate installation of items with all trades that are affected by the work to avoid conflicts. Review all drawings for location of pipe spaces, ducts, electrical equipment, ceiling heights, door openings, window openings, and other details and report discrepancies or possible conflicts to Architect/Engineer before installing pipe.

3.02 PIPE AND FITTINGS

A. General:

1. All piping in finished areas shall be installed concealed unless specifically noted otherwise.

2. Install piping at such heights and in such a manner so as not to obstruct any portion of windows doorways, passageways, or access to any items requiring routine service, maintenance, or inspection. Offset or reroute piping as required to clear any interferences which may occur.

3. Install all piping parallel to the closest wall and in a neat, workmanlike manner. Horizontal exposed straight runs of piping shall not deviate from straight by more than 1/4-inch in ten feet. Vertical piping shall not deviate from plumb by more than 1/8-inch in ten feet.

B. Electrical Items: Do not run any piping above electrical panels (and similar electrical equipment). Provide offsets around such panels as necessary. Such offsets are typically not shown on the plans, and are required per this paragraph.

C. Joints: Prior to the joining of any section of pipe to a pipe run, the section shall be thoroughly cleaned inside and out, the ends shall be reamed to remove any cutting burrs and piping prepared as recommended by pipe and fitting manufacturer.

D. Threaded Connections: Cut piping carefully, ream, thread and work into place without springing. Use TFE tape or lead and graphite lubricant (on male threads only).

E. Welding: Shall conform to ASME B31.1 and ASME B31.9. Welders and welding operators shall be qualified as required by ASME B31.1, ASME B31.9, and governing code. Welded joints on piping system shall be continuous, without backing rings, and pipe ends beveled for butt weld connections. Gas cuts shall be square and free from burned material. Before welding, surfaces shall be thoroughly cleaned. Piping shall be carefully aligned, with no weld material projecting inside the pipe.

F. Unions: Install unions in pipe connections to equipment and other items where it may be necessary to disconnect the item from piping for repairs or maintenance; and as indicated. Where flanged connections occur at equipment additional unions are not required unless indicated otherwise.

G. Equipment Drip Legs: Provide drip legs in pipe connections to all equipment. Drip legs shall be located downstream of equipment isolation valves, and upstream of unit flexible connectors or unions. Provide adequate clearance for removal of drip leg cap.

H. Regulators: Provide drip legs with removable caps upstream of all regulators; provide test tee with capped valve 10 pipe diameter downstream of all regulators.

I. Flexible Connectors: Provide flexible connectors in piping at connections to all equipment. Size flexible connectors to match pipe size shown on plan, with reducer after the flexible connector to match the equipment connection size. Install such that both ends of flex connectors are accessible.

J. Vents: Pipe regulator vent lines and all equipment gas train vents full size to outside of building; terminate with vent cap.

K. Outdoor Piping - Painting: All aboveground piping outside of building shall be cleaned and prime painted with one coat of a rust-inhibiting paint and a final coat of finish paint (color to match adjacent building color, unless noted otherwise).

3.03 VALVES AND ACCESSORIES

A. Applications: Provide isolation valves at piping connections to all equipment, at inlet of all pressure regulators, at inlet of all seismic shut-off valves, downstream of gas meters, at inlet to gas solenoid valves, and where indicated.

3.04 TESTING AND INSPECTION

A. General: All piping shall be tested, inspected, and approved by the AHJ prior to being concealed or covered.

B. Witnessing: Testing shall be witnessed by the AHJ and the Architect/Engineer (at his option). Notify Architect/Engineer minimum 72 hours prior to date of testing, and mutually agree upon times arranged.

C. Testing:

1. Piping shall be inspected, purged and pressure tested in accordance with IFGC (except where more restrictive requirements are specified herein, the most restrictive shall prevail).

2. Test pressure shall be not less than 150 percent of the maximum to which the pipe will ordinarily be subjected; but in no case less than 50 psig.

3. Components that may be damaged by the test pressure shall be removed or isolated from the piping system during testing.

4. Portions of the system that are reconnected after system testing that could not be tested (e.g. low pressure equipment connections, separate portions of the system, etc.) shall be specifically tested with a non-corrosive leak detection fluid acceptable to the AHJ.

5. Any leaks or defective piping disclosed by testing and inspection shall be repaired with new materials and the system re-tested.

D. Documentation: Provide documentation to the Architect/Engineer indicating that the system has been completely pressure tested, and all portions inspected and accepted by the AHJ.

END OF SECTION

PART 1 GENERAL

1.01 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 00 and Division 01 Specification Sections, apply to this Section.

B. Requirements of Section 23 05 00 apply to this Section.

1.02 WORK INCLUDED

A. Hydronic Piping.

B. Valves.

C. Balancing Valves.

D. Air Vents.

E. Flushing and Initial Testing.

F. Chemical Cleaning, Treatment and Final Testing.

1.03 SUBMITTALS

A. General: Comply with Section 23 05 00.

B. Product Data: Submit product information data for all items.

C. Shop Drawings: Submit shop drawings of underground piping system.

D. System Flushing, Cleaning and Testing: Submit documentation of work performed.

E. Water Treatment:

1. Submit name and qualifications of Water Treatment Specialist and chemical product data.

2. MSDS sheets for all chemicals.

3. Submit Water Treatment Specialist report.

F. Operation and Maintenance: Submit operation and maintenance data, submittal data, and Water Treatment Specialist report for inclusion in project O&M Manuals.

1.04 QUALITY ASSURANCE

A. Water Treatment Specialists (WTS): Shall be a company regularly engaging in this work, having local representation and staff with at least 5 years experience, separate and

independent from the system installers. WTS shall have staff trained and experienced in hydronic system chemistry and water treatment. WTS shall have water treatment research and laboratory services available for analyzing hydronic water systems and prescribing proven treatment systems.

1.05 REFERENCES

A. ASME B16.3: Malleable Iron Threaded Fittings.

B. ASME B16.15: Cast Bronze Threaded Fittings: Classes 125 and 250.

C. ASME B16.18: Cast Copper Alloy Solder Joint Pressure Fittings.

D. ASME B18.22: Wrought Copper and Copper Alloy Solder Joint Pressure Fittings.

E. ASME B18.24: Cast Copper Alloy Pipe Flanges and Flanged Fittings: Classes 150, 300, 400, 600, 900, 1500, and 2500.

F. ASME B31.1: Power Piping.

G. ASME B31.9: Building Service Piping.

H. ASTM A 53: Pipe, Steel, Black and Hot Dipped, Zinc Coated, Welded and Seamless.

I. ASTM A 530: General Requirements for Specialized Carbon and Alloy Steel Pipe.

J. ASTM B 16.18: Seamless Copper Water Tube.

K. ASTM B 32: Solder Metal.

L. ASTM E 84: Standard Test Method for Surface Burning Characteristics of Building Materials.

M. AWS A5.8: Filler Metals for Brazing and Braze Welding.

PART 2 PRODUCTS

2.01 ACEPTABLE MANUFACTURERS

A. Products shall comply with Section 23 05 00, Paragraph 2.01, Acceptable Manufacturers.

B. Pipe and Fittings: US Steel, Anvil International, Wheatland Tube, Weldbend, Exltube, Elkhart, CTS, Mueller, Cerro, Cambridge-Lee.

C. Valves: Milwaukee, Nibco, Watts, Conbraco/Apollo, Stockham, Red-White.

D. Balancing Valves: Bell & Gossett, Armstrong, Taco, Nibco, Red-White.

E. Air Vents – Manual: Same as listed for valves.

F. Air Vents – Automatic: Bell & Gossett, Hoffman.

G. Chemicals: Hydrochem, Dow Chemical, Hercules Chemical Company, Rhomar Water Management, U.S. Water

2.02 PIPE AND FITTINGS – MATERIALS

A. Steel Pipe and Fittings:

1. Pipe: Black steel pipe, per ASTM A 53, Type E or S, Grade A or B, Schedule 40 unless indicated otherwise.

2. Fittings:

a. Threaded: Malleable iron fittings per ASME B16.3 or threaded cast iron fittings per ASME B16.1 or ASME B16.4.

b. Welded: Steel weld fittings per ASTM A 234; butt weld type per ASME B16.9; socket weld type per ASME B16.11.

c. Flanged: Fittings, bolts, nuts, and bolt patterns per ASME B16.5, Class 150. Flanges shall comply with ASTM A105. Bolts shall be high strength or intermediate strength, with material conforming to ASTM A193.

3. Threads: Shall conform to ASME B1.20.1

4. Coupled Piping Systems: See Section 23 21 15.

B. Copper Pipe and Fittings:

1. Pipe: Seamless copper water tube, hard temper (unless noted otherwise), type K or L as indicated, per ASTM B88.

2. Fittings:

a. Solder Joint: Wrought copper and bronze fittings per ASME B16.22 and cast copper alloy fittings per ASME B16.18, cast bronze threaded fittings per ASME B16.15.

b. Flanged: Cast bronze fittings per ASME B16.24.

c. Solder Material: 95/5 tin-antimony solder per ASTM B32 or “Silvabrite 100” (95.5 tin/4 copper/0.5 silver) solder; lead free.

d. Brazing Material: AWS A5.8, BCuP-5.

3. Coupled Piping Systems: See Section 23 21 15.

2.03 VALVES

A. Ball Valves:

1. 2 Inches and Smaller: 125 psi-swp bronze body, full port, 2 piece construction, anti-blowout stem, reinforced TFE seats, stainless steel or chrome plated brass ball, extended stem, cadmium plated steel lever handle with vinyl covering, solder or threaded connections as required. Provide with extension stem for handle where valve is installed in systems with insulation thickness greater than 0.5 inch. Nibco S-585, T-585 (or approved).

2. 2-1/2 Inches and Larger:

   a. Stainless: Class 150 stainless steel body, split-body full bore design, anti-blowout stem, carbon filled TFE seats, stainless steel ball, stainless steel trim. Nibco F-515-S6-F-66-FS (or approved).

   b. Cast Iron: Class 125 cast iron body, split-body full port, anti-blowout stem, PTFE seats, stainless steel ball. Conbraco/Apollo IBV-125 Series (or approved).

B. Butterfly Valves:

1. 2-1/2 Inches and Larger: 200 psi non-shock cold water, ductile iron body, extended neck, molded-in seat EPDM liner, stainless steel stem, and aluminum bronze disc. Provided with lugs for dead-end service. Nibco LD-2000, WD-2000 (or approved).

C. Check Valves:

1. 2 Inches and Smaller:

   a. Horizontal: 125 psi-swp bronze body horizontal swing check valve, regarding type, y-pattern, renewable seat and disc, solder or threaded connection. Nibco S-413 or T-413 (or approved).

   b. Vertical: 125 psi-swp bronze body vertical inline check valve, stainless steel or bronze disk holder, Buna-N disk, stainless steel spring actuated, solder or threaded connection. Nibco S-480 or T-480 (or approved).

2. 2-1/2 Inches and Larger:

   a. Horizontal: 125 psi-swp iron body vertical inline “silent” check valve, wafer or flanged style, renewable seat and disk, stainless spring actuated, bronze disk. Nibco W-910 (or approved).

   b. Vertical: 125 psi-swp iron body vertical inline “silent” check valve, wafer or flanged style, renewable seat and disk, stainless spring actuated, bronze disk. Nibco W-910, F-910 (or approved).

D. Drain Valves: Bronze ball valve, minimum 125 psi-swp, anti-blowout stem, stainless steel or chrome plated brass ball, reinforced TFE seat, solder or threaded inlet connection, male 3/4 inch hose thread outlet connection, with brass cap and chain. Nibco S-585-70-HC, T-585-70-HC (or approved).

E. Triple Duty Valve: Not allowed.

2.04 BALANCING VALVES

A. Manual:

1. General: Valve shall have, as an integral factory manufactured part of the valve, ports which allow measurement of the pressure drop across the valve to determine the flow rate using factory calibrated pressure drop versus flow charts. Valve shall have a means to adjust the flow rate through the valve and shall have a numerical readout indicating valve position. Valve shall have a concealed locking memory stop feature which prevents opening the valve beyond its balanced setting. Locking position may be unlocked by use of a standard size allen wrench.

2. Construction: Rated 300 psig at 250 deg F, Y-pattern, globe type, constructed of brass copper alloy or ASTM A536 ductile iron, with EPDM O-ring seals. Handwheel controlling valve position shall be of plastic construction, containing readout of valve position.

3. Connections: Valves 2-1/2 inch and smaller shall have solder or threaded end connections; larger valves shall have flanged or grooved ends.

4. Sizing: Valve shall be same size as pipe installed in, except where required for proper flow measuring, valve may be one pipe size smaller.

2.05 AIR VENTS

A. Automatic Air Vent - - High Capacity: Float type, with stainless steel float and float mechanism, cast iron body, rated for 250 psig maximum operating pressure, 300 degrees F. maximum temperature and 10 cfm capacity at 100 psig water pressure. Hoffman No. 792 (or approved).

B. Automatic Air Vent: Float type, with stainless steel float and float mechanism, semi-steel or cast brass body, ball check preventing re-entry of air, rated for 150 psig maximum pressure and 250 degrees F. maximum temperature. Hoffman No. 78 (or approved).

C. Manual Air Vent – Unfinished Areas: 1/4-inch, 125 psi bronze ball valve (Nibco S-589, T-580 or equal), with nipple connecting to pipe and discharge nipple and 1/4-inch diameter soft copper tubing, 24-inch long, provided.

D. Manual Air Vent – Finished Areas: 1/4 inch, 125 psi bronze ball valve (Nibco S-589, T-580 or equal), with nipple connecting to pipe and discharge nipple with 1/4-inch male threaded outlet adaptor and cap.

2.06 CHEMICALS

A. General: Chemicals shall be compatible with system materials and suitable for system operating conditions. Chemical shall be acceptable by local utility for discharge to sanitary sewer. Chemicals shall be delivered to the site in manufacturer’s original sealed and labeled containers.

B. Cleaner: Single liquid chemical product formulated for use as a cleaner in hot water heating and chilled water piping systems. Product shall have detergents, dispersants, alkaline emulsifiers, and additional agents to effectively remove grease, oil, dirt, mill scale and other contaminants from the piping systems. Cleaner shall be biodegradable. Rhomar "Hydro-Solv 9100" (or approved).

C. Biocide: Broad spectrum microbiocide for use in hydronic piping systems.

D. Corrosion Inhibitor: Liquid chemical product formulated for use in hot water heating and chilled water cooling systems to provide protection from corrosion. Shall be compatible with system heat exchanger and other materials (i.e. aluminum, stainless steel, or copper). Product shall be compatible with antifreeze, and all materials in the hydronic system that the product may come in contact with. For work on existing systems where portions of the existing system water will remain in the system use the same corrosion inhibitor type as currently in the system and compatible with the existing chemicals.

E. Antifreeze: Industrially inhibited propylene glycol, formulated for use in hot water heating and chilled water cooling systems. Shall have operating range from -28 deg F to 325 deg F. Antifreeze shall contain corrosion inhibitors to prevent system corrosion. Product shall be dyed a bright color for easy leak identification. Reserve alkalinity shall be at least 15 to provide long term resistance to acidic pH. Dow "Dowfrost HD" (or approved).

PART 3 EXECUTION

3.01 GENERAL

A. Installation: Installation of all items shall comply with code, best professional practices, and manufacturers written installation instructions.

B. Complete System: Provide all piping as indicated and as required to allow complete supply and return connections to each item requiring hydronic service. Provide piping connections to equipment furnished by others in accordance with Section 23 05 00.

C. Coordination: Coordinate installation of items with all trades that are affected by the work to avoid conflicts. Review all drawings for location of pipe spaces, ducts, electrical equipment, ceiling heights, door openings, window openings, and other details and report discrepancies or possible conflicts to Architect/Engineer before installing pipe.

3.02 PIPE AND FITTINGS

A. General:

1. Install piping at such heights and in such a manner so as not to obstruct any portion of windows doorways, passageways, or access to any items requiring routine service, maintenance, or inspection. Offset of reroute piping as required to clear any interferences which may occur.

2. Install all piping parallel to the closest wall and in a neat, workmanlike manner. Horizontal exposed straight runs of piping shall not deviate from straight by more

than 1/4-inch in ten feet. Vertical piping shall not deviate from plumb by more than 1/8-inch in ten feet.

3. Use eccentric reducers for changes in pipe sizing, keeping the top of pipes in line.

B. Insulation: Allow sufficient clearances for installation of pipe insulation in thickness specified. If interferences occur, reroute piping to accommodate insulation.

C. Electrical Items: Do not run any piping above electrical panels (and similar electrical equipment). Provide offsets around such panels as necessary. Such offsets are typically not shown on the plans, and are required per this paragraph.

D. Joints: Prior to the joining of any section of pipe to a pipe run, the section shall be thoroughly cleaned inside and out, the ends shall be reamed to remove any cutting burrs and piping prepared as recommended by pipe and fitting manufacturer.

E. Threaded Connections: Cut piping carefully, ream, thread and work into place without springing. Use TFE tape or lead and graphite lubricant (on male threads only).

F. Soldered and Brazed Connections: Polish contact surfaces of fittings and pipes with emery cloth before fluxing male and female surfaces of joints. Steel wool and sandpaper not permitted for polishing.

G. Welding: Shall conform to ASME B31.1 and ASME B31.9. Welders and welding operators shall be qualified as required by ASME B31.1, ASME B31.9, and governing code. Welded joints on piping system shall be continuous, without backing rings, and pipe ends beveled for butt weld connections. Gas cuts shall be square and free from burned material. Before welding, surfaces shall be thoroughly cleaned. Piping shall be carefully aligned, with no weld material projecting inside the pipe.

H. Unions: Install unions in pipe connections to valves, coils, and any other equipment where it may be necessary to disconnect the equipment or piping for repairs or maintenance; and as indicated. Where flanged connections occur at equipment additional unions are not required unless indicated otherwise.

I. Insulating Unions: Install dielectric insulating unions or insulating type flexible connectors between all connections of copper piping and steel piping of steel equipment. Where flanged connections occur use insulating type flanges.

J. Automatic Air Vents:

1. Provide automatic air vents installed at each high point in the system, where air may become trapped, and where system is separated from other air vents by vertical drops or rises. Provide added automatic air vents where shown on drawings.

2. All automatic air vents shall be connected to the system through a ball valve.

3. All automatic air vents shall be provided with drain piping to the nearest funnel or floor drain. Multiple vents may be plumbed to a common drain line which then

runs to the nearest funnel or floor drain. Such a drain system is not shown on the drawings (due to its incidental nature) but is a project requirement. Such drain line shall pitch toward nearest drain at a minimum 1% slope down and shall be the same size as the air vent connection size where serving 1 AAV, minimum 1/2-inch for serving up to 4 AAV's, 3/4-inch for serving up to 12 AAV's, and 1-inch where more are served.

K. Manual Air Vents: Provide manual air vents where shown on the drawings and at each coil, except that automatic air vents shall be used where specifically called for on the drawings or where it is a high point in the system or where air may become trapped.

L. Drains: Install drain valves at the low points in the piping system and at the base of each system riser. Provide additional drains as required to allow for complete draining of the system. These drain valves shall take off of the bottom of any horizontal pipe that they are connected to. Identify system drains on record drawings.

M. Accessories: Install flow measuring devices, balancing valves, and related items per manufacturer's instructions; with the proper distances upstream and downstream to any pipe fittings.

3.03 VALVES

A. General: Provide isolation valves as shown on the drawings. In addition to those shown, provide added valves to allow for the isolation of all individual equipment items.

B. Type: Valves 2 inches and less shall be the ball type; larger valves may be ball or butterfly type at Contractor’s option; except that valves indicated to be a specific type shall be the type as noted.

C. Installation: Install valves so as to be easily accessible and oriented to permit ease of operation. Valve stem shall be directed toward operator in either the vertical or horizontal direction. Provide access doors for valves not otherwise accessible.

E. Balancing Valves: Provide balancing valves in piping where indicated and where required to allow for equal distribution of water flows. Install in full open position unless noted otherwise.

F. Check Valves: Check valves used on the discharge of pumps shall be the non-slam type (except for pumps 3/4 hp and less).

3.04 FLUSHING, TESTING, AND CHEMICAL TREATMENT

A. General:

1. Entire CHS/CHR piping system shall be flushed and pressure tested. The entire system is to be chemically treated to restore proper chemical levels.

3. The activities specified herein represent the minimum work required; Provide additional work as necessary to suit unique aspects of the project (e.g. phased construction, long pipe runs, etc.) and as recommended by the Water Treatment

Specialist (WTS) in order to provide clean, pressure tested, and chemically treated hydronic systems ready for service.

4. Prior to beginning work have WTS confirm existing system treatment levels, conditions, and chemicals being used. Submit written report of condition and any adverse conditions discovered.

5. System shall not be allowed to remain in a condition that is deleterious or aggravates corrosion. After being filled with water systems may not remain without chemical treatment for more than 48 hours; after having been filled and drained, systems may not remain empty for more than 24 hours. Provide added chemical treatment cycles during initial fill periods as needed to suit project phasing or extended testing/flushing periods.

6. Provide clear, accurate, and readable pressure gauges to ensure accurate pressure testing. Make a written record of the gauge readings, time, date, and where connected to the system and mark this information on site as-builts.

B. Sequence: Work shall occur in the following order:

1. Prepare system for work.

3. Flushing (includes strainer blow-down).

4. Fill and leak testing.

5. Chemical treatment.

C. Preparation: Prepare system for flushing and testing. Isolate from the piping any parts of the system or equipment that may be damaged by the test pressure or entrapment of debris during the flushing process, or that are not part of the flushing process. Verify all system valves are in the required positions. Install any required (or recommended) start-up strainer screens or related items to protect components or to aid the flushing process.

D. Flushing and Cleaning:

1. Flush system to remove system of debris. Use clean water or existing system hydronic water. Blow-down all strainers that are part of system being flushed. Open system valves (where possible) and other components to ensure full flushing. Provide temporary fill and drain piping as necessary. Provide sufficient number of drain points to ensure that all parts of the new piping are flushed.

2. Clean new portions of work by circulating through the system a cleaning chemical. Use concentration, flow rates, and duration as recommended by the chemical supplier and WTS.

E. Fill and Leak Test: Fill portions of the system to be flushed with clean water. Open local air vents and valves to allow filling. Check system for leaks during filling. Pressurize system to at least 20% above what system will experience during flushing process (but not

less than 75 psig) and check for leaks. Any leaks shall be repaired and the system re-filled and re-checked until system proves tight. Provide temporary hose and piping as necessary.

F. Final Testing: After flushing, drain the initial fill water from the portions undergoing flushing. Apply hydrostatic test to the system. Test pressure on systems with all new components only, shall be 125 psig; test pressure on portions with new and existing shall be 75 psig (unless noted otherwise). Confirm all test pressures with Engineer prior to test. System shall hold the test pressure for a minimum of 2 hours with no drop in pressure. Any leaks shall be repaired and the system re-tested until system proves tight.

G. Documentation: Document all flushing, testing, and strainer cleaning. Documentation shall indicate when these tasks were conducted, description of the extent/scope of work, who did the work, and be signed by the person performing the work or the person supervising the work.

H. Supervision: All work shall be performed under the direct supervision of the Water Treatment Specialist (WTS) subject to approval by the Architect/Engineer.

I. Chemical Treatment: After successfully proven free of leaks, add corrosion inhibitor to the system to achieve pre-project chemical levels, or to a concentration of 100-150 ppm for molybdate inhibitors and 800-1200 ppm for nitrite inhibitors where pre-project chemical levels are not documented. Provide anti-freeze [where noted; provide] to 20% concentration by volume (unless noted otherwise). Existing chemically treated water drained from the system may be re-introduced into the system provided the water is filtered through a 20 mesh strainer and shows no signs of degradation and is acceptable to the WTS.

J. Final Chemical Testing: Test system as recommended by the WTS to confirm proper system cleaning and stability. Test as a minimum for: total dissolved solids, pH, soluble iron, soluble copper, antifreeze percentage (as applicable), and concentration of corrosion inhibitor.

K. Report: The WTS shall submit a report describing the initial system condition, final chemical test results, and the final condition of the system. Report shall include when testing work was performed, and name of individuals doing the testing work or supervising the work.

END OF SECTION

PART 1 GENERAL

1.01 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 00 and Division 01 Specification Sections, apply to this Section.

B. Requirements of Section 23 05 00 apply to this Section.

1.02 WORK INCLUDED

A. Mechanically Coupled Pipe.

B. Mechanically Coupled Pipe Fittings.

C. Mechanical Couplings.

D. Mechanically Coupled Valves.

E. Mechanically Coupled Piping Specialties.

1.03 SUBMITTALS

A. General: Submittals shall comply with Section 23 05 00.

B. Product Data: Submit product information on all pipe, pipe fittings, valves, and specialty products proposed to be used. Indicate gasket materials and coupling types to be used for each system and pressure/temperature limitations of all products.

C. System Expansion/Contraction: Submit information indicating how system expansion/contraction will be accommodated. Provide plans with locations and details of all expansion joints, loops, anchors, guides, and other system features.

1.04 GENERAL REQUIREMENTS

A. Contractor Option: The Contractor, at his option, may use mechanically coupled pipe, pipe fittings, valves and piping specialties in lieu of those materials otherwise specified. Only the valve and specialty items specifically called out in this specification section may be used.

B. Systems: Mechanically coupled piping products are approved for use on the following only: Water source heat pump hydronic piping.

C. Standardization: All mechanically coupled piping products shall be of one manufacturer.

D. Quality: All mechanically coupled piping products shall be equal to or superior than the otherwise specified product (i.e. if standard threaded, welded or flanged items were used). Mechanically coupled piping products shall only be used where the operating

conditions do not exceed the design parameters of the gasket and product, and where system operation/performance is not adversely affected. The use of mechanically coupled piping products does not eliminate the requirement to provide other components indicated on the plans (i.e. flex connectors, expansion devices, etc.). Product manufacturer shall be ISO-9001 certified.

E. Costs: Contractor shall bear all added costs of using mechanically coupled piping products in lieu of otherwise specified products.

F. Tools: Tools used in grooving pipes and in assembling mechanically coupled system components shall be approved for such use by the mechanical coupled product manufacturer.

1.05 QUALITY ASSURANCE

A. Domestic Manufacturing: Major components (piping, fittings, couplings, and valves, exclusive of minor hardware) shall be made in the United Stated of America, and shall permanently marked as such.

1.06 REFERENCES

A. ASTM A53: Pipe, Steel, Black and Hot-Dipped Zinc Coated, Welded and Seamless.

B. ASTM A183: Carbon Steel Track Bolts and Nuts.

C. ASTM A234: Standard Specification for Piping Fittings or Wrought Carbon Steel and Alloy Steel.

D. ASTM A449: Quenched and Tempered Steel Bolts and Studs.

E. ASTM A536: Ductile Iron Castings.

PART 2 PRODUCTS

2.01 ACCEPTABLE MANUFACTURERS

A. Products shall comply with Section 23 05 00, Paragraph 2.01, Acceptable Manufacturers.

B. Pipe: See system specification sections.

C. Mechanically Coupled Piping Products: Victaulic Company of America, Anvil International, (“Gruvlock”).

2.02 PIPE AND FITTINGS

A. Pipe: See system specification sections.

1. Pipe shall be roll/cut grooved in accordance with the latest manufacturer's recommendations.

2. Pipe ends shall be free from indentations, projections, and roll marks.

B. Fittings:

1. General: Fittings shall be full flow type, with grooves, shoulders and other provisions for use with mechanical couplings by the same manufacturer as the fitting. Shall be products as indicated in the manufacturer's latest catalog literature.

2. Steel Piping Systems: Fittings shall be constructed of malleable iron conforming to ASTM A47, ductile iron conforming to ASTM A536, segmentally welded schedule 40 steel pipe conforming to ASTM A53 (type F, E or S, Grade B), or forged steel conforming to ASTM A234, (Grade WPB). Fittings shall be factory coated with an orange colored alkyd enamel paint; except where piping system is galvanized the fitting shall be hot dipped galvanized (conforming to ASTM A153).

3. Copper Piping Systems: Fittings shall be constructed of copper, conforming to ASTM B-75 alloy C12200 or ASTM B-152 alloy C11000, up through 4 inch size; or conforming to ASTM B-584, copper alloy CDA 836, 5 inch and larger. Fittings shall be factory coated with a copper colored alkyd enamel paint.

2.03 MECHANICAL COUPLINGS

A. Coupling Components:

1. Coupling housings shall be malleable iron conforming to ASTM A47 or ductile iron conforming to ASTM A536; hot dip galvanized per ASTM A153 where the connecting piping or fittings are galvanized.

2. Couplings shall be factory coated with an alkyd enamel paint; copper colored for fittings used on copper piping systems and orange colored for other systems.

3. Bolts shall be carbon steel track type conforming to ASTM A183 Grade 2, or ASTM A449; minimum tensile 110,000 psi. Nuts shall be hex style, conforming to ASTM A183 Grade 2, or ASTM A563 Grade A. Bolts and nuts shall be zinc electroplated to ASTM B633.

4. Gaskets shall be grade "E" EPDM conforming to ASTM D2000 Grade 2, with temperature range from -30 degrees F to +230 degrees F. Gasket selection for each system shall be in accordance with latest manufacturer's recommendations and so as to suit system pressures, temperatures and chemicals.

B. Couplings:

1. Steel Piping Systems: Couplings shall be equal to those manufactured by Victaulic, Styles 77, 177, 72, 750, and 107, or approved.

a. Victaulic Style 77, 177, 72, W77 and 750 coupling (or approved) shall be

used to provide allowance for controlled pipe movement expansion/contraction/deflection to absorb movement for thermal changes, settling or seismic action.

b. Victaulic Style 107 "Zero Flex" W07 rigid coupling (or approved) with angular bolt pads shall be used for all pipe joint connections where joint flexibility is not desired.

2. Copper Piping Systems: Couplings shall be equal to those manufactured by Victaulic, Style 607. Coupling housings shall be cast with angular bolt pads.

2.04 VALVES

A. Butterfly Valves:

1. Shall have housing cast of ductile iron conforming to ASTM A-536, or malleable iron conforming to ASTM A-47, with grooved ends and shall be coated with a black alkyd enamel or epoxy coating or polyphenylene sulfide (PPS). Disc shall be of ductile iron construction, conforming to ASTM A-536, with electroless nickel coating conforming to ASTM B-733, or with grade "E" EPDM coating. Disc seat shall be pressure responsive elastomer, “E” EPDM. Stem shall be Type 416 stainless steel. Valve shall be rated for bubble-tight shut-off service up to 300 psi; vacuum service up to 29.9 inches of mercury; and for dead-end service. Provide valves with extended necks where used on insulated piping to allow for insulation without inhibiting valve operation. Victaulic “Vic-300, MasterSeal-W761” (or approved).

2. Operator: Manual lever lock/infinitely variable handle with memory stop. Shall be fabricated of ductile iron, with painted enamel finish, and steel zinc plated fasteners. On valves 5-inch and larger, provide with manual gear operator with round handwheel.

3. Alternative Valves: Other valves having equal pressure capabilities and of like construction to the above may be used with the Engineer's approval prior to bidding.

B. Check Valves: Body shall be constructed of ductile iron conforming to ASTM A-536 and ASTM A-395, with grooved ends. Disc shall be aluminum bronze conforming to ASTM B-148 or ductile iron conforming to A-536, or Type 304 stainless steel; with spring assist. Body shall be coated with a black alkyd enamel or epoxy coating or polyphenylene sulfide (PPS). Spring shall be constructed of Type 316 stainless steel. Seal shall be grade "E" EPDM with temperature range -30 degrees F to +230 degrees F continuous service, and be rated for up to 300 psi working pressure. Valve shall be operational when installed in horizontal or vertical positions, and shall close off tight with as low as 5' of head on discharge side. Victaulic Series 716/779 W716 (or approved).

C. Balancing Valves:

1. General: Valve shall have, as an integral factory manufactured part of the valve,

ports which allow measurement of the pressure drop across the valve to determine the flow rate using factory calibrated pressure drop versus flow charts. Valve shall have a means to adjust the flow rate through the valve and shall have a numerical readout indicating valve position. Valve shall have a concealed locking memory stop feature which prevents opening the valve beyond its balanced setting. Locking position may be unlocked by use of a standard size Allen wrench. Victaulic/TA Hydronics Series 786, 787, 788, or 789 (or approved).

2. Construction: Rated 300 psig at 250 deg F, Y-pattern, globe type, constructed of brass copper alloy or ASTM A536 ductile iron, with EPDM O-ring seals. Handwheel controlling valve position shall be of plastic construction, containing readout of valve position.

3. Connections: Valves 2-1/2 inch and smaller shall have solder or threaded end connections; larger valves shall have flanged or grooved ends.

4. Sizing: Valve shall be same size as pipe installed in, except where required for proper flow measuring, valve may be one pipe size smaller.

2.05 PIPING SPECIALTIES

A. Suction Diffuser: Body shall be constructed of ductile iron conforming to ASTM A536 or malleable iron conforming to ASTM A47. The combination diffuser-strainer-orifice cylinder shall be of Type 304 stainless steel with 5/32-inch or 3/16-inch diameter holes. Start-up pre-filter shall be stainless steel (or bronze), 20 or 16 mesh screen. Rated for 300 psi working pressure at 250 deg F. Provide with 1-1/4-inch pipe support boss, bottom drain plug and side gauge tap. Victaulic 731-D/W731 (or approved).

B. Strainer: “T” or “Y” type configuration. Body shall be constructed of ductile iron conforming to ASTM A536 and ASTM A395 or malleable iron conforming to ASTM A47. Body shall be coated with an alkyd enamel or epoxy coating or polyphenylene sulfide (PPS). Screen shall be removable by removing end cap coupling. Screen shall be basket type, constructed of Type 304 stainless steel, 6 mesh. End cap shall have NPT blow-down connection, minimum 1/2-inch, and utilize manufacturers standard coupling style and gasket matching other couplings used in the system. Strainer Cv shall be no less than the nominal strainer diameter squared times 26. Rated for 300 psi working pressure at 250 deg F. Victaulic style 730/W730 (or approved).

C. Branch Outlets: Victaulic Style 923 "Vic-Let", Style 924 "Vic-O-Well", Victaulic Style 920 and 920N “Mechanical-T” outlets (or approved); rated for 300 psi working pressure at 230 deg F.

D. Dielectric Connection: Victaulic Style 47 "Clearflow Dielectric Waterway” fitting (or approved). Constructed of steel or ductile iron pipe, with zinc electroplating and internal thermoplastic lining. Rated for 300 psi working pressure at 230 deg F.

E. Adapter Connection: Conversion of flanged outlets to mechanically coupled system connection shall be accomplished by Victaulic Styles 741 Flange Adapter (or approved),

conforming to ANSI Class 125/150 bolt pattern, or Style 743 Flange Adapter (or approved), conforming to ANSI Class 250/300 bolt pattern.

F. Flanged Adapter Nipples: Victaulic Style 41, 45, 46 (or approved) for connecting ANSI class 125, 150, and 300 flanged components to mechanically coupled piping system connection. Nipples shall be constructed of carbon steel pipe (same schedule as the piping system being connected); flanges of cast iron or carbon steel construction.

PART 3 EXECUTION

3.01 INSTALLATION

A. General: Install all components according to the manufacturer's written installation instructions and applicable codes and standards. See piping system specification section for piping and system installation requirements.

B. Pipe Preparation: Piping shall be prepared in strict accordance with the coupling manufacturer’s instructions and ANSI/AWWA C-606.

C. Coupling Fasteners: Torque as required by manufacturer. Demonstrate equipment used upon Engineer’s request.

D. Dielectric Connection: Provide dielectric at all piping connections between dissimilar metals and equipment to protect from local cell corrosion.

E. Coupling Types: Couplings that allow for system flexibility and expansion/contraction shall be used except where a rigid coupled system is specifically required.

F. Manufacturer’s Review: Coupling manufacturer’s factory representative shall periodically visit the project site and review the mechanical coupled products and installation and confirm compliance with the manufacturer’s installation instructions.

G. System Expansion/Contraction:

1. “Flexible” Coupled Systems: Install piping ends with proper clearances (“pre-gap”) to allow for system expansion (or contraction), as appropriate to temperatures at the time of installation and system operating temperatures and pressures. Provide pipe anchors at the end of pipe runs and intermediate guides to allow the gap between piping ends to take up piping expansion/contraction. Provide additional couplings (or expansion joints) to accommodate all pipe movement without excessive pipe stress or angular deflection in piping mains and branch connections.

2. “Rigid” Coupled Systems: Provide expansions joints and expansion loops (or changes in piping direction) to accommodate system expansion and contraction. Provide pipe anchors at the end of pipe runs and intermediate guides to allow piping to expand/contract into the installed expansion device/system.

3. The system features to accommodate all system expansion and contraction shall be Contractor selected, subject to review by the Engineer. Contractor's methods shall be based on guidance from the coupling manufacturer and engineering principles.

END OF SECTION

PART 1 GENERAL

1.01 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 00 and Division 01 Specification Sections, apply to this Section.

B. Requirements of Section 23 05 00 apply to this Section.

1.02 WORK INCLUDED

A. In-Line Pumps.

1.03 SUBMITTALS

A. Product Data: Provide product information and performance data for all pumps. Performance data shall include pump curves, showing pump performance as head vs. GPM, BHP and NPSH vs. GPM, with system operating point clearly marked. (NPSH vs. GPM not required for pumps 1 HP and less.)

B. Installation: Submit manufacturers installation instructions for pumps.

1.04 QUALITY ASSURANCE

A. Factory Testing: All pumps shall be factory tested per the Hydraulic Institute Standards and be thoroughly cleaned.

B. Electrical: Coordinate pump electrical voltage/phase with Division 26 prior to ordering.

1.05 REFERENCES

A. Hydraulic Institute Standards: ANSI/HI Pump Standards, Version 3.1.

PART 2 PRODUCTS

2.01 ACCEPTABLE MANUFACTURERS

A. Products shall comply with Section 23 05 00. See Section 23 05 00, paragraph 2.01 for Acceptable Manufacturer requirements.

B. In-Line Pumps: Bell & Gossett, Armstrong, Taco.

2.02 GENERAL

A. Balancing: All rotating parts shall have been statically and dynamically balanced at the factory.

B. Alignment: Pump and motors shall be factory aligned, and have alignment checked and

reset once installed in place.

C. RPM: Pumps and motors shall operate at 1750 rpm unless indicated otherwise.

D. Pump Capacity: Shall be no less than the values listed on the Mechanical Equipment Schedule on the drawings.

E. Pump Types: The type of each pump is indicated on the Mechanical Equipment Schedule under the "Type" column, and corresponds to the types specified herein.

F. Motors: Shall comply with Section 20 05 00. Motors shall be of sufficient size so as to be non-overloading at any point on the operating curve and shall be no smaller than the size shown on the drawings. Motors shall be of drip-proof construction (unless indicated otherwise), resilient mounted with oil lubricated journal or ball bearings, and have built-in thermal overload protectors. Motors shall be for use with the voltage and phase as indicated on the drawings.

G. Finish: Pumps shall have minimum one coat high grade machinery enamel finish, factory applied, manufacturer's standard color.

H. Nameplate: Pumps shall have nameplates identifying: manufacturer, model number, capacity (gpm and head), and date of manufacturer.

I. Variable Speed Application: Pumps used with variable speed drives shall have motors that are compatible with the variable frequency drive unit and shall have suitable couplings and accessories to suit variable speed duty.

J. Coupling Guards: Provide pumps with coupling guards complying with OSHA requirements.

K. Pump Seal Replacement: If pumps are used for any Hydronic System Flushing or Cleaning (see hydronic piping system specifications), Contractor shall replace pump seals when flushing/cleaning is complete.

2.03 VERTICAL IN-LINE PUMPS

A. Type: Centrifugal, single stage, split coupled, in-line pump with vertical shaft. Bell & Gossett Series 80-SC (or approved).

B. Operating Range: Pump shall be rated for continuous operation at a minimum 175 psi and 250°F.

C. Volute: Cast iron or ductile iron construction (except shall be of bronze construction where pump is noted as “all bronze”), with plugged gauge tappings at inlet and outlet, and plugged vent and drain tappings at top and bottom. Shall have flanged suction and discharge connections, pressure class to match piping system connected to.

D. Impeller: Cast bronze, fully enclosed, keyed to shaft and secured with stainless steel locknut. Impeller key and hardware shall be of stainless steel construction.

E. Shaft: Type 416 stainless steel, guided by a carbon graphite throttle bushing. Shaft shall be coupled to motor with a split rigid spacer type coupling, with slotted coupler guard.

F. Seal: Internally self-flushing mechanical seal; with EPR or EPDM or Viton elastomer, carbon rotating face, tungsten carbide (or silicon carbide) stationary face, stainless steel spring, and metal parts of stainless steel or brass construction.

G. Service: Pump seal shall be replaceable without removing pump motor or disturbing piping connections.

H. Support: Provide all floor supported vertical shaft pumps with a cast iron pump stand designed for attachment to pump to provide substantial support off the floor.

PART 3 EXECUTION

3.01 INSTALLATION

A. General: Comply with Section 23 05 00. Install in accordance with manufacturer's written installation instructions, code, applicable standards and best construction practices. Install pumps at locations indicated and in accordance with Contract Documents.

B. Piping: Decrease from line size to pump inlet size with long radius reducing elbows and minimum 5-pipe diameter straight pipe into pump (except where suction diffusers are used) and out of pump. Where reducers in the horizontal are used on pumps, they shall be the eccentric type installed with taper on the bottom.

C. Flexible Connectors: Provide flexible connectors in piping to pumps and where indicated.

D. Alignment: Check motor alignment after pump installation; re-align as necessary.

E. Owner Instruction: Instruct Owner on equipment operation, including: system start-up, shut-down, emergency shut-down, normal control operation, safety aspects, maintenance and repair instructions. Comply with Section 23 05 00.

3.02 START-UP

A. Pre Start-Up Inspection: Inspect equipment and connecting systems to confirm equipment and connecting systems, and to confirm equipment has been installed properly and is ready for start-up. As a minimum, check for: proper voltage and phases, correct electrical connections, correct pump rotation, and other items as listed by the manufacturer are properly provided/connected and operating to ensure safe and proper start-up. Install in accordance with manufacturer's written instructions, code, applicable standards and best construction practices. Care shall be taken when moving and setting units not to damage roof, curb, units, or other items.

B. Start-Up: Perform start-up in accordance with manufacturers written start-up procedures. Arrange other trades needed to be present (i.e. balancer, control technician, etc.). Check

pump operation to ensure that specified flows are provided, without motor unloading or pump cavitation. Notify the Architect/Engineer of any unusual conditions or performance other than as specified.

C. Adjustments: Adjust and set unit components to allow for proper operation (i.e. adjust fan sheaves, adjust fan speeds, unit settings, etc.). Observe unit to detect any unusual vibration, leakage, loose wiring, or other situations that could affect unit operation.

END OF SECTION

PART 1 GENERAL

1.01 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 00 and Division 01 Specification Sections, apply to this Section.

B. Requirements of Section 23 05 00 apply to this Section.

1.02 WORK INCLUDED

A. Ductwork Systems.

B. Flexible Duct.

C. Acoustical Duct Lining.

D. Preparation of Duct for Service.

1.03 DEFINITIONS

A. Duct Sizes: All duct dimensions shown are inside clear dimensions. Where inside duct lining is specified or indicated, duct dimensions are to the inside face of lining.

B. Environmental Ductwork Systems: Ductwork systems that are not covered by Section 23 35 00 - Special Exhaust Systems.

1.04 QUALITY ASSURANCE

A. All work and materials shall comply with SMACNA-DCS, NAIMA-DLS, ASHRAE-F, IBC, IMC, NFPA-90A, NFPA-90B, and code. The most restrictive criteria governs.

B. Leakage Criteria: Duct system shall be constructed and sealed so that leakage does not exceed 5%.

C. Fabrication Proximity: The Contractor performing the work of this section shall have fabricating facilities located within 100 miles of the project site.

D. Drawing Review: Prior to beginning any work review all drawings, duct routing, duct connections, equipment configuration, equipment connection locations, and other work details to discover conflicts in anticipated duct arrangement and improper or incomplete connections. Review shall include the following: supply ducts not connected into return (or exhaust) ducts, ducts not crossed and improperly connected in shafts, air outlets/inlets connected to ducts, unit configuration compatible with planned duct connections, louver locations match architectural plans. Submit resolutions of such possible conflicts as submittals with shop drawings of proposed solutions; written description in lieu of shop drawings is acceptable for minor issues.

1.05 SUBMITTALS

A. General: Comply with Section 23 05 00.

B. Product Data: Submit product data for duct lining, flexible duct, and factory fabricated items.

C. Shop Drawings: Submit shop drawings for all HVAC ductwork which is to be installed differently than as shown on the drawings.

1.06 DUCT PRESSURE CLASS

A. Constant Volume Systems: Ductwork shall be constructed to the pressure class corresponding to 1.2 times the static pressure indicated for the fan which serves the duct system (plus or minus as appropriate); unless noted otherwise. (For example, a fan designed to operate at 1-inch wc static pressure would require 2-inch pressure class duct construction as 1-inch x 1.2 = 1.2-inch; 2-inch is therefore the required pressure class.)

1.07 REFERENCES

A. ADC-FLEX: Air Diffusion Council Flexible Duct Performance and Installation Standards.

B. ASHRAE-F: ASHRAE Handbook of Fundamentals.

C. ASTM A 653: Steel Sheet, Zinc Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot Dip Process.

D. ASTM A 924: General Requirements for Steel Sheet Metallic-Coated by the Hot-Dip Process.

E. ASTM E 84: Standard Test Method for Surface Burning Characteristics of Building Materials.

F. IMC: International Mechanical Code.

G. NAIMA-DLS: North American Insulation Manufacturers Association Fibrous Duct Liner Standards, 1st Edition.

H. NFPA 90A: Standard for the Installation of Air Conditioning and Ventilating Systems.

I. NFPA 90B: Standard for the Installation of Warm Air Heating and Air Conditioning Systems.

J. SMACNA-DCS: SMACNA HVAC Duct Construction Standards, 3rd Edition.

K. UL 181: Underwriter Laboratories Factory-Made Air Ducts and Air Connectors.

L. UL 181A: Underwriter Laboratories Closure Systems for Use with Rigid Air Ducts.

PART 2 PRODUCTS

2.01 ACCEPTABLE MANUFACTURERS

A. Products shall comply with Section 23 05 00, Paragraph 2.01, Acceptable Manufacturers.

B. Sheet Metal: All domestic manufacturers.

C. Spin-in Fittings and ATTO: Sheet Metal Connectors Inc., United McGill, Royal Metal Products, Airflow Products Inc.

D. Gasketing: Preson, Insulfab, Duraco.

E. Duct Sealant and Tape: Carlisle (Hardcast), Ductmate, Benjamin Foster, Grace Construction Products, United McGill, Polymer Adhesives Sealant Systems, RCD Corporation, Nashua, 3M.

F. Acoustical Duct Lining: Johns-Manville.

2.02 GENERAL MATERIALS

A. Ducts: Construct of galvanized sheet steel, suitable for lock forming without flaking or cracking, conforming to ASTM A653 and A924, having a zinc coating of 0.90 ounces total per square foot for both sides of a sheet, corresponding to coating G90.

B. Fasteners: Steel construction, electroplated zinc coated, having strength properties adequate for the application, compatible with materials being joined, and in accordance with SMACNA-DCS. Where exposed to corrosive conditions shall be of Type 304 or 316 stainless steel. Type to meet duct pressure class and duct leakage requirements. Where used for the support and anchorage of ducts shall comply with Section 20 05 29, with independent test reports regarding strength.

C. Spin-in Fittings: Factory fabricated of galvanized steel with die-formed mounting groove and damper with raised damper quadrant where ducts are to be insulated. Collar length for flexible duct attachment shall be at least 2" long.

D. Air-Tight Take-Off Fittings (ATTO): Factory fabricated branch duct connector, of galvanized steel. Flange shall be 1-1/2” wide with 1/8” self-adhesive gasket and pre-drilled fastener holes. Collar length for flexible duct attachment shall be at least 2” long. Where used on round duct mains, shall be saddle type appropriately sized for main duct diameter.

E. Draw Bands:

1. Metal: Worm gear type clamp, constructed of galvanized steel, stainless steel, or aluminum; minimum 1/2-inch wide band; suitable for 200 pound loading.

2. Non-Metal: Nylon “zip-tie” with self-locking ability, designed for flexible duct usage, minimum 1/4 inch wide, rated for 175 pound load, suitable for temperatures from 0 to 185 deg F; listed per UL181B and labeled “UL181B-C”.

F. Gasketing: Vinyl nitrile, vinyl neoprene, or neoprene nitrile PVC blend; designed for HVAC use with size to suit the application having minimum 1.5-inch width at equipment roof curb applications. Fire hazard rating not to exceed 25 for flame spread and 50 for smoke development per ASTM E 84.

G. Duct Sealant/Mastic: Water based duct sealant, listed per UL 181B-M and UL 181A-M, suitable for indoor and outdoor use. Fire resistant with a flame spread rating of 5 or less, and a smoke developed rating of 0. Sealant shall be resistant to ultraviolet radiation and ozone. Fiberglass mesh shall be minimum 0.006-inches thick, with minimum 9 x 9 weaves per inch, and 2-inch width; for use with mastic in sealing ductwork. Sealant system shall be suitable for duct system pressure class and materials used with. Carlisle Hardcast “Versa-Grip 181”.

H. Foil Tape: Foil back adhesive tape, listed per UL181A-P and UL181B-FX, with listing labeled on tape outer foil face. Minimum 3-inch width for metal-to-metal applications; minimum 2-inch width for flexible duct applications. 3M No. 3340 or Nashua No. 324A.

2.03 DUCT FABRICATION

A. Duct Gauge and Reinforcement: Shall be as shown in SMACNA-DCS according to the pressure classification of the system and the duct dimensions; with heavier gauge duct used as required to minimize duct reinforcement to suit space available and other project constraints. In no case shall ducts be constructed of less than 26 gauge material.

B. Joints and Seams: Construct in accordance with SMACNA -DCS, code requirements, and these specifications (more stringent governs). Ducts shall be constructed and sealed so that the leakage criteria is not exceeded. Round ducts shall be the spiral seam type; except that branch ducts to individual air inlets/outlets less than 16" diameter may be of other types as allowed by SMACNA-DCS. Coordinate joint spacing with duct reinforcement requirements so that transverse joints having the required stiffness may be incorporated in the reinforcement spacing schedule. Round duct transverse joints shall be made with beaded sleeve joints or flanged connections in accordance with SMACNA-DCS; except that branch ducts to individual air inlets/outlets less than 16" diameter may use other joining methods as are allowed by SMACNA-DCS.

C. Elbows and Tees: Shall be long-radius type with a center-line radius not less than 1-1/2 times the width or diameter of the duct. Where space does not permit the use of long-radius elbows, short-radius or square elbows with turning vanes may be used. Elbows in round duct systems with duct pressure class above 2-inches shall be stamped type, welded segmented type, or standing seam segmented type.

D. Transitions: Increase duct sizes gradually. Transitions for diverging air flow shall be made with each side pitched out not more than 22.5 degrees. Transitions for converging air flow shall be made with each side pitched in not more than 30 degrees. Except that eccentric transitions for round to flat oval may have up to a 45 degree pitch.

E. Branch Connections: Shall comply with SMACNA-DCS, and as required herein.

1. Rectangular-to-Rectangular: Rectangular take-off with 45 degree angle on “inside” of take-off, minimum 4" length. Reference SMANCA-DCS Figure 4-6.

Close corner openings.

2. Rectangular-to-Round: Serving Branch Duct: Rectangular to round transition, with maximum degree pitch as specified for transitions. Rectangular end size shall have free area no less than round end. Rectangular connection to rectangular main shall be made as specified for "Rectangular-to-Rectangular" connections.

3. Other Connections: In accordance with SMACNA-DCS and recognized professional practices.

F. Ductmate Systems:

1. Rectangular Duct: Transverse duct joints may be made with Ductmate System, or approved equal. System shall consist of companion flanges of 20 gauge galvanized steel with an integral polymer mastic seal; corner pieces of 12 gauge G90 galvanized steel; 20 gauge G90 galvanized cleats; closed cell, high density gasket type; and galvanized carriage bolts with hex nuts. The flanges shall be securely fastened to the duct walls using self-drilling screws, rivets or spot welding. Fastener spacing shall be as recommended by the manufacturer for the size of duct and the pressure class. The raw duct ends shall be properly seated in the integral mastic seal. A continuous strip of gasket tape, size 1/4" x 3/4", shall be installed between the mating flanges of the companion angles at each transverse joint; and the joint shall be made up using 3/8-inch diameter x 1-inch long plated bolts and nuts. Galvanized drive-on or snap-on cleats shall be used at spacing recommended by the manufacturer.

G. Lined Ductwork:

1. Rectangular Ducts: Contractor Fabricated ductwork with interior duct lining. Duct fabrication and liner installation shall comply with NAIMA-DLS. Lining material shall comply with paragraph titled "Duct Lining" in this specification section.

2.04 DUCT LINING

A. Material: Flexible, inorganic glass fiber material, bonded with thermosetting resin, maximum thermal conductivity of 0.24 Btu-inch/hr-sq. ft.-degree F at 75 degrees F, coated to prevent erosion, conforming to NAIMA-DLS and exceeding that standard as specified herein. Suitable for air temperatures to 250 degrees F, and duct velocities to 6000 feet per minute. Surface shall be coated with an acrylic coating having anti-microbial agents and factory applied edge coating. Johns-Manville "Permacote Linacoustic" (or approved).

B. Thickness: Lining shall be 1-inch thick except where noted otherwise.

C. Adhesives and Fasteners: Shall conform to NAIMA-DLS, and as suitable for the duct liner material and ductwork.

D. Fungi and Bacteria Resistance: Conform to ASTM C 1338 and ASTM G21 for fungi

resistance and ASTM G 22 for bacteria resistance.

PART 3 EXECUTION

3.01 DUCTWORK INSTALLATION

A. General: Install all ductwork with all accessories and connections to provide complete and operable duct systems, in accordance with plans and specifications. See Section 20 05 29 for hangers and supports. Provide quality assurance review of all drawings prior to beginning work (see paragraph titled Quality Assurance, this specification Section and see Section 20 05 00). Provide duct and plenum sizes and locations as shown on the drawings; except as adjusted for field conditions and work of other trades, and with prior approval of the Engineer. See Section 20 05 00 for offsets and transitions to be included in project.

B. Coordination: The Contractor shall fully coordinate the work of all trades to avoid interferences and conflicts. Due to the extremely tight spaces in portions of the building, the Contractor shall coordinate duct reinforcement spacing and supports with other trades as necessary to avoid interferences. In addition, the Contractor shall select duct gauge and reinforcement types to avoid interferences. Changes required due to lack of coordination between trades, improper spacing or selection of hangers, or improper duct gauge and reinforcement selection, shall be done at no additional cost to the owner.

C. Field Measurements: Prior to fabricating any duct materials, the Contractor shall field measure all areas where ducts will be installed to verify room available and all offsets and fittings required. Field verify connection sizes and locations to equipment, louvers, and similar items.

D. Workmanship: All work shall comply with code, SMACNA-DCS, and other applicable standards. Ducts shall be installed level (unless noted otherwise) and in neat lines with the building construction using best professional practices.

E. Exposed Ducts: All ducts are to be installed concealed unless indicated otherwise. Ducts that are exposed shall be carefully fabricated, stored, and installed for best appearance. All dents, dings, scratches and other damage shall be repaired for a high quality finished look; all dirt, debris, labels, stickers, lettering, and marks removed; and the duct completely cleaned. Any sealant shall be cleaned to form a straight and even seam adjacent to joints, have no overlap onto duct areas not needing sealant, and have all excess sealant removed (mask off adjacent areas as necessary).

F. Spin-in Fittings/ATTO’s: May be used for branch ducts to individual outlets only. Apply a bead of duct sealant to all spin-in fittings where fitting seals against sheet metal duct.

G. Sealing:

1. General: Use materials listed and approved for the specific application. Foil tape may only be used at duct connections to air inlets/outlets (unless specifically noted otherwise). Clean surfaces to be sealed of moisture and all contaminants. Seal joints in accordance with SMACNA-DCS, sealant manufacturer’s

instructions, and UL 181.

2. Ductwork: Seal to meet duct leakage criteria as follows: Seal Class B.

H. Ductmate: All "Ductmate" and similar systems shall be installed in strict accordance with manufacturer's instructions.

I. Protective Caps: Provide temporary sheetmetal caps or heavy visqueen covers over all open portions of ductwork to prevent debris, dirt, and dust from entering the ductwork. Such covers shall be installed at the end of each work shift, and shall remain in place until all work activities or events that may cause duct contamination will no longer occur.

3.02 ACOUSTICAL DUCT LINING INSTALLATION

A. General: Install acoustical duct lining in ducts to extent shown on drawings, covering all interior surfaces. Round ducts shall use factory fabricated double-wall ducts as specified.

B. Installation: Installation shall comply with NAIMA-DLS and these specifications. The liner shall be cut to assure tightly butted joints.

C. Liner Attachments: The duct liner shall be applied with a 100% coverage of adhesive. Mechanical Fasteners shall be installed flush with the liner surface, and shall be spaced in accordance NAIMA-DLS.

D. Horizontal Duct Runs: Tops of ducts over 12" wide and sides of duct over 16" high shall have liner additionally secured with mechanical fasteners.

E. Vertical Duct Runs: Any side of duct over 12" in size shall have liner additionally secured with mechanical fasteners.

F. Exposed Edges: All joints, exposed edges and any damaged areas of the liner, shall be heavily coated with fire resistant adhesive/mastic.

G. Metal Nosing: Install metal nosings on the leading edges of the liner in ducts where the velocity exceeds 4000 feet per minute.

3.03 PREPARATION FOR SERVICE

A. Cleaning: All ducts shall be wiped or blown clean of all dust and debris prior to the installation of grilles or diffusers. Notify the Engineer to allow for an inspection prior to installing grilles or diffusers.

B. Contaminated Ducts: Where ducts have been contaminated by dirt or debris during the construction process, the affected duct systems shall be cleaned by an independent firm specializing in the vacuum cleaning of ductwork. All costs associated with such cleaning shall be the responsibility of the Contractor.

END OF SECTION

PART 1 GENERAL

1.01 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 00 and Division 01 Specification Sections, apply to this Section.

B. Requirements of Section 23 05 00 apply to this Section.

1.02 WORK INCLUDED

A. Turning Vanes.

B. Flexible Connectors.

C. Access Doors.

1.03 QUALITY ASSURANCE

A. General: Comply with Section 23 05 00.

B. Workmanship: Construction and installation of all duct accessories shall comply with applicable SMACNA-DCS, and exceed those standards as noted.

1.04 SUBMITTALS

A. General: Submittals shall comply with Section 23 05 00.

B. Product Data: Submit product information on all items to be used.

1.05 REFERENCES

A. AMCA 500D: Laboratory Methods for Testing Dampers for Rating.

B. SMACNA-DCS: SMACNA HVAC Duct Construction Standards, 3rd Edition.

PART 2 PRODUCTS

2.01 ACCEPTABLE MANUFACTURERS

A. Products shall comply with Section 23 05 00, Paragraph 2.01, Acceptable Manufacturers.

B. Turning Vanes: Duro-Dyne, Aero-Dyne, Oil Capital Sheet Metal, Airsan.

C. Flexible Connections: Ventfabrics, Duro-Dyne Elgen.

D. Duct Access Doors: National Controlled Air, Ventfabrics, United-McGill, Kees, Ruskin, Vent Products, Duro-Dyne.

E. Building Access Doors: J.R. Smith, Zurn, Acudor, Elmdoor, Kees, J.C. Industries, Milcor.

2.02 TURNING VANES

A. Type: Galvanized steel turning vanes to guide airflow through duct elbows to minimize pressure drop.

B. Construction: Turning vanes shall comply with SMACNA-DCS. Vanes shall be fabricated of minimum 26 gauge galvanized steel; rails shall be fabricated of minimum 24 gauge galvanized steel. For duct widths less than 12 inches, vanes may be single wall construction; for widths 12” and greater, vanes shall be double wall "airfoil" type.

C. Spacing: Turning vanes shall be equally spaced in accordance with SMACNA-DCS, parallel to each other, and securely attached to runners.

D. Unequal Elbows: For elbows where the inlet and outlet dimensions are not the same, modify vane shape or angle to provide optimum turning.

2.03 FLEXIBLE CONNECTORS

A. Type: Flexible fabric type connectors, to provide vibration isolation at equipment duct connections and to allow for movement in duct systems.

B. Fabric:

1. Width: Minimum 3” wide except at equipment 3 hp or larger with external vibration isolators fabric shall be minimum 6” wide.

2. Indoor Applications: Flexible woven glass fiber fabric with neoprene coating, minimum 22 oz/sq. yard, 500 lbs x 450 lbs tensile strength. Suitable for temperatures from -40 to 200 deg F.

3. Outdoor Applications and Where Exposed to Chemicals: Flexible woven glass fiber fabric with hypalon coating, ozone resistant, 24 oz/sq. yard, 225 lbs x 300 lbs tensile strength. Suitable for temperatures from -40 to 250 deg F.

4. High Temperature Applications: Fiberglass/satin weave with Teflon coating; temperature rating of minimum 500 deg F and to suit application, 400 lbs x 300 lbs tensile strength.

C. Metal Collars: Minimum 24 gauge galvanized steel 3” wide metal edge connectors, each side of fabric, connected to fabric by folded over metal seam. Fabricate of same material as ducts connected to.

D. Fire/Smoke Rating: Flame spread rating not over 25, and smoke developed rating not higher than 50; complying with IMC requirements and NFPA standards.

2.04 DUCT ACCESS DOORS

A. Construction: Access doors shall be of double wall construction, made with minimum 24 gage galvanized steel, tight fitting, with sealing gasket, and cam locks (or may be hinged type with latches).

B. Size:

1. General: Access doors shall be of sufficient size so that items concealed in duct can be serviced and inspected, and shall be adequately sized to allow complete removal of the item being served (where removal cannot be made without disturbing fixed ductwork).

2. Minimum size: Doors shall be minimum 14" x 14". Where duct size will not accommodate this size door, the doors shall be made as large as practicable.

3. Large Sizes: Doors larger than 14" x 14" shall have a minimum of 4 cam locks (or where hinged type is used, have a minimum of two (2) latches).

C. Insulation: Doors in insulated ducts shall be insulated type, with minimum 1 inch thick fiberglass insulation.

D. Round Ducts: Access doors on round ducts shall use either lined rectangular tap off with rectangular access door or curved insulated access door (for insulated duct); or curved type un-insulated access door (for un-insulated duct).

2.05 BUILDING ACCESS DOORS

A. Type: Hinged lockable steel access doors, for wall or ceiling installation.

B. Construction: Minimum 16 gauge frame and 14 gauge door, concealed hinge, cam and cylinder lock, anchoring provisions, and 1” wide frame to conceal rough building opening. Provide of 18-8 stainless steel construction with No. 4 finish where used in restrooms, locker rooms, kitchens, and similar "wet" areas. Provide of steel construction with prime coated finish in other areas.

C. Size: Size shall be 12" x 12" (unless indicated otherwise) but shall be large enough to allow necessary access to item being served and sized to allow removal of the item (where access door is the only means of removal without disturbing fixed construction).

D. Fire Rating: Door shall maintain fire rating of element installed in; reference drawings for required rating.

E. Keys: Access doors shall all be keyed alike. Provide two (2) keys for each door.

PART 3 EXECUTION

3.01 TURNING VANES

A. General: Install turning vanes in all duct elbows and “T” fittings, and at locations shown on the drawings.

B. Attachment: Securely attach turning vane runners to ductwork.

3.02 FLEXIBLE CONNECTORS

A. General: Provide flexible connectors at all duct connections to all equipment, where ducts of dissimilar metals are connected, and where shown on the drawings. Except that flexible connectors are not required on internally spring isolated fans where the fan is located in a separate mechanical room and a flexible connector has not been shown.

B. Round: For round ducts, the flexible material may be secured by zinc-coated, iron clinch type draw bands directly to adjoining duct; or with normal duct joining methods and using metal collars furnished with flexible connectors.

C. Slack: Install flexible connections with sufficient slack to permit 1 inch of horizontal or vertical movement of ducts or equipment at flexible connection point without stretching the flexible material. At building expansion joints install sufficient flexible material to allow for 2 inch movement in any direction; provide two flexible connectors separated by a 12 inch section of duct.

D. Outdoors: Where installed exposed to outside weather, provide a galvanized "hat" channel protecting top and vertical stretches of flexible connector from sunlight and weather.

3.03 DUCT ACCESS DOORS

A. General: Provide duct access doors at all automatic control dampers, fire dampers, fire/smoke dampers, smoke dampers, backdraft dampers, all duct coils, thermostats, filters, control devices, and any other components in the duct system that require service or inspection. Coordinate with Division 25 to confirm quantity and location of control devices.

B. Size and Location: Access doors shall be of sufficient size and so located so that the concealed items may be serviced and inspected or completely removed and replaced.

3.04 BUILDING ACCESS DOORS

A. General: Provide access doors in walls, floors, ceilings, etc. as indicated on the drawings and where needed to provide service access or maintenance to duct access doors, backdraft dampers, damper actuators, automatic dampers, coils, control devices, fans, HVAC equipment and similar items.

B. Coordination: Consult architectural drawings and coordinate location and installation of access doors with trades which are affected by the installation.

END OF SECTION

PART 1 GENERAL

1.01 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 00 and Division 01 Specification Sections, apply to this Section.

B. Requirements of Section 20 05 00 apply to this Section.

1.02 WORK INCLUDED

A. GRD Outlets.

B. GRD Inlets.

1.03 DEFINITIONS

A. GRD's: Grilles, Registers, and Diffusers.

1.04 REFERENCES

A. AHRI 885: Procedure for Estimating Occupied Space Sound Levels in the Application of Air Terminals and Air Outlets.

B. AMCA 500: Laboratory Methods of Testing Louvers for Rating.

C. ASHRAE 70: Method of Testing the Performance of Air Outlets and Air Inlets.

D. ASHRAE-F: ASHRAE Handbook of Fundamentals.

E. SMACNA-DCS: HVAC Duct Construction Standards, 3rd Edition.

1.05 SUBMITTALS

A. General: Comply with Section 20 05 00.

B. Product Data: Submit product information for all items to be used.

C. Operation and Maintenance: Submit operation and maintenance data and submittal data for inclusion in project O&M Manuals.

PART 2 PRODUCTS

2.01 ACCEPTABLE MANUFACTURERS

A. Products shall comply with Section 20 05 00, Paragraph 2.01, Acceptable Manufacturers.

B. Grilles, Registers and Diffusers: Titus, MetalAire, Krueger, Price, Tuttle & Bailey, Kees,

Carnes.

2.02 GENERAL REQUIREMENTS

A. Type: Air outlets and inlets shall be of the size, type, and with number of throws as shown on the drawings; and shall match the appearance and performance of the manufacturers' models specified and scheduled on the drawings.

B. Performance: Air outlet and outlet performance shall be based on tests conducted in accordance with ASHRAE 70.

C. Sound Level: Air outlets and inlets shall not exceed a sound level of NC 30 for the size indicated and airflow rate application. Sound levels shall be determined in accordance with AHRI 885 and ASHRAE-F.

D. Finish: Grilles, Registers and Diffusers shall have factory applied finish, color as selected by Architect/Engineer, except where indicated to have a brushed aluminum finish (or other finish type). Finish shall be an anodic acrylic paint, baked on, with a pencil hardness HB to H. Pint shall pass a 90 hour ASTM B117 salt spray test, 250 hour ASTM D870 water immersion test, and an ASTM D2794 reverse impact test with at least a 50 inch-pound force applied.

E. Frame Style: Provide air outlets and inlets with frame style to match ceiling or wall construction installed in. Where supply air outlets or inlets are installed in T-bar ceiling systems, they shall be factory installed in 2' x 2' or 2' x 4' metal panel to match ceiling layout. Where installed against gypsum board surface, brick or similar hard surface, or where exposed, provide with 1-1/4-inch wide outer border. Where space does not permit installing 2' x 2' metal panel, provide outlets or inlets with 1-1/4-inch wide outer border. Where air outlets are installed adjacent to surface mounted light fixtures, outlets shall have 4-inch deep drop frames. (See reflected ceiling plan and/or electrical lighting plan for ceiling and lighting types).

F. Transfer Grilles: Ceiling transfer grilles shall be same as ceiling exhaust grilles (CEG) unless noted otherwise; wall transfer grilles (WTG) shall be same as wall exhaust grilles (WEG) (unless noted otherwise).

G. Construction: Air outlets and inlets shall be of steel or aluminum construction except that:

1. Where noted to be constructed of a specific material, shall be as noted.

2. In assemblies with a required fire rating and required to have fire dampers shall be of steel construction.

3. In wet areas or subject to condensation (i.e., locker rooms, restrooms, kitchens, exterior soffits, etc.), where not used in fire rated assemblies, shall be of aluminum construction.

4. Air outlets and inlets in the same room, area, or within common view shall be constructed of the same material.

2.03 SUPPLY AIR OUTLETS

A. Ceiling Diffuser (CD): Aluminum or steel construction, have louver face, for horizontal discharge and square neck. Louver face shall be fixed, and be available for one, two, three or four way discharge configurations. Core shall be easily removed with no tools required. Krueger SH, SH5 Series (or approved equal).

2.05 RETURN AIR INLETS

A. Ceiling Return Grille (CRG): Aluminum construction, "cube-core" or "egg-crate" type, with 0.025-inch thick x 1/2-inch deep strips mechanically joined to form 1/2" x 1/2" x 1/2" cubes. Krueger Series EGC5. Titus Series 50F.

2.06 EXHAUST AIR INLETS

A. Ceiling Exhaust Grille (CEG): Same as CRG.

B. Ceiling Exhaust Register (CER): Same as CEG but with opposed blade damper operable from face of register.

C. Wall Exhaust Grille (WEG): Same as WRG.

PART 3 EXECUTION

3.01 INSTALLATION

A. General: Install air outlets and inlets in locations indicated and so as to conform with building features and coordinated with other work. See hangers and supports specification Section for supports and additional requirements.

B. Location Verification: Verify all air inlet/outlet locations with building features and other trades prior to installing any duct systems that will connect to the air outlets/inlets. For locations where air inlet/outlet location is noted to be verified, or location is not clear, develop shop drawings showing the proposed location, or the location that best suits field conditions, and submit for review.

C. Connections: Furnish all necessary screws, clips, duct collars, and transitions required to allow for the installation and connection of ductwork to all air outlets/inlets. Connect all ductwork to air inlets and outlets with fasteners, minimum one each side and in compliance with SMACNA-DCS. See ductwork specification Section for sealing and additional requirements.

D. Painting:

1. Paint ductwork and accessories which are visible behind air outlets and inlets flat black. Painting to include ductwork, duct liner, turning vanes, liner attachments, and all visible items (including fastening pins for duct lining).

2. Coordinate with the Division 09 Contractor for any necessary painting of air outlets/inlets/louvers prior to installation.

END OF SECTION

PART 1 GENERAL

1.01 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 00 and Division 01 Specification Sections, apply to this Section.

B. Requirements of Section 20 05 00 apply to this Section.

1.02 WORK INCLUDED

A. Boilers.
B. Controls and Boiler Trim.
C. Boiler Start-up.
D. Owner Instruction.

1.03 SUBMITTALS

A. Submittals shall comply with Section 20 05 00.

C. Submit product information on boiler, showing performance data, dimensions, point of connection of all utilities.

D. Submit certification of boiler's compliance with the ASME Boiler and Pressure Vessel Code.

E. Submit shop drawings of boiler control system, panel layouts, and sequence of operation.

1.04 WARRANTY

A. Boiler: The boilers and all accessories shall be warranted to be free from defects in material and workmanship for a period of 12 months following start-up. Any items which prove to be defective during this period shall be repaired or replaced by factory authorized personnel at no cost to the Owner.

PART 2 PRODUCTS

2.01 ACCEPTABLE MANUFACTURERS

A. Products shall comply with Section 20 05 00, Paragraph 2.01, Acceptable Manufacturers.

B. Boilers: A.O. Smith, Cleaver-Brooks, RBI, Lochinvar.

2.02 ELECTRIC HOT-WATER BOILERS

A. Type: Electrically heated, hot-water generating boiler, package type, factory assembled, wired and tested and shall be U.L. listed and bear the Underwriter’s Laboratories label.

B. Rating: Boiler shall have capacity as scheduled on the drawings. Boiler shall be suitable for system use and flows, temperature increase as required by system.

C. Vessel: Generator vessel shall be vertically constructed in accordance with the ASME code, Section IV, and shall be National Board inspected and bear the "H" stamping for psi as scheduled. Relief valve to be ASME, NB rated set at the psi as scheduled. Vessel shall be insulated with 2 inches of fiber blanket insulation having 1-1/2" PCF density.

D. Heating Elements: Shall be copper sheathed, rod type, individually mounted so as to be field replaceable with standard tools. Heating element watt density shall not exceed 75 watts/square inch.

E. Trim and Controls: Generator shall be complete with the following standard trim and controls:

1. Modulating step control to apply the load gradually.

2. Proportioning temperature control to balance power input to match system demand.

3. Integral contractors.

4. Supplemental internal circuit protection fuses, current limiting, rated 200,000 amps interrupting capacity.

5. Main lugs for supply circuits.

6. 120-volt, fused control circuit.

7. Integral dual high temperature limit control (one manual reset, one auto reset).

8. Manual reset low water cutoff.

9. External interlock terminals.

10. Pilot switch.

11. Pilot lights.

12. Pressure relief valve.

13. Pressure temperature gauge.

14. Drain valve.

15. Ammeter/Voltmeter/KWH.

16. Flow switch.

17. Alarm circuit with horn and silence button.

18. Door interlock (cut power when door opened).

19. DDC interface.

F. Temperature Control System: Boiler shall have modulating step controls featuring all solid state circuitry with modulating control to proportion the power input to the system demand. The control shall include a recycle feature to cause the hot water generator to always start in the unloaded condition at startup or after a power outage of more than a few seconds. The step control shall be a progressive sequencing type and shall provide "first-off" control of the heating element circuits so as to equalize the number of cycles at operation of all of the components controlled by the step control. At each increase in load, the heating elements which have been off the longest are the next to be energized; at each decrease in load the elements which have been on the longest are the next to be de-energized. Boiler shall be controllable either by DDC system or Boiler furnished ("conventional") controls. Provide with DDC interface relays and devices to allow control by Division 25 including control of percent firing, demand limiting, indication of percent firing, alarm indication, and other control/monitoring data listed in Division 25. Provide complete controls to allow for independent (from DDC) control of boilers. Temperature shall be sensed by a 125 ohm slidewire type controller which incorporates both set point and proportional band adjustments, which shall have setpoint adjustment and have remote header mounted sensor.

PART 3 EXECUTION

3.01 INSTALLATION

A. Install as indicated and in accordance with the boiler manufacturers recommendations and instructions. Connect all piping and services up to boilers as shown on the drawings and as required to provide a complete and operational boiler system.

B. Clean boilers as recommended by manufacturer before installing boiler relief valves and connecting final piping.

C. Install on boilers any items shipped loose with boilers (i.e. relief valves, gauges, etc.).

D. After all boilers and new and existing piping have been cleaned and all piping connections completed and tested, fill the system with clean water and chemical additives as specified for the hydronic system.

3.02 BOILER CONTROLS

A. Connect remote sensor and provide all connections required on the boilers between temperature sensors, safety devices, etc., to provide complete and operational boiler system. Coordinate with Control Contractor for interconnection of system controls.

B. Set all boiler safety devices for proper operation; test to verify all devices operate properly.

C. Boiler installation/connections shall comply with governing codes. Install boiler

temperature sensor in the system supply header. Initial modulating range shall be: Low fire at 75 deg F system temperature, High fire at 60 deg F system temperature.

D. A copy of the approved wiring diagram for an automatic boiler installation shall be permanently and prominently displayed, under protective covering, in the boiler. Such diagram shall include the coding of the actual wiring by color or by number to permit a ready check of the system.

3.03 START-UP

A. Boilers shall be inspected by the boiler manufacturer’s authorized service representative to verify proper unit installation prior to start-up.

B. Start-up shall be provided by the boiler manufacturer's authorized service representative. Boilers shall be operated by the manufacturer's authorized service representative in various modes to test for proper operation, including proper operation of all safety devices, proper control setpoints/operation. Boilers shall be adjusted for optimum efficiency, considering system operation and boiler application. All adjustments shall be made in strict accordance with manufacturer's instructions.

C. After one (1) year of operation, manufacturer's authorized service representative shall re-adjust all boilers for optimum operation and re-check all safety devices.

D. Start-up services as listed herein shall be for a minimum of eight (8) hours for each boiler.

E. Notify the Engineer when the start-up is proposed to occur, to allow a mutually agreed upon time to be arranged. Start-up may be witnessed by the Engineer and Owner's Maintenance representative (at their option).

F. Written Report: Contractor shall submit a written report by the boiler manufacturer’s authorized service representative detailing all inspection and start-up procedures and findings.

3.04 OWNER INSTRUCTION

A. After all testing and adjustments have been satisfactorily completed, the Owner shall be provided with operator instructions (including start-up, shut-down, emergency, maintenance, and repair instructions) by the manufacturer's authorized service representative.

B. Time Period: Instruction period shall be for a minimum of four hours for each different boiler type.

C. Instruction and notification shall comply with Section 20 05 00.

END OF SECTION

PART 1 GENERAL

1.01 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 00 and Division 01 Specification Sections, apply to this Section.

B. Requirements of Section 23 05 00 apply to this Section.

1.02 WORK INCLUDED

A. Fluid Coolers.

B. Electrical Panel.

C. Electrical Heat Tracing.

D. Start-Up.

E. Owner Instruction.

1.03 SUBMITTALS

A. General: Submittals shall comply with Section 23 05 00.

B. Product Data: Submit product data on all items to be used.

C. Submit product information on fluid cooler, showing: Performance data, dimensions, electrical requirements, wiring diagram and point of connection of all utilities.

1.04 QUALITY ASSURANCE

A. Provide quality assurance checks required per Section 23 05 00.

1.05 WARRANTY

A. Fluid Cooler: The fluid cooler and all accessories (fan, drive, heater, coil, controls, etc.) shall be warranted to be free from defects in material and workmanship for a period of 1 year following project substantial completion. In addition, all rotating mechanical equipment, including fans, fan motors, fan shafts, bearings, sheaves and associated supports shall be warranted to be free from defects in material and workmanship for a period of 5 years from date of project substantial completion.

1.06 GENERAL REQUIREMENTS

A. Motors: Shall comply with Section 23 05 00.

1.07 REFERENCES

A. ASTM A653: Steel Sheet, Zinc Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot Dip Process.

B. CTI 201: Cooling Technology Institute Certification Standard STD-201.

C. NEMA MG-1: National Electrical Manufacturers Association Standards Publication MG-1, Motors and Generators.

PART 2 PRODUCTS

2.01 ACCEPTABLE MANUFACTURERS

A. General: Products shall comply with Section 23 05 00, Paragraph 2.01, Acceptable Manufacturers.

B. Fluid Cooler: Baltimore Aircoil Co., Evapco, Marley

2.02 FLUID COOLERS

A. Type: Closed circuit fluid cooler, blow through vertical discharge, low height profile, with centrifugal fan. BAC "VFL" series (or approved equal).

B. Capacity: Unit shall be guaranteed to cool the scheduled gpm of water at the conditions scheduled, with fans and pumps sized to provide required capacity and overcome all pressure drops due to unit and accessories. Thermal performance shall be certified per CTI 201.

C. Configuration: Unit shall be of counterflow blow-through design, with single side horizontal air entry.

D. General Construction: Unless noted otherwise, all steel panels and structural members shall be constructed of heavy gauge hot-dipped galvanized steel per ASTM A653 with a coating designation of G235, with all edges given a protective coating of zinc rich compound and having a polymer corrosion protection system. The unit shall be suitable for applications requiring equipment anchorage to resist wind loads of up to 30 psf and seismic forces of Seismic Design Category D and Component Importance Factor 1.0, per the International Building Code.

E. Pan/Fan Section: The combination pan/fan section shall be constructed of heavy gauge galvanized steel protected with a polymer corrosion protection system. The fans and motors shall be located in the dry entering airstream. Standard pan accessories shall include circular access doors, large area lift-out hot-dip galvanized steel strainer, waste water bleed line with valve, and electric make-up water controls and valve. Fans shall be the forwardly curved centrifugal type and shall be factory statically and dynamically balanced. Fans shall be mounted on a steel fan shaft supported by heavy-duty, self-aligning, relubricatable bearings with cast iron housings and designed for a minimum L10 life of 40,000 hours (280,000 hrs average life).

F. Fan Motor and Drive: Motors shall be of minimum size as scheduled on the drawings and

for use with electricity of the voltage/phase shown. Motors shall be energy efficient totally enclosed fan cooled type, designed specifically for cooling tower service, and comply with Section 23 05 00. Fan motor(s) shall be inverter-duty type designed for use with VFD's per NEMA Standard MG-1. Each motor shall be located in a protective enclosure on an adjusted heavy-duty motor base, adjustable by a single threaded bolt-and-nut arrangement. V-belt fan drive(s) shall be designed for not less than 150% of motor nameplate horsepower, with taper lock sheaves. Drive(s) and all moving parts shall be protected by removable hot-dip galvanized screens and panels protected with a polymer corrosion protection system. Provide two single speed fan motors, one sized for full speed and load, the other sized for 2/3 speed and approximately 1/3 of full load horsepower shall be provided in each cell for capacity control and standby protection from drive or motor failure. Two speed motor(s) is not an acceptable alternative.

G. Coil Assembly: Shall be constructed of continuous length prime surface steel, hot dip galvanized after fabrication. Coil shall be tested at 375 psig, be designed for low pressure drop, and be sloped to allow for complete coil drainage. Shall be rated for 280 psig (minimum) working pressure. Shall be enclosed in galvanized steel panels with polymer corrosion protection, removable from unit.

H. Water Distribution System: Water shall be distributed uniformly over the coil at an engineered flow rate to ensure complete wetting of the coil at all times; rate shall be no less than 4.5 gpm per square foot of coil face area. The distribution system shall consist of Schedule 40 PVC pipe header and spray branches with non-clog plastic distribution nozzles. The branches and spray nozzles shall be held in place by snap-in rubber grommets providing quick removal of individual nozzles or complete branches for cleaning or flushing.

I. Spray Pump System: Pump shall be close-coupled, bronze fitted centrifugal pump equipped with a mechanical seal; mounted to the unit and completely piped to a suction strainer and water distribution system. Pump shall be installed so that it will drain freely when the pan is drained. Pump and associated piping shall be arranged to allow for easy seal and motor replacement without having to remove piping or fan ductwork. The pump assembly shall include a metering valve and bleed line to control the bleed rate from the pump discharge to the overflow connection. The pump motor shall be totally enclosed fan cooled type.

J. Make-up Water Assembly: Shall be electric water level control type and shall consist of a weather protected electric float switch (or stainless steel water sensing electrode) factory mounted on pan/fan section, a slow-closing solenoid valve factory installed in the make-up water connection on the unit, solid state controls mounted in NEMA 4 control box, and related hardware and components for proper operation. Assembly shall be factory set to allow automatic control of solenoid valve to maintain accurate unit water level. Assembly shall allow field adjustment of operating water level.

K. Drift Eliminators: Drift eliminators shall be constructed of PVC or hot-dip galvanized steel protected with polymer corrosion protection system and be removable in easily handled sections. They shall have a minimum of three changes in air direction with a hooded leaving edge and shall direct discharge air away from the fans and limit drift loss to less than 0.001 percent of the total water circulated.

L. Immersion Heaters: Factory installed electric immersion type, located in cooler pan for protection from freezing. Size and voltage/phase as scheduled. Provide with factory installed sump thermostat for control of heaters, with sensing bulb, contactors/relays and associated wiring/conduit as required to allow for interlock of immersion heaters with spray pump (heater off when pump is on), and with low water level cutout (to prevent heater operation at low water level) and for proper operation of heater to prevent freezing.

M. Discharge Hood/Dampers: Unit shall a have discharge hood with positive closure dampers, designed to minimize heat loss from convective air flow through idle unit. Hood and dampers shall be constructed of heavy gauge hot dip galvanized steel protected with a polymer corrosion protection system. Dampers shall have edge seals and shaft bearings. Damper actuators and linkages shall be factory mounted. Actuators shall be manufactured by Belimo, and be the DC brushless motor type, for use with 120 volt power and having an end switch for connection to the building control system for monitoring.

N. Vibration Cutout Switch: Provide electronic remote reset vibration switch with dry contact for building EMCS monitoring and reset. Provide with local reset ability also. Wiring shall be by the installing contractor. The electronic vibration cut out switch shall be set to trip at a point so as not to cause damage to the cooling tower. The trip point will be 0.45 in/sec.

O. Electrical Panel: Provide factory fabricated electrical panel for single point power connection containing all unit starters and controls. Panel to include:

1. Main disconnect, with door interlock.
2. Main power fuses.
3. Fuses for individual loads (fan motor, pump motor, heater, and controls).
4. Fan VFD with bypass.
5. Pump starter.
6. Heater contactor.
7. Control transformer.
8. Controls for fan VFD, heater (Thermostat), vibration cutoff (wired to stop operation upon exell vibration), damper control, pump control, make-up water level control.
9. Hand-off-auto switches for fan, pump, damper, and heater.
10. Later lock to prevent heater operation when spray pump is on (or “energized”).
11. NEMA 3R enclosure for all electrical components.
12. Control circuit transformer.

13. "Run" indicates lights for fan, pump, damper, and heater.

14. Ability to accept EMCS 4-20 mA input for fan speed control.

15. Ability to accept designated input for low speed fan operation (I-e, at set VFD valve) with default to high speed valve.

2.03 VARIABLE FREQUENCY DRIVES (VFD'S)

A. Type: Adjustable frequency and voltage variable speed controller, pulse width modulated type.

B. Controller: Shall be housed in a NEMA 3R equivalent (or better) enclosure (as required to suit the application), and shall provide 6 to 60 Hz adjustable torque output. Standard Features:

1. Start-stop speed selection.

2. Manual speed potentiometer.

3. Insensitive to incoming power phase sequence.

4. Adjustable volts/Hertz.

5. Output frequency stabilized to + 0.5% of set speed for +10% to -5% change in line voltage of 15 degrees C change in ambient temperature.

6. Three-phase output voltage regulated to + 1% of rated voltage with +10% to -5% variations in plant power.

7. Standard off-the-shelf, NEMA B and synchronous motors (3600, 1800, 1200 rpm) usable without derating controller.

8. Automatic shutoff under output short circuit conditions or when load current exceeds 150% of maximum output amps (RMS).

9. Input fuses.

10. Line transient protection to prevent power line transients from harming the controller.

11. Relay contact to provide external signal for alarm and run condition.

12. Monitor lamps (or LCD display) indicating: power on, zero speed, enabled, unit failure (with type indicated).

13. Hand-Off-Auto switch.

14. Auto restart after power outage.

15. Isolated Process control Follower - accepts 0 to 5 mA, 1 to 5 mA, 4 to 20 mA, 10

to 50 mA, 0 to 10 V D-C or 25 to 250 V D-C signal.

16. Input Disconnect (meeting NEC requirements for unit power disconnect).

17. Output Contactor - for positive motor disconnect.

18. Output Overloads - using individual phase bimetallic thermal sensors.

19. Ammeter - ampere scale depending upon drive rating.

20. Voltmeter - 0 to 500 volt (460 volt drives); 0 to 750 volts (575 volt drives).

21. Frequency Meter - 0 to 120 Hz scale.

22. Manual Bypass: To switch the motor to or from the controller to the line.

C. Application and Control: VFD shall be for use with the specified equipment and be fully compatible with motors used with. Unit shall accept 4-20 ma control signal and provide for variable speed operation of fan served.

D. Noise: VFD and motor shall be free of audible noise exceeding an NC of 45 in any octave band.

E. Enclosure: Provide VFD with an outdoor weatherproof enclosure suitable for outdoor temperatures from 0 deg F to 122 deg F. Provide enclosure with factory wired ventilation fan and heater as necessary to maintain conditions within the enclosure to allow for proper VFD operation. Provide all power wiring, transformers, devices, etc. such that no additional electrical power circuiting will be required for the enclosure fan and heater.

PART 3 EXECUTION

3.01 INSTALLATION

A. Install unit as indicated on drawings and in accordance with manufacturer's instructions and recommendations.

B. Connect and install all items shipped loose with unit. Connections and installation of unit control items shall be provided by the Division 25 Contractor. Power connections to unit shall be by the Division 26 Contractor. Coordinate all installation requirements with other trades. Install all wiring, conduit, relays, and accessories necessary for proper operation of unit.

C. Anchor unit securely to building structure or concrete slab (as applicable) with vibration isolators between unit and item anchored to.

D. Provide all piping/connections to units as shown on drawings. Provide unit overflow drain and maintenance drain (with valve) piped to nearest point of drainage. Provide sump inter-tie with valving as indicated.

E. Heat Tracing: Provide heat tracing of all piping, fitting/valves, and accessories at unit

which carry water and are subject to freezing. Heat tracing shall not be applied until after system has been successfully pressure tested. Secure the heater to piping with cable ties or fiberglass tape. Apply "electric traced" signs to the outside of the thermal insulation. After installation and before and after installing the thermal insulation, subject heat to testing using a 1000 VDC megger. Minimum insulation resistance should be 20 to 1000 megohms regardless of length.

3.02 START-UP

A. Initial Checks: Prior to operating units, checks shall be make to insure that adequate voltage, water flow, electrical connections, control connections, and other items as listed by the manufacturer are properly provided/connected and operating to insure safe and proper unit operation.

B. Testing and Adjustment: Operate unit in various modes of operation to test for proper operation, including fan rotation, proper damper travel (where applicable), proper spray pump operation, heater operation, make-up water level, correct interface to other controls (solenoid valve, etc.), purging of air from coils, etc. Make necessary adjustments per manufacturer's directions.

C. Final Check: When the testing and adjustment is complete, a final check of each unit shall be done by the manufacturer's authorized service representative, or direct employee, to verify proper unit operation. Any defective items shall be repaired or replaced by the contractor until proper operation is confirmed by the manufacturer's authorized service representative.

D. Commissioning: Coordinate start-up checks and final check of unit operation with commissioning activities and control contractor. Provide additional work as required for unit commissioning.

E. Written Report: When the final check has been completed, a written report from the manufacturer's authorized service representative shall be provided. This report shall list all units checked, items checked, check results, any items which may impair proper unit operation, and the name and phone number of the actual individual(s) doing the check. The report shall include a statement stating whether or not all units are operating as specified.

3.03 OWNER INSTRUCTION

A. After all testing and adjustments have been satisfactorily completed, the Owner shall be provided with operator instructions (including start-up, shut-down, emergency, maintenance, and repair instructions) by the manufacturer's authorized service representative and by the Water Treatment Specialist.

B. Time Period: Instruction period shall be for a minimum of four (4) hours for each unique fluid cooler type and a minimum of two (2) hours for each chemical treatment system.

C. Instruction and notification shall comply with Section 23 05 00.

END OF SECTION

PART 1 GENERAL

1.01 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 00 and Division 01 Specification Sections, apply to this Section.

B. Requirements of Section 20 05 00 apply to this Section.

1.02 WORK INCLUDED

A. Energy Recovery Ventilators (or DOAS units)

B. Start-up

1.03 SUBMITTALS

A. General: Submittals shall comply with Section 20 05 00.

B. Product Data: Submit product information on unit including fan curves, coil performance, unit construction details, wiring diagram, data showing energy recovery, filter data, and weight.

C. Shop Drawing: Submit drawings of unit showing all dimensions, locations of unit components, and point of connection of all utilities.

D. Operation and Maintenance: Submit Operation and Maintenance data and submittal data for inclusion in project O&M Manuals.

1.04 GENERAL REQUIREMENTS

A. Standardization: All units of the same type shall be the product of the same manufacturer.

B. Substituted Equipment: The drawings show design configuration based on a particular manufacturer's equipment (i.e. basis of design). Use of another manufacturer's equipment (i.e. substituted equipment) that is configured different from what is shown will require redesign of mechanical ductwork, piping, electrical, structural, unit support systems, and general building construction to accommodate the substituted equipment. Such redesign shall meet the requirements and have the approval of the Architect/Engineer prior to fabrication. Contractor shall submit complete shop drawings showing all alternate unit installation plans and details; shop drawings shall comply with Section 20 05 00. The redesign shall be equal or superior in all respects to the Architect/Engineer's design (as judged by the Architect/Engineer), including such aspects as equipment access, ease of maintenance, duct connection locations, unit electrical requirements, noise considerations, vibration unit performance, and similar concerns. Cost of redesign and all additional costs incurred to accommodate the substitutional equipment shall be borne by the contractor. Contractor is cautioned that certain aspects of the equipment cannot be fully evaluated until items are installed and operational, and all

added costs after installation to make units equal to the basis of design shall be by the Contractor.

1.05 REFERENCES

A. AMCA 230: Laboratory Methods of Testing Air Circulating Fans for Rating and Certification.

B. AHRI 1060: Standard for Performance Rating of Air-to-Air Exchangers for Energy Recovery Ventilation Equipment.

1.06 WARRANTY

A. General: See Division 00 and Section 20 05 00 for basic warranty requirements.

B. Extended Warranty: The ERV core shall be warranted to be free of manufacturing defects and to retain its functional characteristics, under circumstances or normal use, for a period of ten years from the date of purchase. The balance-of-unit shall be warranted to be free of manufacturing defects and to retain its functional characteristics, under circumstances of normal use, for a period of two years from the date of installation.

PART 2 PRODUCTS

2.01 ACCEPTABLE MANUFACTURERS

A. Products shall comply with Section 20 05 00, Paragraph 2.01, Acceptable Manufacturers.

B. Energy Recovery Ventilator: RenewAire.

2.02 GENERAL

A. Guards: Exposed openings into fan housings shall be protected with substantial metal screens or gratings. Electrical components with shock potential shall be physically protected and labeled (label as to hazard and items being accessed).

B. Fan Balancing: The shaft and fan wheel(s) shall be factory statically and dynamically balanced.

C. Motors: Shall be UL listed and comply with Section 20 05 00. Motor efficiency shall comply with Code. Motors shall have integral thermal protection with automatic reset.

D. Outlets and Inlets: Equipment shall be furnished with attachment angles and/or flanges to allow for attaching external ductwork.

E. Fan Performance: Shall be based on laboratory tests conducted in accordance with AMCA 230. Fan capacity shall not be less than the values scheduled on the drawings and shall be constructed to be able to operate with total pressures 20% higher than that indicated.

F. Controls: Coordinate with Division 25 Contractor for required interfaces between air

handling equipment and building control system.

G. Gasketing: Where units are furnished in sections, unit manufacturer shall furnish unit with gasketing to allow sealing of adjoining sections.

H. Sound Tests: Shall be done by fan manufacturer in an AMCA certified sound testing laboratory. Sound tests shall be conducted in accordance with AMCA 300. Provide necessary testing and calculations to develop required sound data. Tested sound power levels shall not exceed specified levels by more than 3 dB in any octave band.

2.03 ENERGY RECOVERY VENTILATOR

A. Type: Outdoor, rooftop energy recovery ventilator using enthalpy heat exchanger.

B. General:

1. Unit shall be complete single package, self contained factory assembled unit, requiring only electrical, duct, and control connections to operate.

2. Capacity: Shall be as scheduled at the conditions noted.

3. Unit configuration shall be as shown on plans.

C. Cabinet:

1. General: Constructed of minimum 20 gauge G-90 galvanized steel, reinforced and constructed for maximum anticipated static pressures involved, but no less than 4" w.c. with cabinet leakage less than 1% of scheduled airflow.

2. Liner: Interior of cabinet shall be insulated with minimum 1-inch thick, 4 pound per cubic foot density foil scrim faced fiberglass insulation to provide a cleanable surface. Double-wall construction with foam injected insulation and interior 20 gauge G-90 galvanized steel is also acceptable.

3. Access Doors: Constructed same as cabinet, size to access unit internals, with full perimeter gasket. Doors shall be opened by releasing multiple latches or similar method requiring no tools.

D. Fan(s): Integral supply and exhaust fans, direct drive, steel or aluminum construction, multi-blade centrifugal type. Motors shall be ECM type.

E. Energy Recovery Core:

1. General: Total enthalpy type, capable of transferring both sensible and latent energy between airstreams. Latent energy transfer shall be accomplished by direct water vapor transfer from one airstream to the other, without exposing transfer media in succeeding cycles directly to the exhaust air and then to the fresh air. No condensate drains shall be required.

2. Certifications: The energy recovery cores used in these products shall be third party Certified by AHRI 1060 for Energy Recovery Ventilators. AHRI published certifications shall confirm manufacturer's published performance for airflow, static pressure, temperature and total effectiveness, outdoor air (OACF) and exhaust air leakage (EATR). OACF shall be no more than 1.02 and EATR shall be a 0% against balanced airflow.

F. Filters: Unit shall be provided with filter racks for accommodating 2" thick filters (unless noted otherwise), with minimum filter area (or sizes) and MERV rating as scheduled. Access to filters shall be through unit access doors.

G. Electrical: Unit shall be for use with single point electrical power connection. Unit shall be furnished with all necessary wiring, raceway, transformers, contactors, relays, motor starters, and accessories with power and controls connected to all unit devices for unit operation and with the specified sequence. Electrical shall comply with NEC and local code requirements. Unit shall have a main fused power disconnect. Disconnects shall comply with NEC, and be accessible from outside unit enclosure.

H. Controls: Unit control shall be by Section 23 09 33 (unless otherwise noted); unit shall have limited factory controls to provide necessary safeties and to allow for control by Section 23 09 33. Section 23 09 33 shall enable unit fans when "run" terminals are connected. Unit shall be furnished with all necessary relays, starters, wiring terminal strips, timers, safety devices, etc. to allow for the sequence of operation as specified in Section 23 09 33 using the Section 23 09 33 control system. Unit wiring shall be color coded and numbered corresponding to unit's wiring diagram. Access panels to unit controls shall be hinged with latches (or equivalent device), requiring no tools to open.

I. Roof Curb: Factory fabricated heavy gauge steel curb, with horizontal base foot, top wood nailer wrapped over top with top of steel curb, and top gasket seal. Size, configuration, and capacity to match equipment served and roof slope installed on. Curb shall provide level watertight mounting surface for equipment served, and shall have provisions for seismic anchoring of unit to curb, and curb to building structure.

J: Damper: Provide with motorized Class I outside air and exhaust air dampers; interlocked to unit fans.

PART 3 EXECUTION

3.01 INSTALLATION

A. General: Install the units as shown on the drawings, in accordance with manufacturer's instructions, Code, and best construction practices.

B. Locations: Install at locations indicated, to allow for maintenance access and proper clearances.

C. Duct Connections: Provide flexible connections in ductwork connections to units.

3.02 START-UP

A. Initial Checks: Prior to operating units, checks shall be made to insure that adequate voltage, duct connections, electrical connections, control connections, and other items as listed by the manufacturer are properly provided/connected and ready to ensure safe and proper unit operation.

B. Testing and Adjustment: Operate unit to test for proper operation, including fan rotation, and correct interface to other controls.

END OF SECTION

PART 1 GENERAL

1.01 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 00 and Division 01 Specification Sections, apply to this Section.

B. Requirements of Section 23 05 00 apply to this Section.

1.02 WORK INCLUDED

A. Make-up Air Units.

B. Start-up.

1.03 QUALITY ASSURANCE

A. Units shall be rated in accordance with recognized standards and meet Code requirements for motor and combustion efficiencies.

B. Fan performance ratings shall be based on tests made in accordance with AMCA Standard 210.

1.04 SUBMITTALS

A. General: Shall comply with Section 23 05 00.

B. Product Data: Provide complete product information submittals on all units; include performance capacities, fan performance (cfm vs. esp); and information on all filters and accessories.

1.05 GENERAL REQUIREMENTS

A. Standardization: All units of the same type shall be the product of the same manufacturer.

B. Substituted Equipment: The drawings show design configuration based on a particular manufacturer’s equipment. Use of another manufacturer's equipment (i.e. substituted equipment) that is configured different from what is shown will require redesign of mechanical ductwork, piping, electrical, structural, unit support systems, and general building construction to accommodate the substituted equipment. Such redesign shall be provided by the Contractor, meet the requirements, and have the approval of the Architect/Engineer prior to fabrication.

C. Adjustable Sheaves: All belt drive fans shall have adjustable sheaves (except where motors are 5 hp and larger, fixed sheaves may be used). Sheaves shall be selected so that they are at their midpoint at the design conditions.

PART 2 PRODUCTS

2.01 ACCEPTABLE MANUFACTURERS

A. Products shall comply with Section 23 05 00, Paragraph 2.01, Acceptable Manufacturers.

B. Make-Up Air Units: Trane, Ice, Reznor, Rapid, Greenheck, Modine, JCI/York, Accurex.

2.02 MAKE-UP AIR UNIT

A. Type: Direct gas fired make-up unit for outdoor rooftop application with capacity and configuration as shown on plans.

B. Casing: The unit exterior casing shall be of minimum 18 gauge galvanized steel with enamel finish. The entire unit casing shall be insulated with minimum 1 inch thick 1.5-lb. fiberglass duct lines or be double-wall construction with foam injected insulation. An integral welded steel channel frame shall support the unit. Finish painted surfaces shall successfully pass 500 hours salt spray test in accordance with ASTM B117. Access panels shall provide access to unit controls, coils, fans, compressors, heating section, and all items requiring service. Access panels shall be easily removable, and be gasketed and insulated.

C. Fan and Motor: The fan section and motor assembly shall be constructed in accordance with AMCA standards. The assembly shall be designed to house the fan, bearings, motor, and v-belts which shall be selected for at least 50% above the rated motor capacity. Fan shall be forward curved centrifugal type, belt drive or direct drive, with variable frequency drive or EC motor. The fan shall be statically and dynamically balanced, and mounted on a turned, ground and polished shaft with rigid bearing supports. Motor shall comply with Section 23 05 00.

D. Filter and Outdoor Air: Shall have rear outside air inlet with integral Class I dampers, and filters. Damper actuators and controls by Division 25. Filters shall be 2" pleated throwaway, type as scheduled on the plans, with minimum square footage as noted. Filter access shall be through a hinged side access door, requiring no tools to open.

E. Burner: Burners shall be direct gas-fired type.The burner shall be CGA/AGA approved for natural gas. The burner shall modulate with a single furnace turndown ratio of at least 20% up to 100% for units under 400 MBH and 50% to 100% for larger units. Unit shall start on low fire and modulate to full fire as required. Unit controls type shall maintain the turndown, proper fuel-to-air ratios, and unit efficiencies. Unit controller shall be for use with the Division 25 control system, and shall adjust unit modulating gas valve to control furnace output. Electronic ignition system with hot stick type ignition spark transformer. Unit shall be complete with all code required safety controls including main gas valve, flame supervision, positive burner safety switch, pilot cock and adjustable main and pilot pressure regulators. Flame safeguard system and the fuel control system in compliance with UL listing.

G. Electrical: Shall be factory wired for single point field power connection, and include: Main NEC compliant disconnect, fusing for all loads, on/off/auto selector switch, burner on, flame failure LED, blower on LED, line voltage/step transformers for control circuits,

fuse blocks, terminal strip for field connection, electronic burner safety relay with main and pilot sensing, timer for purging the combustion chamber, automatic electric ignition system, fan, limit, draft and combustion air switches. All unit components requiring power or control shall be factory wired.

H. Temperature Controls: Unit shall be for use with Division 25 controls, providing on/off control and temperature control.

I. Curb Adapter: Heavy gauge galvanized welded steel curb adapter. Size, configuration, and capacity to match equipment served and existing curb. Curb shall provide level watertight mounting surface for equipment served, and shall have provisions for seismic anchoring of unit.

PART 3 EXECUTION

3.01 INSTALLATION

A. Unit installation shall be in strict accordance with the manufacturer's requirements. Units shall be installed in locations shown on drawings. Units shall be level (or slightly sloped to drain) and aligned with building walls.

B. Make-up air unit casing shall be sealed to eliminate all leakage. Unit shall be thoroughly cleaned of all debris and factory filter shall be removed prior to operation.

C. Sheaves: Include in bid costs for sheave changes for all belt driven fans as required to suit balancer or Engineer requirements. If fewer fans require sheave changes a credit (i.e. deductive change order) will be issued.

3.02 START-UP

A. Prior to air balancing and testing, check fans for correct rotation, tighten belts to proper tension, adjust fan rpm to value shown on drawings, and lubricate bearings per manufacturer's recommendations.

B. Subsequent to installation, and prior to air balancing, the installing Contractor shall perform functional tests and start-up for a minimum period of 3 days with various thermostat settings to assure proper operation over the full design range. Provide start-up report, listing all checks performed.

C. All air handling equipment shall be tested for proper fan operation, bearing integrity, and unit performance.

END OF SECTION

PART 1 GENERAL

1.01 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 00 and Division 01 Specification Sections, apply to this Section.

B. Requirements of Section 20 05 00 apply to this Section.

1.02 WORK INCLUDED

A. Air Handling Unit Refurbishment.

B. Start-up.

1.03 SUBMITTALS

A. General: Shall comply with Section 20 05 00.

B. Product Data: Submit on all products to be installed within air handling unit(s).

1.04 EXISTING SYSTEM INFORMATION

A. See drawings.

B. General: Equipment shall be capable of completely cleaning the air handling unit and systems involved in this project.

1.05 GENERAL REQUIREMENTS

A. Experience: Work shall be performed by a Company and individuals experienced in the refurbishment of air handling units.

B. Refurbish Quality: All fans, motors, shafts, belts, sealings, and items being refurbished shall be equal or better than the original items furnished on the unit. All work materials shall be provided to have complete and functioning units, able to operate without added repairs or refurbishment for a minimum 15 year period.

C. Warranty: All work shall be warranted for a one year period, as described in Division 00 and 01 specifications. Warranty shall cover all refurbished components and all refurbished work.

PART 2 PRODUCTS

2.01 ACCEPTABLE MANUFACTURERS

A. Products shall comply with Section 20 05 00. See Section 20 05 00, Paragraph 2.1 for Acceptable Manufacturer requirements.

2.02 REFURBISHMENT MATERIALS

A. Belts: Provide high strength type or as specified by original air handling manufacture, suitable for application.

B. Sheaves: Adjustable type. Adjustable sheaves. Sheaves shall be selected so that they are at their midpoint at the design conditions.

C. Bearings: Heavy duty, pillow block, self aligning ball type. Selected for minimum L-50 life of 200,000 hours at the maximum horsepower and operating speed for the fan class. Pressure lubricated with safety pressure relief grease fittings. Grease fittings shall be extended to accessible position.

D. Motors: Size and general type to match existing; shall be energy efficient type. Motors shall be UL listed and as specified in Section 20 05 00.

E. Gaskets/Seals: Neoprene type, size and thickness to suit application and provide tight seal off at access doors. Unit casing shall be sealed to eliminate all leakage

F. Liner: Approved duct liner, minimum of 1-inch thick, 1.5 pound per cubic foot density fiberglass insulation applied with mechanical fasteners 12-inch on center.

PART 3 EXECUTION

3.01 GENERAL

A. General: Work shall be in accordance with code, manufacturers written instructions and recommendations and best professional practices.

B. Coordination: Coordinate timing and schedule of all work with Owner’s staff. Items to be coordinated include: system down-times, system draining, disposal of materials (off-site, by Contractor), building/room access, re-filling of system, equipment start-up, etc.

C. Protection: Protect all portions of building, equipment, piping, and all other systems from damage during the course of performing the work. Mask off and protect areas that may be damaged by pressure washing or cleaning work, by fiberglass, epoxy, or other materials or activities. Provide protective enclosures and other measures as needed to provide a proper environment for all work and to protect adjacent areas from any deleterious effects due to the work

D. Repair: Repair all damaged items in the course of performing the work to pre-construction conditions (or better).

E. Removal/Access: Remove all piping, supports, panels, electrical, controls, etc. as needed to accomplish the work. Re-install all such items when work is complete.

3.02 REFURBISHMENT

A. General: Refurbish all items as indicated and so as to provide fully functioning as close

to an "all new" unit as possible. Refurbishment includes the remove and installation of new: Belts, Guards, Drives, Adjustable Sheaves, Bearings, Balancing and Shafting, etc.

B. Bearings: Remove and replace existing bearings within existing air handling units. If original bearings are welded remove bearing support bars and install new support bars and weld into place.

C. Motors: Remove existing motors and provide new premium efficiency motors.

D. Gaskets/Seals: Remove existing gaskets/seals and provide new.

E. Cleaning: Air handling units' fans, and similar items shall be cleaned by steam cleaning and with hot water pressure washing equipment. Sanitize all areas after cleaning. All corrosion and damaged metal areas shall be cleaned, with a prime paint applied after cleaning. All damaged unit internal lining, insulation, and related components shall be repaired. Contractor shall base bids on assuming 100 square feet of existing damaged duct lining per air handling unit, and 20 square feet of corroded metal per unit. Provide new filters for all air handling units cleaned. Filters shall be the same as those currently used, but size and thickness to match units.

END OF SECTION

PART 1 GENERAL

1.01 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 00 and Division 01 Specification Sections, apply to this Section.

B. Requirements of Section 23 05 00 apply to this Section.

1.02 WORK INCLUDED

A. VRF Split System Heat Pumps.

B. Refrigerant Piping.

D. System Controls and Control System Design.

E. System Interface to Other Controls.

F. Start-up and Commissioning.

1.03 QUALITY ASSURANCE

A. Listing: Units shall be listed by an approved testing agency for the use and application intended.

B. Ratings and Certification: Unit performances shall be tested and rated in accordance with AHRI Standards and shall be AHRI certified.

C. Energy Efficiencies: Equipment energy efficiencies shall not be less than code requirements and shall exceed code efficiencies as indicated.

D. Installer Qualifications:

1. General: The installer shall have experience installing VRF systems by the manufacturer being used for this project. Installer shall be certified by the VRF system manufacturer as a “certified installer”.

2. Refrigeration Components: Shall be installed by a licensed refrigeration mechanic having experience with VRF systems, and the work shall be supervised by personnel trained by the VRF system manufacturer.

3. Controls: Control work shall be done by individual trained and certified by the VRF manufacturer for the installation of the specified controls.

1.04 SUBMITTALS

A. General: Comply with Section 20 05 00.

B. Product Data: Provide complete product information submittals on all units; include performance capacities as a function of indoor and outdoor coil db/wb temperatures and indoor coil air flow rates, supplementary heater capacity, fan performance (cfm vs. esp), and information on all filters and accessories.

C. Refrigerant Piping: Submit proposed refrigerant pipe sizes, schematic of routing, and refrigerant system accessories.

D. Control Shop Drawings: Submit shop drawings of complete control system, including the following information: interconnect drawings showing all wiring and control connections, all control device locations, sequence of operation for all controlled systems, building floor plans with all proposed thermostat and other control device locations shown.

E. Installer Qualifications: Submit qualifications of the personnel installing the refrigeration system components and the system controls (when requested by the Engineer).

1.05 GENERAL REQUIREMENTS

A. System Type: System shall be a Variable Refrigerant Flow (VRF) heat pump system, allowing for simultaneous heating and cooling modes operation of indoor units, with indoor units operating independently of other indoor units, changeover from one mode to the other (heating to cooling, cooling to heating) with no interruption to system operation, and the recovery of energy between units in different modes. The system shall be capable of accommodating a range of the sum of all indoor unit capacity, from 50% to 150% of outdoor unit capacity.

B. Standardization: In interests of Owner's standardization, all system heat pumps and heat pump controls shall be the product of the same manufacturer.

C. Alternate Manufacturers: The project has been designed around equipment by the manufacturer scheduled on the drawings. Alternate manufacturers may be used (see Acceptable Manufacturers, Section 20 05 00); however, any redesign (from what is shown on the drawing) to mechanical, electrical, structural, or general construction to accommodate such an alternate manufacturer shall be provided by the Contractor. Furthermore, such redesign shall meet the requirements and have the approval of the Architect/Engineer prior to fabrication. Contractor shall submit complete shop drawings showing all alternate installation plans and details; shop drawings shall comply with Section 20 05 00. The redesign shall be equal or superior in all respects to the Architect/Engineer's design, including such aspects as equipment access, ease of maintenance, duct connection locations, unit electrical requirements, noise considerations, unit performance, and similar concerns. Cost of redesign and all additional costs incurred to accommodate the alternate heat pumps shall be borne by the Contractor.

D. Refrigerant Pipe Sizing: Due to the use of proprietary selection criteria by the heat pump manufacturers, the heat pump supplier shall size all refrigerant piping between the indoor and outdoor units and provide such sizes to the installing Contractors prior to the bid date. The heat pump supplier shall also determine the need for any additional accumulators, solenoid valves, and similar accessories and size/select such devices and

inform potential installing contractors to allow proper bids. The heat pump supplier is obligated to furnish complete heat pump units, with properly calculated pipe sizes and accessories so as to allow the unit performances as scheduled.

E. Electrical and Controls: Component wiring shall comply with NEC and be color coded and numbered and match unit wiring diagrams. All necessary terminal blocks, fuse, wiring, junction boxes and electrical/control accessories shall be factory installed within the unit cabinet (unless noted otherwise).

1.06 WARRANTY

A. General: See Division 00 and 01 for general warranty requirements.

B. Warranty - VRF System Equipment:

1. Basic: Entire heat pump (outdoor and indoor sections) shall be warranted by the manufacturer to be free from all manufacturing defects and capable of providing satisfactory operation for the project warranty period. Repair and/or replacement of defective items (labor and parts) during the project warranty period shall be at no additional cost to the Owner.

2. Extended: Compressors and all coils shall be warranted by the manufacturer to be free from defects and capable of operating satisfactorily for a period of 5 years beyond the basic project warranty. Extended Warranty shall cover all warranted parts and associated shipping to the site, with repair labor by the Owner.

C. Warranty - VRF System Controls:

1. Basic: System shall be warranted for the project warranty period to provide the sequence of operation and basic features specified, with the accuracy and flexibility specified. The system shall be repaired or replaced, including materials and labor, if in Owner's reasonable opinion, system is other than as warranted.

2. Emergency Service: During the warranty period maintain a 24-hour emergency phone service and be able to respond by a trained and qualified Controls Engineer familiar with the installed system.

3. Warranty Service Allowance: Include 8 hours of control technician/programmer’s time for special service (i.e. software changes, system consultation, setting up additional trends, etc.) and other services during the warranty period as required by the Owner or Engineer. The Owner and Contractor will jointly track the amount of time used. Only time directly authorized and agreed to by the Owner may be tracked as part of this allowance. This allowance is for work outside of other required project work, and is for specific tasks assigned to the Contractor by the Owner or Engineer.

4. End of Warranty Service: At the end of the warranty period, the Contractor shall provide a re-check of the entire system operation, including calibration testing of a sample number of components and providing any necessary control

adjustments for proper system operation. Such work shall be for a minimum of 8 hours on site.

5. Extended Warranty: Controls and control system shall be warranted for 2 years, beyond the project warranty period.

1.07 REFERENCES

A. AHRI 210/240: Standard for Unitary Air Conditioning and Air Source Heat Pump Equipment.

B. AHRI 350: Standard for Sound Rating of Indoor Air Conditioning Equipment.

C. AHRI 270: Standard for Sound Rating of Outdoor Unitary Equipment.

D. AHRI 1060: Performance Rating of Air-to-Air Exchangers for Energy Recovery Ventilation Equipment.

E. ASME B16.22: Standard for Wrought Copper and Copper Alloy Solder Joint Pressure Fittings.

F. ASME B16.26: Standard for Cast Copper Alloy Fittings for Flared Copper Tubes.

G. ASME B280: Standard Specification for Seamless Copper Tube for Air Conditioning and Refrigeration Field Service.

PART 2 PRODUCTS

2.01 ACCEPTABLE MANUFACTURERS

A. Products shall comply with Section 23 05 00, Paragraph 2.01, Acceptable Manufacturers.

B. VRF Heat Pumps: Mitsubishi, Carrier, Toshiba, Samsung, Daikin.

D. Refrigerant Pipe and Fittings: Domestic made products only.

2.02 SPLIT SYSTEM HEAT PUMP - OUTDOOR UNIT

A. Type: VRF air-to-air heat pump, outdoor section, for serving multiple indoor units.

B. Capacity: Units shall allow the indoor units to have the minimum cooling and heating capacities scheduled on the drawings at the conditions shown; rated in accordance with AHRI standards.

C. General: Unit shall be fully factory assembled and shall be complete with casing, coils, fans, compressor, piping, wiring, controls, and all other accessories required to be ready for field connections and operation. Unit shall be capable of operating in the cooling mode from 30 to 125 degrees F ambient, and in heating mode from 0 to 65 degrees F ambient. Unit shall be factory run-tested to verify proper heating, cooling, defrost, control, and fan operation.

D. Unit Casing: Shall be constructed of galvanized steel, bonderized and finished with manufacturer's standard color. Casing shall be able to withstand 960 hours per ASTM B117 criteria.

E. Compressor(s): Shall be high performance, inverter driven, modulating capacity scroll type. Compressor shall have internal overcurrent protection and thermal overload protection, high pressure safety switch, and crankcase heaters. Compressor(s) shall be mounted to avoid transmission of vibration.

F. Refrigerant Circuit: Units shall be for use with refrigerant R-410A and shall be fully charged at the factory for the piping and indoor units used with. Unit shall include an accumulator with refrigerant level sensors and controls.

G. Coils: Shall be of nonferrous construction with lanced or corrugated plate fins on copper tubing, with a factory applied corrosion resistant finish and integral metal guard protector.

H. Fan: Shall be direct drive, variable speed propeller type with a raised guard to prevent contact with moving parts. Fan motor shall have permanently lubricated bearings and inherent overcurrent protection.

I. Electrical and Controls: Units shall be for use with power of voltage and phase as scheduled on the drawings. Unit shall have over-current protection and DC bus protection. Unit shall include all controls for units components, interconnection to other system components for automatic operation, safeties to prevent unsafe operation, to accommodate system defrost, and to allow for 8 stages of operation. Units controls shall be 24 volt.

J. Sound: Unit shall have a sound rating not higher than 60 db(A) individually, and 64 dB(A) where twinned. In "night mode" unit shall have a sound rating not higher than 50 db(A) individually, and 53 dB(A) where twinned.

2.03 SPLIT SYSTEM HEAT PUMP – INDOOR - CEILING CASSETTE

A. Type: Indoor VRF heat pump for overhead suspended installation in a ceiling (or at ceiling height).

B. General: Unit shall be fully factory assembled and shall be complete with fan, four-way discharge outlet, evaporator coil, refrigerant metering device, heavy gauge steel chassis, refrigerant piping controls, condensate pan, drain connection, and related accessories to operate properly with VRF system.

C. Capacity: Unit shall have minimum cooling and heating capacities as scheduled on the drawings at the conditions shown and with the outdoor unit indicated; rated in accordance with AHRI standards.

D. Unit Casing: Fabricated of galvanized steel, with support provisions for hanging from building structure. Unit shall have bottom discharge grille, adjustable for two, three, or four-way discharge. Grille vane angles shall be adjustable via room wall thermostat. Exposed portion of unit shall have finished paint, manufacture's standard color.

E. Refrigerant Circuit: Shall be fully factory piped and shall include an electronic linear thermostatic expansion device to allow for both heating and cooling operation. Units shall be factory charged with dehydrated air (or an inert gas).

F. Coil: Non-ferrous construction with plate fins on copper tubing, with all joints silver brazed. Coils shall be factory tested to a minimum of 1.5 time's normal working pressure. Coil shall have corrosion resistant drain pan and drain fitting; configured to allow draining either end of unit. Unit shall have an integral condensate pump, rated for unit condensation rate and 2.5 feet of head.

G. Fan: Direct drive, multi-speed type, statically and dynamically balanced, with permanently lubricated motor, manually adjustable guide vanes for side to side discharge, and a motorized discharge louver directing air up and down automatically. Fan speed shall be adjustable via room wall thermostat to a set level, or be able to be set to vary according to heating or cooling demand.

H. Filter: Unit shall have an integral washable filter, easily removable.

I. Electrical and Controls: Unit shall be for use with power of voltage and phase as scheduled on the drawings. Unit shall include all controls for unit's components, interconnection to other system components, and to provide the specified sequence of automatic operation. Unit shall include controls providing self-diagnostic checks, auto restart (on power outage or loss of control communication), test run switch, auxiliary contacts for control of an external heat source, four digital inputs for custom control applications, and three digital outputs for custom control applications.

J. Condensate Pump: Provide unit with condensate pump. Where not available internal to unit, or where internal pump doesn't meet the pumping capacity required, provide external type, with controls, and gpm capacity to suit unit maximum condensate rate, at 10 feet of head. Provide mounting assembly, accessories for complete connections, and an architectural cover to match the finish of the unit to minimize visibility.

2.08 BRANCH CIRCUIT CONTROLLER

A. Type: Refrigerant Branch Circuit (BC) Controller controlling refrigerant flow and with controls and accessories for system heating/cooling operation.

B. General: The BC Controller shall be fully factory assembled, and complete with all piping, valves, controls, and wiring. Unit shall be factory run tested. Provide unit size and capacity appropriate for the system and number/size of indoor units.

C. Unit Cabinet: Fabricated of galvanized steel, sized to enclose all components. An integral condensate pan and drain connection shall be provided. Provided with factory supplied condensate pump.

D. Refrigerant Circuit: Unit shall have multiple tow-position automatic refrigerant valves to control refrigerant flow, and each branch line shall have a service valve to allow servicing any indoor unit without interruption of service to other units. Unit shall have a liquid-gas separator a tube-in-tube heat exchanger. Linear electronic expansion valves shall be provided for control of refrigerant flow.

E. Electrical: Unit shall be for use with power of voltage and phase as scheduled on the drawings. Unit shall include all controls for proper operation interconnection to other system components.

2.09 VRF SYSTEM CONTROLS

A. General:

1. System shall have VRF manufacturer's controls to control all space indoor units, heat recovery unit, outdoor unit, and additional HVAC system components, as a unified system. System shall provide the sequence of operation specified.

2. The control system shall consist of a low voltage communication network of controllers and control devices, communicating over a high-speed communication bus, with a web-based operator interface. A web controller with a network interface shall gather data from the VRF and HVAC control system and generate web pages accessible through a conventional web browser for PC's connected to the network. Operators shall be able to perform all normal operator functions through the web browser interface.

3. System shall be capable of email generation for remote alarm annunciation.

4. Provide all control system software, programming, and control devices to allow for the system operation, the specified sequence, specified features, and to allow remote access via a standard web browser. Provide graphics accessible by the web browser which display the systems in a schematic fashion with system data overlayed on the graphics. Provide all software licensing to the project Owner.

B. EMCS Interface: System controls shall have BACnet interface for connection to the building EMCS to allow the EMCS to monitor complete system operation and to allow enable/disable of the overall system components (i.e. placing in off or auto modes remotely).

C. Room Thermostats: Shall provide space temperature control for indoor units, completely independent of other indoor units. Thermostats shall include: occupant setpoint adjustment of plus or minus 3 deg F, room temperature display, room setpoint display, fan speed adjust, indoor unit diagnostics, discharge vane/louver adjust (where indoor units are specified with adjustable vanes/louvers), and related features as specified with the system equipment.

D. Master Controller:

1. General: Shall provide time schedule, warm-up, optimum start, night setback, monitoring system status, unit on/off control, unit airflow control, temperature settings, and other control functions for the system and to serve as one of the users' interface. Shall allow for system programming, start-up, trouble-shooting, setup, and provide the specified sequence of operation. Wall mounted, backlit, color touch panel, with visual display of all settings, and system diagnostics.

2. Communication Ports: Controller shall be equipped with two RJ-45 Ethernet ports to support interconnection with a network PC via a closed/direct Local Area Network (LAN) or to a network switch for IP communication to other controllers for display of up to two hundred indoor units.

3. Scheduling:

   a. Time Schedules: The Control System shall provide time clock schedule with at least 20 time schedules. Each schedule to be 8-day type, 5 entries per day. All entries to be in 12 hour AM/PM format. The complete schedule shall be displayed at one time on the master controller for easy editing. Each time program shall be able to include on/off, high/low speeds, temperature setpoints, dduty cycle commands, as required to provide the specified sequence of operation.

   b. Holiday Schedules: A minimum of 20 holiday time schedules shall be available and shall be assigned to any number of available points. Holiday schedule shall display entire year and shall also allow for an interval holiday time, program showing holiday start date to end date (example: December 24 to January 2).

4. Warm-up Mode: Control System shall have warm-up mode prior to occupied mode on heating to pre-warm building prior to occupancy. Time of beginning warm-up cycle shall be determined by an optimum start/stop program.

5. Optimum Start/Stop: Control System shall have optimum start/stop program to reduce run time of HVAC equipment. Optimum start/stop program shall consider building mass, building temperatures, outdoor air temperatures, and other system factors in determining time of system start-up or shut-down. Program shall record previous warm-up times versus actual warm-up times and shall adjust the program algorithm so that program calculated warm-up time corresponds to actual.

6. Standard software functions shall be available so that the user can securely log into each master controller via the PC's web browser to support operation monitoring, scheduling, error email, interlocking and online maintenance diagnostics.

E. Sub-Controllers: Controllers providing control system equipment in conjunction with the VRF system and master controller. Controller capabilities shall be as required to provide the specified sequence of operation and communicate via the VRF control system network. Controls to include inputs/outputs as required for the application for adjustment of system setpoints, control HVAC equipment (VRF and non-VRF), detect system errors, and monitor system (and equipment) status. See specified sequence of operation for requirements and specified system features.

F. Input/Output Devices: Devices with binary and analog inputs/outputs to control general HVAC equipment in conjunction with the VRF system, master controller, and sub-controllers. Device capabilities shall be as required to provide the specified sequence of operation and communicate via the VRF control system network. See specified sequence

of operation for requirements and specified system features.

G. Wiring and Conduit:

1. General: As manufacturer's system requires; complying with Division 26, and in accordance with NEC.

2. Low Voltage: Multi-conductor, 16 AWG, twisted, stranded shielded wire; unless required otherwise by the VRF system manufacturer.

3. Network Wiring: CAT-5 with RJ-45 connection; unless required otherwise by the VRF system manufacturer.

H. Labels:

1. General: Shall comply with Section 20 05 00.

2. Control Devices: Labels on control devices shall use the same designation that appears on the control shop drawings and an indication as to purpose; except that devices in finished rooms shall be labeled as to the generic item controlled for better user understanding (i.e. "Room Exhaust Fan", "Hood Fan").

3. Wiring: Wiring labels shall be the self-laminating or heat shrink type with numbering, lettering, or an alpha-numeric identifier indicating the wire signal/power purpose and matching the designation that is used on the control drawings

I. Control Cabinets: Wall mounted, NEMA rated construction, type and rating to suit location environment, UL listed, minimum 14-gauge sheet metal, hinged front door with latch. Size as required to house controls. Controls/devices shall be logically assembled in cabinet, with all devices and cabinet labeled.

J. Relays/Contactors: Shall be the single coil electrically operated, mechanically held type. Positive locking shall be obtained without the use of hooks, latches, or semi-permanent magnets. Contacts shall be doubled break silver to silver type protected by arching contact where necessary. Number of contacts and rating shall be selected for the application intended. Operating and release times shall be 100 milliseconds or less. Contactors shall be equipped with coil transient suppression devices to limit transients to 150% of rated coil voltage. Relays shall have mechanical switching to allow manual operation of relay and LED light to indicate the energized state.

K. Miscellaneous Control Components: Complying with Section 20 05 00 and Division 26. Standard components, for use in commercial and institutional occupancies, rated and designed for the application and able to provide the specified sequence of operation.

2.10 REFRIGERANT PIPING AND ACCESSORIES

A. Piping and Fittings: Rated for system pressures per VRF system manufacturer. Hard drawn ACR copper tubing per ASTM B280, Type L, with silver brazed joints and wrought copper fittings per ASME B16.22. Use only long radius elbows. Flared fittings

(at equipment connections only) shall comply with ASME B16.26. Soft copper tubing may only be used on runs less than 50-feet or where necessary (i.e. when routing through sleeves, or similar poor access areas) and where acceptable to VRF system manufacturer.

B. Isolation Valves: Brass ball valve, full port, rated for system pressures and temperatures, but no less than 700 psig and -40 deg F to 300 deg F. Compatible with refrigerant used with, UL listed, with rupture proof encapsulated stem, extended copper connections for ease in brazing. Provide in configuration (i.e. angle, straight, with access port) as required to suit application.

PART 3 EXECUTION

3.01 INSTALLATION

A. General: Install system in accordance with code, manufacturers written installation instructions, and best construction practices. Set units in locations as shown on the drawings and maintenance to units.

B. Location and Arrangement: Install all equipment at locations and as shown on the drawings. Install so as to allow maximum access to units. Prior to selecting unit final location, confirm that: Proper unit clearances and access will be provided; no adverse airflow conditions are present; confirm location and installation details with other trades. Units shall be level and aligned with building walls. Set outdoor unit on concrete pad (or roof sleepers); anchor to pad (or sleepers).

C. Complete Connections: Connect and install all items shipped loose with units; provide and connect all utilities and accessories as required for proper unit operation.

D. Refrigerant Piping: Shall be silver brazed. Bleed dry nitrogen through piping during brazing to minimize oxidation. Keep all open ends of piping capped when not being worked. Soft copper shall have long radius bends; install without kinks or excess bends. Piping shall be routed concealed, except where routed outdoors and where noted. Piping shall be ran plumb and square to building walls, and in a neat professional manner.

E. Refrigerant Charge: System shall be checked for proper refrigerant charge and oil level and charged to proper levels after all leak testing and evacuation work has been completed. Refrigerant to be added to the system shall be delivered to the site in factory charged containers and charged into the system through a filter/drier.

F. Unit Protection: Units shall be protected during construction to prevent mud, dirt, paint overspray, plaster materials, and similar debris from depositing on the unit. Units shall be clean and in new condition prior to Owner acceptance.

G. Cleaning: Units shall be thoroughly cleaned of all debris prior to operation. Units shall be clean and in new condition prior to Owner acceptance.

H. Operation: Units shall not be operated until all construction activities that generate dust, dirt, fumes, or odors are complete; system checkout has occurred; and the Engineer has reviewed the system and granted approval.

3.02 VRF SYSTEM CONTROLS

A. General: Installation shall comply with VRF system manufacturer written instructions and recommendations. Provide all software, hardware, licensing, sensors, relays, switches, dampers, actuators, conduit, tubing, wiring, transformers, motor starters and all other devices required to provide a complete integrated VRF control system with the system features and sequence of operation specified. Control system shall be contractor designed to comply with Contract Document requirements.

B. Room Sensors: Room sensors (i.e. thermostats) shall be mounted at an ADA accessible height (unless indicated otherwise). Thermostats shall control the equipment which affects the temperature serving the space the thermostat is located in (unless indicated otherwise). Not all room sensors are shown on the drawings and the locations shown are preliminary only. Contractor shall review all drawings, coordinate with other trades, and indicate all final proposed room sensor locations on the submittal shop drawings. Contractor is responsible for coordinating locations to avoid chalkboards, tack boards and other interferences.

C. Electrical Power:

1. General: Provide all electrical wiring and devices in accordance with codes, and Division 26 requirements.

2. Sources: It shall be the responsibility of the installer of the VRF control system to provide power for all VRF control devices requiring power. Coordinate with the Division 26 Contractor to arrange for necessary power circuits. System Master Controller shall obtain power from a UPS (uninterruptible power supply); unless the unit has an internal battery back-up adequate for 24 hours.

3. Conduit: All wiring shall be installed in conduit and in accordance with Division 26, except that low voltage wiring within the ceiling plenum spaces may be ran without conduit provided that plenum rated cable is used. Install all conduit and wiring parallel to building lines.

D. Equipment Interconnect Wiring: In addition to control wiring between equipment and control devices (furnished under this Section) to accomplish the specified sequence, provide added control wiring to interconnect equipment and to interconnect equipment and associated control/safety devices. Provide as required by the equipment manufacturers to allow for proper operation of the equipment and system.

E. Component Labeling: All control components, except regular room thermostats, shall be equipped with name plates to identify each control component. Components in finished rooms shall be labeled as to generic item controlled for better user understanding; other devices shall be labeled with the same designation which appears on the Control Diagrams. Contractor shall submit list of proposed labeling prior to installing.

F. Complete System: Provide all devices as required to allow for automatic control with sequence of operation specified. Provide all control interconnections between indoor and outdoor units, and other equipment.

G. Adjustability: All setpoints and differentials shall be adjustable. Setpoints indicated are initial settings.

H. Confirm Settings: Confirm with Owner all setpoints, all time schedules, and all other adjustable programming parameters before substantial completion.

I. Thermostats Setpoints: Shall be adjustable, with initial settings as follows unless indicated otherwise:

Occupied Heating	70 degrees F
Unoccupied Heating	65 degrees F
Occupied Cooling	76 degrees F
Unoccupied Cooling	85 degrees F

J. Sequence Terminology: Wherever the control sequences refer to an article, device or piece of equipment in the singular number, such reference shall mean to include as many of such articles, devices, or equipment as are shown on the plans, required for the sequence, or required to complete the installation. Wherever the control sequence refers to an operating stage in the singular number, such reference shall mean to include as many stages as are specified for the equipment and shall mean analog (i.e. proportional) type control where specified for the equipment (reference drawings and equipment specifications).

3.03 VRF HEAT PUMPS - SEQUENCE OF OPERATION

A. General: VRF controls shall provide time schedule control and heating/cooling/fan operation of indoor units, with BC and outdoor units automatically operating in response to system loads and needs using their integral controls.

B. Occupied Mode:

1. Fan: Indoor fan shall run continuously when heating or cooling is required; fan shall cycle to low speed (or as an option cycle off) when no heating or cooling is required.

2. Heating: Indoor heat pump section shall operate in heating as required to satisfy the space setpoint. Airflow shall vary from minimum to maximum depending on load, and shall be programmable to remain at a fixed value instead of varying.

3. Cooling: Indoor heat pump section shall operate in the cooling mode as required to satisfy the space setpoint. Airflow shall vary from minimum to maximum depending on load, and shall be programmable to remain at a fixed value instead of varying.

C. Unoccupied Mode: Indoor fan and indoor heat pump heating/cooling shall cycle on and off as required to maintain unoccupied setpoints.

D. Mode Control: Units' mode of operation shall be determined by time schedule and time schedule override; warm-up mode shall be initiated by optimum start controls.

E. Outdoor unit and Refrigerant Controller: Shall operate to provide adequate and correct refrigerant flow to serve indoor units and to reject or recover heat.

3.04 ENERGY RECOVERY UNIT (DOAS) - SEQUENCE OF OPERATION

A. General: VRF controls shall provide time schedule control of the Energy Recovery Unit (ERU or DOAS) in conjunction with the heat pump units. ERU mode shall match the mode for the VRF system served, except that when any heat pump (served by the ERU or DOAS) is in the occupied mode, the ERU (or DOAS) shall be on in the occupied mode.

B. Occupied Mode:

1. Fans: Supply and exhaust fans are on.

2. Outside Air and Exhaust Air Dampers: 100% open (dampers and actuators provided with units).

3. Bypass Damper and Economizer: The bypass damper shall be closed (to allow energy recovery) unless: the outside air temperature is above 60 deg F (adjustable) and is lower than the exhaust air temperature then the outside air bypass damper shall be activated so that outside air bypasses the energy recovery coil (for economizer cooling).

C. Unoccupied Mode: Unit shall be off.

D. Warm-Up Mode: Unit shall be off.

3.05 ELECTRIC HEATERS – DUCT TYPE

A. General: Heater shall be controlled by a duct mounted temperature sensor and outdoor air temperature sensor. Heater capacity shall be varied to meet the supply air set point.

B. Operation - SCR Heaters: Heater shall be allowed to operate once the outside air temperature has fallen below set point (initially set at 60°F) and duct air temperature (downstream of heater) has fallen below set point (initially set at 70°F) with proportional control between on/off limits.

C. Interlock: Shall be hard-wire interlocked with the supply fan on the unit which serves the heater, to only allow heater operation when the unit's fan is proven on. Provide differential pressure switch or CT's at unit fan to provide interlock and proof of operation.

3.06 MISCELLANEOUS - SEQUENCE OF OPERATION

A. Fire/Smoke Shutdown:

1. Smoke Detector: Provide necessary conduit, wiring, and accessories to shutdown each unit upon activation of that unit's smoke detectors. Connections shall be hardwired; independent of any control system logic, so that failure of control system or loss of control system will in no way prevent the shutdown of each

unit. In addition to shutting down the unit with the alarmed smoke detector, all equipment interlocked or served by that unit shall be off. Other units shall also shut-off as required to avoid building pressure differentials and similar undesirable effects.

2. Fire Alarm System: Shut-down all air handling equipment when the building fire alarm system goes into alarm. Contacts in the fire alarm system are available for this purpose. This shut-down may be accomplished by use of control logic and is not required to be hardwired but shall be of a fail-safe nature so as to provide the necessary shut-down in case of control failure and the control components shall be rated for such purposes (as required by the AHJ).

B. Automatic Restart:

1. General: Equipment shall automatically restart after being shut-off by a power outage, fire alarm, smoke detector, or similar alarm (or fault); upon clearing of the alarm (or fault). System shall revert to its normal operation for the conditions at the time of restarting.

2. Controlled Restart: Provide controlled re-start by building wing or building floor and in a manner to prevent pressure differentials, equipment issues, or other undesirable effects. Provide time delay on the re-start of equipment 2.5 KW and larger to minimize electrical surges.

3.07 REFRIGERANT LEAK TESTING AND EVACUATION

A. Notification/Witnessing: Prior to beginning any testing, notify the Architect/Engineer when the testing will occur. The Architect/Engineer will witness (at his option) various parts of the test. Failure to notify the Architect/Engineer will be cause to re-test all piping in the presence of a representative of the Architect/Engineer.

B. Disconnect and isolate from the system any components that may be damaged by the test pressure.

C. Connect oil-pumped, dry nitrogen to the system through a pressure reducing gauge manifold. Charge enough nitrogen into the system to raise the pressure to 50 psig. Let stand for 2 hours and check for signs of leakage. If no leakage is noted, slowly increase pressure to 300 psig (or as required by local code, whichever is higher). Tap all brazed connections with a rubber or rawhide mallet sufficiently hard to start any leak that might subsequently open from thermal expansion/contraction or vibration. Check the manifold gauge for any drop in pressure. Let the system stand pressurized for 24 hours. Re-check the manifold gauge. If no change in pressure is noted (after adjusting for temperature) the system may be considered free of leaks.

D. If leakage is suspected or apparent, check joints with a glycerin soap solution or other means to locate the leaks. Repair any leaks found by completely disassembling the connection, cleaning the fitting and remaking the connection. Re-test the system after repairs are made both with pressure (300 psi for 24 hours) and at the leak location with a glycerin soap solution or other means of determining leaks.

E. When the system has been proven free of leaks with the above methods, the system shall be completely evacuated of all air and moisture. Connect a vacuum pump to the system and pump the system down to 500 microns and let stand for a minimum of 2 hours. If the vacuum reading remains unchanged, the system may be charged with refrigerant.

F. After satisfactory pressure testing and vacuum evacuation, fully charge the system with refrigerant. Any final connections that were not subject to the full test pressure (e.g. connections at unit, etc.) shall be carefully checked with a halide or electronic leak detector after the system has been charged.

3.09 START-UP/TESTING AND ADJUSTMENT

A. Initial Checks: Prior to operating units, checks shall be made to insure that adequate voltage, air flow, duct connections, electrical connections, control connections, crankcase heaters (where applicable), and other items as listed by the manufacturer are properly provided/connected and operating to insure safe and proper unit operation.

B. Testing and Adjustment: Manufacturers representative shall provide start-up. Operate unit in various modes of operating to test for proper operation, including fan rotation, proper damper travel (where applicable), proper cooling/heating, correct interface to other controls (time clock, fans, etc.), etc. Make necessary adjustments.

C. System Commissioning: As the systems become operational, the VRF system installer shall test and observe the operation of each and every air moving and heating/cooling unit and shall adjust all controls so that the items function according to the intent of the specifications. The VRF system installer shall commission the VRF system controls, including a point-to-point check of all devices, and provide documentation substantiating the work. This commissioning work is separate from the Section 20 08 00 commissioning, and is to occur prior to the commissioning work of Section 20 08 00.

D. Report/Statement: After making all necessary system testing and adjusting, the Contractor shall submit a report to the Engineer indicating all testing/adjustment work done and comment on how system is operating. Such report shall be signed by the individual directly responsible for supervision of the installation of the control system. When the Contractor feels that the system is complete and ready for review by the Engineer, Contractor shall submit a written statement (signed by same individuals as for report) stating that the system is in compliance with the project requirements and ready for review.

3.10 OWNER INSTRUCTION

A. General: Comply with Section 23 05 00. After all testing and adjustments have been satisfactorily completed for the first phase of the project, the Owner shall be provided with operator instructions (including start-up, shut-down, emergency, maintenance, and repair instructions). Instruction shall be by the manufacturer's authorized service representative.

B. Time Period: Instruction period shall be for a minimum of three separate sessions of four hours each. Training to be provided to three Owner staff members.

3.11 COMMISSIONING

A. The Products referenced in this section are to be commissioned per Section 23 08 00 - Commissioning. The Contractor has specific responsibilities for scheduling, coordination, startup, test, development, testing and documentation. At a minimum, the Contractor shall provide a documented and signed record to verify that all equipment and systems installed under this contract have been inspected and functionally tested to verify full compliance with the contract specifications.

END OF SECTION

PART 1 GENERAL

1.01 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 00 and Division 01 Specification Sections, apply to this Section.

B. Requirements of Section 23 05 00 apply to this Section.

1.02 SECTION INCLUDES

A. Hydronic Heat Pumps.

B. Start-Up.

C. Owner Instruction.

1.03 DEFINITIONS

A. "ESP" is defined to mean external static pressure, measured external to the heat pump unit duct connection collars but including a pressure drop for the units' filters. Filter pressure drop has been estimated in a one-half dirty/one-half clean condition using 0.25 inch.

1.04 QUALITY ASSURANCE

A. Listing: Units shall be listed by an approved testing laboratory for the use and application intended (reference Section 23 05 00).

B. Rating and Certification: Unit performances shall be tested and rated in accordance with AHRI Standard 320, and units shall be AHRI certified.

1.05 SUBMITTALS

A. Shall comply with Section 23 05 00.

B. Submit product and performance data on all products to be used. Provide schedule clearly indicating what model numbers are proposed for each unit.

1.06 GENERAL REQUIREMENTS

A. Standardization: In interests of Owner's standardization, all heat pumps shall be the product of the same manufacturer.

B. Substituted Equipment: The drawings show design configuration based on a particular manufacturer’s equipment. Use of another manufacturer's equipment will require redesign of mechanical ductwork, piping, electrical, structural, unit support systems, and general building construction to accommodate the substituted equipment. Such redesign shall meet the requirements and have the approval of the Architect/Engineer prior to

fabrication. If a different manufacturer than shown on the plans is used, the Contractor shall submit complete shop drawings showing all alternate unit installation plans and details; shop drawings shall comply with Section 20 05 00. The redesign shall be equal or superior in all respects to the Architect/Engineer's design (as judged by the Architect/Engineer), including such aspects as equipment access, ease of maintenance, duct connection locations, unit electrical requirements, noise considerations, unit performance, and similar concerns. Cost of redesign and all additional costs incurred to accommodate the substitutional equipment shall be borne by the Contractor.

1.07 REFERENCES

A. AHRI 320: Water Source Heat Pumps (ANSI/ARI 320).

B. AHRI 350: Sound Rating of Indoor Air Conditioning Equipment.

C. ASHRAE 52: Air Cleaning Devices Used in General Ventilation for Removing Particulate Matter, Method of Testing.

PART 2 PRODUCTS

2.01 ACCEPTABLE MANUFACTURERS

A. Hydronic Heat Pumps: Trane, Climate Master, Water Furnace, Daikin.

2.02 GENERAL

A. Capacity: Units shall have the minimum heating, cooling, and supply air cfm capacities as scheduled on the drawings at the conditions shown. Units shall be capable of meeting or exceeding all the capacities indicated.

B. Starting Limits: Unit shall be capable of starting in an ambient of 40 degrees F with entering water at 70 degrees F with both air and water flow rates at the ARI rating conditions.

C. Operating Limits: Units shall be capable of operating satisfactorily within the following limits:

	Cooling	Heating
Minimum Ambient Air	20 deg F	20 deg F
Maximum Ambient Air	100 deg F	85 deg F
Minimum Entering Air	50 deg F	50 deg F
Maximum Entering Air, db/wb	100/83 deg F	80 deg F
Minimum Entering Water	20 deg F	20 deg F
Maximum Entering Water	120 deg F	120 deg F

D. Electrical: Units shall have single point power connection and have an internal power distribution system providing necessary power to all components. Unit shall be for use with the power (voltage and phase) as scheduled on the drawings. Unit shall be nameplated to accept time delay fuses or HACR circuit breaker for branch over-current

protection of the power source.

E. Fan Drives: Shall be sized for not less than 120% of the rated motor horsepower.

F. Listing: Shall be UL listed and as specified in Section 20 05 00 and shall also comply with this section.

2.03 HYDRONIC HEAT PUMPS

A. Type: Indoor, water source heat pumps with inlet/outlet configuration as indicated on plans.

B. Cabinet:

1. General: Shall be constructed of heavy-gauge galvanized steel, with a baked-on enamel finish. Cabinet interior shall be lined with minimum 1/2-inch thick, 1-1/2 lb./ft.^{3} density fiberglass duct liner. Cabinet shall have panels providing access to fan, fan motor, compressor, and control box. An insulated panel shall separate the air handling compartment from the compressor compartment.

2. Filter Bracket/Collar: Units shall be provided with a combination return air duct collar/filter bracket, suitable for holding a 2-inch thick filter and allowing return air duct connections directly to the unit. Filter bracket shall be capable of being field modified to allow for bottom or side filter removal. Units shall be factory shipped with side filter access.

3. Drain Pan: Units shall have integral condensate drain pan, constructed of stainless steel, insulated, with drain connection extending through unit cabinet. Drain pan shall comply with ASHRAE 62.1-2007.

4. Configuration: Unit shall be provided from the factory configured as shown on the drawings in either straight-discharge or side-discharge. For unit ventilator - console type provide with top supply grille and bottom front return grille.

5. Knockouts/Utility Connections: Cabinet shall have separate holes and knockouts for entrance of line voltage and low voltage control wiring. Supply and return water connections shall be copper FPT fittings and shall protrude through the cabinet.

C. Acoustic Package: Provide units with additional sound attenuating material factory applied to compressor, cabinet interior and fan scroll to further dampen and attenuate sound transmissions.

D. Compressors: Shall be hermetic type with external vibration isolators and motor thermal overload protection; compressors shall be specifically designed for heat pump duty.

E. Air/Refrigerant Coils: Shall be constructed of aluminum fins mechanically bonded to copper tubes; tubes shall be tested to 400 psig.

F. Water/Refrigerant Coils: Shall be coaxial type with an outer steel tube serving as the shell and inner finned copper tube. Coil shall be rated for 400 psig on the water side and 450 psig on the refrigerant side. Water coils shall be for use with 25% glycol solution.

G. Refrigerant Circuit Accessories:

1. Reversing Valve: Pilot operated sliding piston type, with replaceable encapsulated magnetic coil; valve shall be energized/de-energized in such a manner to minimize noise of operation.

2. Metering System: Refrigerant metering system for proper heating and cooling cycle operation.

3. Safety Controls:

a. High refrigerant pressure cut-out.

b. Low refrigerant Pressure cut-out.

c. Low refrigerant pressure bypass time delay (to prevent nuisance trippings at cold start-up).

d. Anti short cycle timer (to prevent short cycling of compressor).

e. Safety cut-outs shall be reset only by interrupting and then restoring main power supply to the unit. Control system calls for cooling, heating, or fan operation shall not reset safely cut-outs.

H. Refrigerant: Unit shall be fully charged at the factory with refrigerant.

I. Fan/Motor Assembly:

1. Drive Type:

Cooling Capacity	Drive Type
50 MBH and Less	Direct
51 MBH to 69 MBH	Direct or Belt
70 MBH and Higher	Belt

2. Direct Drive: Fan shall be forward curved centrifugal type. Fan motor shall be multi-speed permanent split capacitor type, with internal thermal overload protection. Fan arrangement shall be field convertible from straight-through to right-angle discharge (and vice-versa) without the use of additional parts.

3. Belt Drive: Fan shall be forward curved centrifugal type, with solid steel shaft having heavy duty ball bearing supports, with adjustable pitch motor sheave and fixed fan pulley. Motor shall be open type, permanently lubricated, with internal overload protection. Fan/motor assembly shall be mounted on a heavy steel assembly, isolated from the unit; motor mounting shall be adjustable to allow proper bolt tension.

J. Duct Collar: Fan housing shall extend through the cabinet to provide a collar for duct connections.

K. Filters: Unit shall be for use with thickness and MERV rating as indicated on plans; rated in accordance with ASHRAE 52; provide minimum size (or area) noted on plans.

L. Electrical: Units shall be factory furnished with all necessary motor starters, transformers, relays, etc. to provide for start/stop of all powered equipment and appropriate interlocks to all safety cut-outs and connections to unit control terminal strip.

M. Controls:

1. General: Unit shall be furnished with devices that are compatible with the Division 25 control system. Unit shall have all necessary interconnections, relays, transformers, terminals, and wiring to properly control the unit's compressor, reversing valve, fan, as activated by the Division 25 system. Unit's internal safety controls shall lock-out unit operation; reset shall occur per safety controls. All control devices shall be located in an accessible control box within the unit.

2. Condensate Overflow: Units shall have a condensate overflow float switch in the drain pan to shut down compressor operation when the pan is full.

3. Alarm Indication: Provide dry contacts for connection to Division 25 system to indicate unit alarmed condition. Alarmed condition to include any safety cut-out and compressor malfunction.

4. Division 25 Interface: Provide unit with necessary terminals and accessories to allow sequence of operation as specified in Division 25, and to be compatible with the control system furnished. Unit shall (as a minimum), allow for Division 25 control of fan compressor, heating, and cooling operation.

PART 3 EXECUTION

3.01 INSTALLATION

A. General: Install units in locations shown on plans and in accordance with manufacturer's instructions.

B. Piping: Provide condensate, hydronic loop supply, and hydronic loop return piping connected to unit. No hydronic loop piping connections shall be made to the heat pumps until these lines are thoroughly flushed and cleaned per Section 23 21 13.

C. Unit Protection: Units shall be protected during construction to prevent mud, dirt, paint overspray, plaster materials, and similar debris from depositing on the unit.

3.02 START-UP

A. Initial Checks: Prior to operating units, checks shall be made to insure that adequate

voltage, water flow, duct connections, electrical connections, control connections, crankcase heaters (where applicable), and other items as listed by the manufacturer are properly provided/connected and operating to insure safe and proper unit operation.

B. Testing and Adjustment: Operate unit in various modes of operation to test for proper operation, including fan rotation, proper damper travel (where applicable), proper cooling/heating, correct interface to other controls (time clock, fans, etc.), purging of air from coils, etc. Make necessary adjustments per manufacturer's directions. See Section 25 05 93.

C. Final Check: When the testing and adjustment is complete, a final check of each unit shall be done by the manufacturer's authorized service representative, or direct employee, to verify proper unit operation. Any defective items shall be repaired or replaced by the Contractor until proper operation is confirmed by the manufacturer's authorized service representative.

3.03 OWNER INSTRUCTION

A. After all testing and adjustments have been satisfactorily completed, the heat pump owner shall be provided with operator instructions (including start-up, shut-down, emergency, maintenance, and repair instructions) by the manufacturer's authorized service representative.

B. Instruction and notification shall comply with Section 23 05 00.

END OF SECTION

PART 1 GENERAL

1.01 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 00 and Division 01 Specification Sections, apply to this Section.

B. Requirements of Section 23 05 00 apply to this Section.

1.02 WORK INCLUDED

A. Single Package Gas Heat/Electric Cool Units.

B. Unit Roof Curbs.

1.03 SUBMITTALS

A. General: Submittals shall comply with Section 23 05 00.

B. Product Data: Submit product information on HVAC units, including performance data showing cooling capacity (as function of indoor and outdoor temperatures and airflow rates), heating capacity, fan performance, filter information, unit dimensions, required clearances, unit accessories, wiring diagram (distinguishing unit wiring from field wiring) and point of connection of all utilities.

C. Installation: Submit unit installation instructions.

1.04 QUALITY ASSURANCE

A. Listing: Units shall be UL listed and labeled.

B. Performance Ratings: Units' cooling performance shall be rated in accordance with ANSI/AHRI 210/240. Units' heating performance shall be rated in accordance with ANSI/AHRI Z21.47.

C. Codes: Unit and accessories shall conform to applicable codes and standards. Unit efficiency shall comply with code (and exceed code as indicated).

D. Operating Ability: Unit and all components shall be able to withstand ambient temperatures from 0 deg F to 125 deg F, plus direct exposure to sun and weather elements without adverse affects. Unit shall be able to operate and produce cooled air between ambient temperatures of 45 deg F and 115 deg F. Unit shall be able to operate and produce heated air between ambient conditions of 0 deg F and 80 deg F. Unit shall be able to operate with supply air temperatures between 50 deg F and 125 deg F; and with room temperature setpoints between 65 deg F to 85 deg F.

E. Electrical: Coordinate equipment electrical voltage/phase, minimum circuit amps, and overcurrent protection requirements with the Division 26 contractor prior to ordering.

1.05 GENERAL REQUIREMENTS

A. Extended Warranties:

1. Unit compressors shall be warranted by the manufacturer for five years. All labor and materials associated with compressor replacement (or repair) shall be warranted.

2. Gas fired heat exchanger shall be warranted by the manufacturer for ten years. All labor and materials associated with heat exchanger replacement (or repair) shall be warranted.

1.06 REFERENCES

A. ANSI/AHRI 210/240: Performance Rating of Unitary Air Conditioning & Air-Source Heat Pump Equipment.

B. ANSI/AHRI 270: Sound Performance Rating of Outdoor Unitary Equipment.

C. ANSI Z21.47: Gas Fired Central Furnaces.

D. ANSI/ASHRAE 52.2: Method of Testing General Ventilation Air-Cleaning Devices for Removal Efficiency by Particle Size.

E. ASTM B117: Standard Practice for Operating Salt Spray Apparatus.

PART 2 PRODUCTS

2.01 ACCEPTABLE MANUFACTURERS

A. Products shall comply with Section 23 05 00. See Section 23 05 00, Paragraph 2.01 for Acceptable Manufacturer requirements.

B. Units: Trane, Carrier, York/JCI.

2.02 SINGLE PACKAGED GAS HEATING/ELECTRIC COOLING UNITS

A. General:

1. Type: Single packaged outdoor gas heating and electric air conditioning unit. Configuration as shown on drawings.

2. Factory Assembled Package: Units shall be fully factory assembled and shall be complete with casing, coils, fans, compressor(s), piping, wiring, disconnect, controls, gas burner, heat exchanger and all other accessories required to be ready for field connections and operation. Units shall be UL listed and labeled, and be designed for outdoor application.

3. Capacity: Units shall have minimum cooling and heating capacities as scheduled on the drawings at the conditions shown.

4. Refrigerant: Units shall be for use with refrigerant R-410A or R-407C, and shall be fully charged at the factory.

5. Fuel: Unit shall be for use with natural gas.

B. Unit Casing: Shall be constructed of zinc coated steel with baked on enamel finish. All exterior surfaces shall be cleaned, phosphatized, and finished with a weather resistant baked-on enamel finish. Finish painted surfaces shall successfully pass 500 hours salt spray test in accordance with ASTM B117. Access panels shall provide access to unit controls, coils, fans, compressors, heating section, and all items requiring service. Access panels shall be easily removable, and be gasketed and insulated. Indoor air section shall be completely insulated with minimum 1/2" thick 1-1/2 lb. per cubic foot foil faced or neoprene coated fiberglass insulation, with cleanable foil faced insulation used at the evaporator section and burner heat exchanger section. All screws or holding devices shall be of cadmium plated construction to resist corrosion. Unit shall have knockouts for utility and control connections with rubber grommets to ensure water-proof connections. Casing below cooling coil shall have condensate drip pan constructed of non-corrosive material, sloped to drain, drain connection to outside, with PVC P-trap.

C. Compressor(s): Direct drive hermetic, scroll type. Motor shall be suction gas cooled, and acceptable voltage range plus or minus 10% of unit nameplate voltage. Compressor shall have internal line break overcurrent protection and overtemperature protection, internal high pressure relief or high pressure switch, and crankcase heaters. Compressors shall be mounted on vibration isolators.

D. Refrigerant Circuit: Shall be fully factory piped and shall include a refrigerant line filter/drier, service gauge ports, and thermostatic expansion valve or fixed orifice metering device.

E. Evaporator and Condenser Coils: Shall be constructed of seamless copper tubing with aluminum fins mechanically bonded to tubes. Evaporator Coils shall be leak tested to 200 psig minimum; condenser coils shall be leak tested to 400 psig minimum.

F. Fans:

1. General: Fans shall be statically and dynamically balanced at factory.

2. Evaporator Fan: Shall be forward curved centrifugal type, with belt drive or multi-speed direct drive motor. Motor shall be permanently lubricated type with built-in auto-reset thermal overload protection. Bearings shall be sealed, permanently lubricated type. Belt drive fans shall have quick adjust fan motor mounting plate or adjustable idler-arm assembly for easy belt tension adjustment. Sheaves shall be the adjustable type on belt driven units.

3. Condenser Fan(s): Shall be propeller type, used in draw-through configuration. Fan shall be direct drive, with permanently lubricated totally enclosed weather-proof motor(s) having built-in auto-reset thermal overload protection.

4. Adjustable Sheaves: All belt drive fans shall have adjustable sheaves (except where motors are 5 hp and larger, fixed sheaves may be used). Sheaves shall be selected so that they are at their midpoint at the design conditions.

G. Heating Section: Shall be gas fired type, with heat exchanger to prevent products of combustion from coming into contact with heated supply air. Heat exchanger shall be constructed of corrosion resistant steel. Heater shall have induced draft or forced draft fans to vent products of combustion; fan shall be interlocked to unit's gas valve and heating controls to allow pre-purge of unit prior to opening gas valve and allowing combustion. Unit shall have code required safeties. Ignition shall be pilotless, and shall use electronic ignition or hot surface ignition system.

H. Filters:

1. General: Units shall be provided with filter racks for accommodating 2" thick filters (unless noted otherwise), with minimum filter area (or sizes) as scheduled. Access panels to filters shall be hinged, with latches (or equivalent device) requiring no tools to open.

2. Filter Type: Shall be pleated panel, disposable type. Filter shall have MERV efficiency as scheduled, as evaluated by ASHRAE 52.2.

I. Electrical Power: Units shall be for use with power of voltage and phase as scheduled on the drawings. Units shall have single source power entry unless indicated otherwise. Units with single source power entry shall require only one field connection and power source. All necessary terminal blocks, fuse blocks, fuses, wiring, junction boxes and accessories shall be factory installed within the unit cabinet to provide power to all unit devices requiring power. Access panels to unit electrical power section shall be hinged with latches (or equivalent device), requiring no tools to open.

J. Economizer – Horizontal Duct:

1. General: Unit shall have economizer system to allow use of 100% outside air for economizer cooling. System shall have outside air and return air dampers, each operable from 0% to 100% of unit total airflow capacity. Dampers shall have linkage to allow return air damper to close as outside air damper opens. Outside air inlet shall have an aluminum mesh water entrapment filter and intake hood.

2. Relief: Unit shall have duct mounted barometric relief damper to allow for pressure relief of building air when outside air damper is 100% open. Relief outlet shall have hood with birdscreen.

K. Controls:

1. General: Unit shall have factory installed controls which allow for the Division 25 control system to control unit fan, cooling, heating, and economizer operations. Unit shall be furnished with all necessary relays, starters, wiring terminal strips, timers, safety devices, interface modules, etc. to provide the sequence of operation as specified in Division 25 using the Division 25 control system, and allowing unit's safeties to protect unit components. Unit wiring shall be color coded and

numbered corresponding to unit's wiring diagram. Access panels to unit controls shall be hinged with latches (or equivalent device) requiring no tools to open.

2. Division 25 Interface: Unit shall have terminal strip (and associated controls) for connection of Division 25 wiring. Unit controls shall allow for:

   a. Fan operation when "common" and "fan" terminals are interconnected (by the Division 25 control system). For units with variable speed fans, unit shall have control terminals to accept a 4 to 20 mA signal from the Division 25 control system to allow the Division 25 control system to control fan speed.

   b. Cooling operation when "common" and "compressor" terminals are connected (by the Division 25 control system). Provide "compressor 1", "compressor 2", etc. terminals to match number of compressor cooling stages for units with multiple stages of cooling.

   c. Heating operation when "common" and "heater" terminals are connected (by the Division 25 control System). Provide "heater 1", "heater 2", etc. terminals to match number of heating stages for units with multiple stages of cooling. For units with modulating heat capability provide unit with terminals and controls to accept a 4 to 20 mA signal from the Division 25 control system to allow the Division 25 control system to control unit heating.

   d. Economizer operation shall be by Division 25. Damper actuators and sensors shall be field installed on the unit by Division 25, and controlled by the Division 25 control system.

3. Control Safeties: In addition to code required safeties, unit shall have safety controls to prevent operation that may be unsafe or damage the unit. Such safeties shall as a minimum include the following:

   a. Heating: Pre-purge controls, proof of flame sensor, proof of combustion fan operation, and high temperature limit switch. Ignition system shall lock-out and require manual reset after 3 consecutive unsuccessful ignition attempts.

   b. Cooling: Controls of all refrigeration system components, low refrigerant pressure safety, high refrigerant pressure safety.

4. Ambient controls: Unit shall have all necessary safeties and controls to allow operation at the specified ambient and room conditions.

L. Roof Curb: Factory fabricated heavy gauge steel curb, with horizontal base foot, top wood nailer wrapped over top with top of steel curb, and top gasket seal. Size, configuration, and capacity to match equipment served and roof slope installed on. Curb shall provide level watertight mounting surface for equipment served, and shall have provisions for seismic anchoring of unit to curb, and curb to building structure. Curb shall include seismic restraint reinforcing and calculations by a structural engineer licensed in the State of the

project location showing forces imparted from the unit to the curb and from the curb to the roof structure as required by code and per requirements of Section 23 05 48.

M. Accessories:

1. Gas Flue Extensions: Provide manufacturers standard or custom fabricated welded stainless steel flue gas extension extending 3 feet higher than top of unit (or as indicated on plans), with flue size matching unit size (or as recommended by manufacturer). Provide drain weep hole at bottom at connection to unit.

2. Convenience Electrical Outlet: GFCI, 120V/15 Amp electrical outlet, for connection to power source separate from unit power. Outlet shall be mounted through unit cabinet, and have weatherproof hinged cover.

3. Electrical: Through the base electrical power connection.

4. Circuit Breaker and Disconnect: Thermal magnetic, molded case, HACR circuit breaker, wired from circuit breaker to unit terminal block. Provide with water tight enclosure having exterior access through a hinged cover. Circuit breaker shall provide unit overcurrent protection and unit disconnect in accordance with NEC, UL, and code requirements. Shall be sized to properly handle unit electrical load, including power exhaust (where power exhaust is used).

5. Smoke Detector: Ionization or photoelectric type, with sampling tube (sized to match unit application), 2 sets form C contacts rated at 10 amps (115 VAC), 1 set form A contacts rated at 2 amps (30 VDC). For use with 115 VAC (or 24 VAC) power. Suitable for temperatures 32 deg F to 140 deg F, and air velocities up to 4,000 feet per minute. Unit shall be complete with plastic housing, clear plastic cover, gaskets, mounting hardware, visual indication of power and alarm, test/reset switch, and all accessories for proper operation. UL listed and complying with applicable codes and standards. Install in unit to sense return air (unless indicated otherwise).

6. Phase Monitor: Provide unit with 3-phase power monitor to monitor power to unit and stop unit operation upon phase loss, phase reversal, or phase unbalance, with auto reset, LED alarm indication and where indicated contacts for remote alarm indication.

PART 3 EXECUTION

3.01 INSTALLATION

A. General: Comply with Section 23 05 00. Install in accordance with manufacturer's written instructions, code, applicable standards, and best construction practices. Care shall be taken when moving and setting units not to damage roof, curb, units, or other items.

B. Location Verification: Install equipment at locations indicated in accordance with the Contract Documents. Prior to selecting unit installation locations and setting unit curb and unit, confirm that: unit curb properly matches building support structure; curb is level and

dimensionally matches unit; installed duct locations match unit connection locations; manufacturer's pre-installation checklists have been completed; proper unit clearances and access will be provided; proper distances from plumbing vents and other vents; no adverse airflow conditions are present; and installation has been coordinated with other trades.

C. Gasketing: Provide gasketing around top of unit curb and where duct connections mate to unit.

D. Complete Connections: Connect and install all items shipped loose with units; provide and connect all utilities and accessories as required for proper unit operation.

E. Refrigerant Charge: Units shall be checked for proper refrigerant charge and oil level and re-charged as necessary. Refrigerant shall be delivered to the site in factory charged containers and charged into the system through a filter/drier.

F. Flue Extensions: Support rigidly from unit and so as to avoid transfer of heat and burning of paint on unit. Brace extension to accommodate wind forces.

G. Cleaning: Units shall be thoroughly cleaned (internally and externally) of all debris prior to operation. Units shall be clean and in new condition prior to Owner acceptance.

H. Owner Instruction: Instruct Owner on equipment operation, including: system start-up, shut-down, emergency shut-down, normal control operation, safety aspects, maintenance and repair instructions.

3.02 START-UP

A. Pre Start-Up Inspection: Inspect equipment and connecting systems to confirm equipment and connecting systems have been installed properly and are ready for start-up. As a minimum, check for: proper voltage and phases, correct system refrigerant charge, correct electrical connections, complete control connections, all unit safety devices properly set and connected, heaters operational, fans free to rotate and rotating correctly, fans lubricated, belts tightened to proper tension, coils clear of obstructions, and other items as listed by the manufacturer are properly provided/connected and operating to ensure safe and proper start-up. If items are discovered that prevent start-up to be completed, notify the installing Contractor and Engineer of issues. Coordinate and re-schedule start-up after items are corrected.

B. Start-Up: Perform start-up in accordance with manufacturers written start-up procedures. Coordinate with any other trades needed to be present (i.e. balancer, control technician, etc.). Operate equipment in various modes to confirm proper operation. Observe proper operation of all unit components (heating, cooling, condenser fan, economizer, etc.). Observe unit to detect any unusual vibration, leakage, loose wiring, or other situations that could affect unit operation.

C. Adjustments: Adjust and set unit components to allow for proper operation (i.e. adjust fan sheaves, adjust fan speeds, unit settings, etc.).

END OF SECTION

DIVISION 25

INTEGRATED AUTOMATION

PART 1 GENERAL

1.01 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions, and Division 00 and 01 Specification sections, apply to this Section.

B. Requirements of Section 20 05 00 apply to this Section.

1.02 SECTION INCLUDES

A. Control System Design.

B. Complete Mechanical System Controls.

C. Control Devices, Components, and Wiring.

D. Control System Commissioning.

1.03 SUBMITTALS

A. General: Comply with Section 20 05 00.

B. Product Data: Submit manufacturer's product data for all items to be used. Provide a complete materials list, labeled to match labeling used on shop drawing, with manufacturer and model number.

C. Shop Drawings: Submit shop drawings of complete control system, including the following information: interconnect drawings showing all wiring and control connections, all control device locations, sequence of operation for all controlled systems, building floor plans with all proposed thermostat and other control device locations shown.

1.04 QUALITY ASSURANCE

A. Skilled Workers: The entire control system shall be installed by skilled electricians, technicians, and programmers, all of whom are experienced, properly trained and qualified for the work they perform. Contractor shall submit evidence of workers' experience and training upon request of the Engineer.

1.05 GENERAL REQUIREMENTS

A. Single Contractor: One single Company shall be responsible to design, furnish and install the complete Division 25 control system. Any subcontracted installation work shall be done by firms experienced and qualified in the work they perform, and subject to approval by the Engineer.

B. Local Contractor: System shall be designed, programmed, and commissioned by local office personnel.

C. Programming Point Names: Custom point naming is required to match the Owner's standard point naming scheme. Coordinate with Owner to confirm standards.

D. Existing Systems:

1. Existing Controls: Existing controls are DDC type, with controllers and other major components manufactured by Delta. New controls shall be DDC type and shall be an extension and revision of the existing system; using components by the same manufacturer, with the same capabilities, and fully compatible with the existing system. Extend and revise system to include new equipment and items indicated. Revise and add system graphics to reflect all project work and to include new equipment and new items.

2. System Demolition and Revisions: Revise existing controls system as necessary so that new and existing items operate properly. Revise existing system graphics to reflect demolished portions of systems. Revise existing control wiring and control components as necessary to properly reconnect to all relocated and revised equipment so that the equipment and system operate properly. Revise and relocate existing wiring and control device locations to suit all revised areas.

3. Wiring and Component Reuse:

a. Existing controls materials may only be reused where specifically indicated.

b. Where indicated to be reused, verify existing system wiring and the details of the components to be reused; confirm they will operate properly with the new equipment and system revisions.

c. Existing components that are indicated to be reused shall be assumed to be in working condition (i.e. temperature sensors, relays, etc.) unless noted otherwise; however, Contractor shall review the operation and functionality of these items to confirm their condition and notify the Owner of any issues or component failure.

d. All reused items shall be cleaned, re-calibrated (where they have a calibration feature), and be adjusted/set for proper operation for the project.

PART 2 PRODUCTS

2.01 ACCEPTABLE MANUFACTURERS

A. General: Products shall comply with Section 20 05 00.

B. Control System Manufacturer: Delta.

C. Other Control Components and Accessories: Idec, Hoffman, McDonnell, Tridelta, Veris, Kele, Edwards, Mamac, APC, Barksdale, Mark-Time, Functional Devices, and control system manufacturer listed.

2.02 BASIC SYSTEM

A. General: The work involves revising the existing control system to accommodate project demolition, new HVAC equipment and related revisions. The system shall be a distributed processing type direct digital control (DDC) system same type as the existing. System shall provide complete stand-alone temperature control/monitoring and energy management for this project, using a network of various independent controllers, sensors and associated devices interconnected in a communicating network.

B. System Protocol: Same as existing (Delta).

C. Network: All controllers shall be interconnected in a communicating network to provide facility wide access to work stations and sharing of information. A Local Area Network (LAN) shall be provided to interconnect controllers for high speed data transmission. Failure of a single or multiple controllers shall not cause loss of communication between other LAN-connected controllers still active.

D. System Performance:

1. Graphics: System shall display a graphic with at least 20 dynamic points with all current data within 10 seconds of being initially displayed. System shall refresh a graphic with at least 20 dynamic points with all current data within 8 seconds.

2. Object Command: Commands of a binary object entered at local workstations shall be executed at the commanded device within 2 seconds of being entered; analog objects shall start to adjust within 2 seconds.

3. Current Data: Any data used or displayed at a controller or local workstation shall
be current within the previous 6 seconds.

4. Alarm Response: Maximum time between an alarm event at it being annunciated shall be 45 seconds.

5. Program Execution Frequency: Applications shall be capable of running as often as every 5 seconds; select execution times that are consistent with the process under control and provide optimum comfort and control of setpoints without excess deviation. Controllers shall be able to execute PI and PID control loops at a selectable frequency of at least once per second; with the process value and algorithm output updated at this same frequency.

6. Reporting Accuracy: Control system reporting end-to-end accuracy shall be no less than the following: Temperatures: Plus/minus 1 deg F.

7. Stability: System shall provide stable and accurate control operation without excessive variation of controlled variables; variation shall in no case be more than 1.5 the reporting accuracy for temperatures, and the same as the reporting accuracy for other variables.

2.03 CONTROLLERS

A. General: Shall be manufacturer's standard controllers used for commercial DDC systems similar to others currently used on this Owner’s facilities. Controllers shall comply with the system communication protocol specified and allowing the system to provide the specified features and sequence of operation. Type, capacities, arrangement and features shall be Contractor selected to provide an overall system complying with Contract Document requirements.

B. Terminal Unit Controllers (TUC's): Controller specifically designed for control of individual air handling units, fans, VAV terminal units, and similar type units; controllers shall be microprocessor based and shall contain a non-volatile resident program to allow for proper sequencing of controlled equipment. An individual controller shall be provided for each piece of unique equipment. Each terminal controller shall be accessible for purposes of control and monitoring from a central or remote operator's terminal as specified herein.

2.04 TEMPERATURE SENSORS

A. Room Temperature Sensors: Solid state electronic type, employing a resistance type output; similar to existing in use in the facility. Factory calibrated to an accuracy of plus/minus 0.5 deg F with a temperature range of 32 to 130 deg F in normally occupied areas and -40 to 140 deg F in other areas, with the following features:

1. Space temperature display.

2. Momentary push button for placing room's system into occupied mode when pressed.

3. Means for adjusting temperature setpoint up or down with setpoint display.

B. Room Temperature Sensor Guards: Lockable, slotted, clear plastic type.

C. Duct Freeze Protection Thermostat: Low temperature thermostat, electric type, manual reset, non-averaging 20 feet long sensing elements that activate sensor contacts whenever any 6-inch section or more of any portion senses a temperature at the thermostat setpoint. Provide with two sets of contacts, one hard-wired to stop unit operation and one for automation system alarm input.

D. Duct Temperature Sensor: Shall be solid state electronic type, employing a resistance type output. Factory calibrated accuracy of plus/minus 0.5 deg F with a temperature range shall be -40 to 160 deg F. The sensor shall include a utility box and gasket to prevent air leakage and vibration noise. For all mixed air and preheat air applications,

install bendable averaging duct sensors with a minimum 5 foot long sensor element installed so as to sense a representative sample of the medium being controlled.

E. Liquid Immersion Temperature Sensor: Shall be solid state electronic type, employing a resistance type output. Factory calibrated accuracy of plus/minus 1 deg F with a temperature range 0 to 250 deg F. Provide brass thermowells and install sensor probe with heat conductive grease. Probe and sensor head shall be removable without breaking fluid seal. Install sensors in top of pipe for horizontal runs and at a positive slope on vertical runs to prevent condensation from flowing to sensor head.

F. Outside Air Temperature Sensor: Solid state electronic type device, for outdoor installation, factory calibrated accuracy of plus/minus 0.5 deg F, with a temperature range of -20 to 180 degrees F. Provide a sun shield and weatherproof assembly.

2.05 ACTUATORS

A. General: Actuators shall use a brushless DC motor controlled by a microprocessor with protection from overload at all angles of rotation. Run time shall be constant, independent of torque. Actuator shall have manual positioning mechanism and direction of rotation control switch and visual position indicator. Housing shall be NEMA rated to suit the conditions at the actuator location.

B. Type: Proportional or two position or floating point type, as required for application. Proportional type shall modulate in response to a 2-10 VDC, or 4 to 20mA control input. Provide with auxiliary switches as required for sequence of operation and to allow for safe operation of items served (and interlocked items), switches shall meet requirements for "double insulation" so an electrical ground is not required.

C. Automatic Closure: Actuator shall spring return upon power interruption, spring return position shall be fail-safe as dictated by freeze, fire or temperature protection requirements; except that actuators required to be the fast operating type may utilize a capacitor discharge for fail-safe closure in lieu of spring (subject to Engineer’s approval). Spring return is not required for air terminal units or zone damper.

D. Performance: Actuator power and torque shall be sufficient to match valves being controlled and allow proper damper and valve operation against system pressures liable to be encountered. Actuator shall be capable of driving control devices from full closed to full open in less than 90 seconds (unless indicated otherwise) and where fast operating type are required (i.e. where interlocked with equipment operation). Where actuators serve valves directly serving equipment or are interlocked with equipment operation verify required operating time of actuator with equipment manufacturers and timing of other system components to allow for proper system operation without nuisance shutdowns of equipment or creating undesirable effects due to improper actuator response time.

E. Accessories: Units shall be complete with all brackets, and hardware required for mounting and to allow for the proper control for the application.

2.06 CONTROL DAMPERS

A. Type: Low leakage control dampers, parallel blade or opposed blade type as selected by Division 25 contractor to best suit application (unless a specific type is indicated).

B. Leakage: Class 1A leakage rated in accordance with AMCA 500-D.

C. Construction: Construct of galvanized steel, except where installed in ducts of stainless steel or aluminum construction or handling corrosive air, shall be of stainless steel or aluminum construction (to match duct material) or have corrosion resistant coating. All materials in contact with the airstream shall be suitable for the conditions without deterioration. Frame shall be minimum 16 gauge with reinforced corners.

D. Blades: One-piece airfoil shape, not exceeding 6 inches in width, minimum 16 gauge, with neoprene, extruded vinyl or butyl rubber edge seals and flexible metal jamb seals; linkage interconnecting all blades and actuator axle.

E. Bearings: Nylon, molded synthetic, or oil impregnated sintered metal bearings (or other materials as conditions require).

2.07 HYDRONIC CONTROL VALVES – 3 INCH AND SMALLER

A. General: Valves shall be fully proportioning, with modulating plugs or characterized ball for equal percentage of linear flow characteristics. The valves shall be sized by the control manufacturer and be provided with actuators of sufficient power for the duty intended. Valve body and actuator selection shall be sufficient to handle system pressure and shall close against the differential pressures liable to be encountered in the system.

B. 1/2 Inch Through 2 Inch: Valves shall be constructed with a cast-brass body and screwed ends.

C. 2-1/2 Inch and Above: Valves shall be constructed with a cast iron body and have flanged connections.

D. Valves shall be selected for a maximum 4.0 psi pressure drop at design flow unless indicated otherwise.

E. All valves shall have field manual positioning capability to allow manual positioning of valve in absence of control power.

2.08 HYDRONIC CONTROL VALVES – 4 INCH AND LARGER

A. General: Valves shall be the butterfly type, waferstyle, with configuration as indicated on the plans. The valves shall be sized by the control manufacturer and be provided with actuators of sufficient power for the duty intended. Valve body and actuator selection shall be sufficient to handle system pressure and shall close against the differential pressures liable to be encountered in the system.

B. Construction: Valve body shall be of cast iron construction, with stainless steel disc, stainless steel stem, polyester bushing, and bronze or sintered metal bearings, provide with extended neck to allow for insulation.

C. Pressure Rating: Rated for 250 psi working pressure from 30 deg F to 200 deg F, and bubble tight shut-off to 150 psi.

2.09 ACCESSORIES

A. Wiring and Conduit:

1. Basic Materials: As specified in Division 26.

2. Power Wiring: 18 AWG minimum and rated for 300 VAC service. Wiring for circuits greater than 24 V shall be as specified in Division 26.

3. Analog Signal Wiring: Field-installed analog signal wiring shall be 18 AWG single or multiple twisted pair. Each cable shall be 100 percent shielded and have a 20 AWG drain wire. Each wire shall have insulation rated for 300 VAC service. Cables shall have an overall aluminum-polyester or tinned-copper cable-shield tape.

4. Life Safety Applications: Wiring that performs code required life safety control (e.g. shutdown of equipment), control of engineered smoke systems, fire alarm interface and similar functions shall comply with code and NFPA standards for fire alarm system wiring and the specific application.

B. Labels:

1. General: Shall comply with Section 20 05 00.

2. Control Devices: Labels on control devices shall use the same designation that appears on the control shop drawings and an indication as to purpose; except that devices in finished rooms shall be labeled as to the generic item controlled for better user understanding (i.e. “Room Exhaust Fan”, “Hood Fan”).

3. Wiring: Wiring labels shall be the self-laminating or heat shrink type with numbering, lettering, or an alpha-numeric identifier indicating the wire signal/power purpose and matching the designation that is used on the control drawings.

C. Control Cabinets: Wall mounted, NEMA rated construction, type and rating to suit location environment, UL listed, minimum 14 gauge sheet metal, hinged front door with latch. Size as required to house controls. Controls/devices shall be logically assembled in cabinet, with all devices and cabinet labeled.

D. Relays/Contactors: Shall be the single coil electrically operated, mechanically held type. Positive locking shall be obtained without the use of hooks, latches, or semi-permanent magnets. Contacts shall be doubled break silver to silver type protected by arching contact where necessary. Number of contacts and rating shall be selected for the application intended. Operating and release times shall be 100 milliseconds or less. Contactors shall be equipped with coil transient suppression devices to limit transients to

150% of rated coil voltage. Relays shall have mechanical switching to allow manual operation of relay and LED light to indicate the energized state.

E. Thermowells: See Section 22 09 00.

F. Condensate Overflow Switch: Overflow switch to detect high condensate level to stop unit operation and indicate an alarm, low voltage, PVC or ABS construction, with switch rated for voltage/amperage used with. Style to best suit application (i.e. in drain pan type, in drain line type, or type that installs in unit auxiliary drain outlet); selected by Contractor subject to Engineer review. Little Giant No.s ACS-2, -3, -4, or -5 (or approved equal).

G. Miscellaneous Sensors/Transmitters/Switches/Transformers: Shall be manufacturer's standard, designed for application in commercial building HVAC control systems, compatible with other components so as to provide sequence of operation specified.

H. Gas Sub-Meters: Shall be suitable for pressures and flows to suit application; with accuracy of plus/minus 1% and repeatability of 0.5%; pressure drop at max flow shall be no greater than 0.5 psi; provide with straightening vanes. Submit shop drawing of proposed locations. Coordinate with Division 22 contractor for installation of monitoring devices.

I. Flow Meter - General Fluids: Insertion dual turbine flow meter for measuring water flow rates in closed and open loop hydronic and domestic water systems. Rated for 250 psi and 230 deg F operating conditions. Bi-directional type where flow occurs in both directions. Meter shall consist of two contra-rotating axial turbines, electronic impedance-based sensing, and an averaging circuit to provide accurate a flow reading. Wetted metal components shall be type 316 stainless steel. Flow meter shall be individually wet-calibrated against a primary volumetric standard that is accurate to within 0.1% and traceable to NIST with manufacturer’s certificate of calibration provided with each flow meter. Accuracy shall be within ± 0.5% of rate at the calibrated velocity, within ± 1% of rate over a 10:1 turndown (3.0 to 30 ft/s) and within ± 2% of rate over a 50:1 turndown (from 0.4 to 20 ft/s). The flow meter shall include integral analog output(s), 4-20 mA, 0-10V, or 0-5V. Bi-directional meters shall include an isolated contact closure output for direction. Provide with hot-tap insertion components with integral ball valve to allow installation and removal without interrupting flow; provide software, accessories, and calibration to allow reading of flow in gallons per minute. Onicon Model F-1210 or FB-1210 (or approved equal).

2.10 SWITCHES

A. Current Monitoring Switches: Electric current sensing device with integral switching contacts. Device shall sense current (amperage) through the conductor the device is applied to and activate switch action (to make and break contacts) once current reaches a preset value. Device shall be able to be clamped around conductor, and be removable. Switch rating, size, switching current, and type selected by Contractor to suit application and provide the required function. Provide type specifically rated for the motor and load type being applied to.

B. Air Flow Switches: General Purpose utilizing differential air pressure, SPDT snap-acting contacts, adjustable 0.1in. W.C. to 2.0 in. (minimum), neoprene diaphragm, all aluminum construction.

C. Emergency Shutdown Switch: Mushroom head, red color, non-spring return, with maintained contacts, NEMA 1 (or better) enclosure. Label as to function.

2.11 PRESSURE AND VELOCITY SENSOR/TRANSMITTERS

A. Air Velocity Transmitter: Shall be a duct mounted instrument that measures the difference between total pressure and static pressure to get velocity pressure. Measurement shall be by a pitot tube located in the moving air stream or by a duct mounted air flow measuring station. The transmitter shall be an industrial quality device that produces a linear output directly proportional to the input utilizing an integral square root extractor. The air velocity span shall be a segment of the range between 200 and 5000 feet per minute.

B. Air Pressure Transmitter: Shall universally measure very low static or differential pressure using a variable capacitance technique. Static pressure shall measure in ranges from 0 to 10 inches water column. Differential air pressure shall have a range of 0 to +/- 0.5 inches. Transmitter accuracy, including non-linearity, hysteresis and non-repeatability shall be within 1% of full scale. Provide zero and span adjustments for a proportional output of 4-20ma.

C. Air Differential Pressure Sensor: Electronic transducer, incorporating linear variable differential transformer type sensing element with two-wire 0-10 VDC transmitter. Accuracy shall be +/- 2% of full scale. Submit chosen spans for review.

D. Liquid Differential Pressure Sensor: Single pole, single throw switch, bellows type, with adjustable range, suitable for application intended.

E. 1/2 Inch Through 2 Inch: Valves shall be constructed with a cast-brass body and screwed ends.

F. 2-1/2 Inch and Above: Valves shall be constructed with a cast iron body and have flanged connections.

G. Valves shall be selected for a maximum 4.0 PSI pressure drop at design flow unless indicated otherwise.

H. Unless otherwise noted, heating valves shall be normally open; cooling valves shall be normally closed.

I. All valves shall have field manual positioning capability to allow manual positioning of valve in absence of control power.

2.12 VARIABLE FREQUENCY DRIVES

A. Type: Adjustable frequency and voltage variable speed controller, pulse width

modulated type.

B. Controller: Shall be housed in a NEMA 1 (or better) enclosure, and shall provide 6 to 60 Hz adjustable torque output. Standard Features:

1. Start-stop speed selection.
2. Manual speed potentiometer.
3. Input fuses.
4. Insensitive to incoming power phase sequence.
5. Adjustable volts/Hertz.
6. Output frequency stabilized to + 0.5% of set speed for +10% to -5% change in line voltage of 15 degrees C change in ambient temperature.
7. Three-phase output voltage regulated to + 1% of rated voltage with +10% to -5% variations in plant power.
8. Standard off-the-shelf, NEMA B and synchronous motors (3600, 1800, 1200 rpm) usable without derating controller.
9. Automatic shutoff under output short circuit conditions or when load current exceeds 150% of maximum output amps (RMS).
10. Input fuses.
11. Line transient protection to prevent power line transients from harming the controller.
12. Relay contact to provide external signal for alarm and run condition.*
13. Monitor lamps (or LCD display) indicating: power on, zero speed, enabled, unit failure (with type indicated).
14. Hand-Off-Auto switch.
15. Auto restart after power outage.
16. Isolated Process control Follower - accepts 0 to 5 mA, 1 to 5 mA, 4 to 20 mA, 10 to 50 mA, 0 to 10 V D-C or 25 to 250 V D-C signal.
17. Input Disconnect (meeting NEC requirements for unit power disconnect).
18. Output Contactor - for positive motor disconnect.
19. Output Overloads - using individual phase bimetallic thermal sensors.

20. Ammeter - ampere scale depending upon drive rating.*

21. Voltmeter -0 to 500 volt (460 volt drives); 0 to 750 volts (575 volt drives).*

22. Frequency Meter - 0 to 120 Hz scale.

23. Manual Bypass - To switch the motor to or from the controller to the line.*

* Not required on units serving fans under 2 hp.

C. VFD shall be for use with specified equipment. Unit shall accept appropriate control signal and provide for variable speed operation of unit served.

D. System shall be fully compatible with motors furnished, and shall be free of audible noise exceeding an NC of 45 in any octave band.

E. Basic Control Inputs/Outputs: Unit shall accept 4-20 mA control signal and provide for variable speed control of unit served. Unit shall have dry contacts that when connected enable VFD to operate, secondary dry contacts for emergency stop function, dry contacts for alarm output.

F. Motor Compatibility: System shall be fully compatible with motors furnished, and shall be free of audible noise exceeding an NC of 45 in any octave band.

G. Network Communications:

1. VFD shall include the following communication as standard without additional card. BACnet I/P, Modbus TCP, Modbus RTU, BACnet MS/TP. Drive shall be BTL listed to Revision 14 or later.

2. The drive shall be classified as an Applications Specific Controller (B-ASC). The interface shall support all BIBBs defined by the BACnet standard profile for a B-ASC including, but not limited to:

   a. Data Sharing: Read Property Multiple-B, Write Property Multiple-B, COV-B.

   b. Device Management: Time Synchronization-B.

   c. Object Type Support: MSV, Loop.

3. The drive's relay output status, digital input status, analog input/output values, Hand-Auto status, warning and fault information shall be capable of being monitored over the network. The drive's start/stop command, speed reference command, relay outputs and analog outputs shall be capable of being controlled over the network. Remote drive fault reset shall be possible.

PART 3 EXECUTION

3.01 INSTALLATION

A. General: Provide complete control system design, all computer software and hardware, operator input/output devices, sensors, relays, switches, dampers, actuators, conduit, tubing, wiring, motor starters, transformers, control cabinets, power panel circuit breakers, and all other components required to provide a complete control system with the system features and sequence of operation specified. Select control components with proper characteristics to suit the application, meet specified system performance, provide specified system features, and provide the specified sequence of operation. Coordinate work with other trades. Review field conditions for work involving existing systems or replacements of existing systems.

B. Room Sensors: Room sensors (i.e. thermostats) shall be mounted at 48" above finished floor, unless indicated otherwise. Thermostats shall control the equipment which affects the temperature serving the space the thermostat is located in, unless indicated otherwise. Not all room sensors are shown on the drawings and those shown are preliminary only. Contractor shall indicate all final room sensor locations on submittal drawings. Contractor is responsible for coordinating locations to avoid chalkboards, tack boards and other interferences.

C. Electrical Power and Wiring:

1. General: All work shall comply with code and Division 26 requirements. Run conduit and wiring in neat lines, parallel with building construction and coordinated with other trades. Use wire type and size as required by code and recommended by component manufacturers and to suit the application conditions.

2. Conduit: All wiring shall be installed in conduit and in accordance with Division 26 section of these specifications, except that low voltage wiring within ceiling plenum spaces and in mechanical mezzanine areas may be ran without conduit provided that plenum rated cable is used. Install all conduit and wiring parallel to building lines.

3. Electrical Power:

a. Scope: It is the responsibility of the Division 25 Contractor to provide power for all control devices requiring electrical power. Coordinate with the Division 26 Contractor to confirm which panels and circuits are to be utilized. Provide all electrical wiring, conduit, junction boxes, circuit breakers, grounding, panel circuit breakers (of proper size/type), transformers, enclosures and all other components as needed to power all control devices.in accordance with code and Division 26 requirements.

b. Sources: Power for control devices shall be obtained from electrical panels and not from power serving the equipment (unless noted

otherwise or the Engineer gives approval). Utilize panels located closest to the items served to the greatest extent possible. Where the building has a generator, equipment served by the generator shall also have their control power (i.e. power to control devices which allow the item to be controlled and monitored) shall also be served by the generator (this is in addition to any required UPS').

D. Equipment Interconnect Wiring:

1. General: In addition to control wiring between equipment and control devices (furnished under this Section) to accomplish the specified sequence, provide added control wiring to interconnect equipment components and associated control/safety devices. Provide as required by the equipment manufacturers to allow for proper operation of the equipment and system.

2. Minimal Wiring Required: For bidding purposes, assume a minimum of four wiring connections for each piece of equipment to an adjoining/connecting piece of equipment and/or device(s), and special wire type and special connectors as required by the equipment manufacturer. Coordinate and review all requirements with manufacturers, contractor installing the equipment, and local representatives to confirm scope. Field review existing conditions where controls interface with existing components.

3. Equipment: This work applies to:

a. Split system HVAC Equipment: Connect between indoor and outdoor units, and between the indoor unit and its thermostat.

b. Boilers: Connect between the boilers and devices for field installation in the boiler system (includes outside air temperature sensor, system temperature sensors, and connections between boilers).

E. Labeling: All control components, except regular room thermostats, shall be labeled. All control wiring shall be labeled except where color coded wiring is used and the control shop drawings clearly identifier wiring for each color and it is fully consistent through-out the entire project. Submit list of proposed labeling prior to installing.

F. Complete Functions: Provide complete system totally programmed to provide all specified functions, including but not limited to:

1. Time and Holiday Schedules.

2. Alarm Limits.

3. Optimum Start of Each Zone.

4. Dynamic Graphic of Each Distinct Floor Area; include graphic key to allow changes in graphic display.

5. Dynamic Graphic of Each Mechanical System; include graphic key to allow changes in graphic display.

6. Summary of All Zone Temperatures.

7. Summary of Data for Each Zone.

8. All Displays Specified in Sequence of Operation.

9. Master Menu and Graphics as requested by the Owner.

10. All Controller Setpoints and Operational Values Required.

11. Demand Limiting.

12. Optimum Start/Stop and Warm-up.

G. On/Off Status Indication: All devices which indicate on/off status to GUI, shall have this on/off status manually or automatically controlled from GUI, and shall have positive proof of on or off by differential pressure switch or other applicable device.

H. OA Sensors: Provide at least two OA sensors for this project, with display at the GUI; use average of two for control purposes. Provide logic to allow disuse of "Bad" OA sensor and indicate alarm.

I. TUC: To simplify controls and mechanical service and trouble-shooting, the TUC shall be mounted inside a waterproof cabinet on the side of rooftop units. This shall allow all controls maintenance and trouble-shooting to be made while at the unit location.

J. Programming: Provide complete system totally programmed to provide all specified sequences, monitoring data, communications and features.

K. CO2 Sensors: Duct mounted type, installed in the return ducts for areas (or units) indicated to have such sensors, except where a wall sensor is indicated on the plans provide a wall mount type. Install where units would be easily accessible for maintenance. Indicate locations on floor plans with submittals.

L. Condensate Overflow: Provide all cooling coils (except not required for exposed AC units) with field installed condensate overflow switches wired to stop unit operation upon detection of a high condensate level and to indicate an alarm at the system graphics.

3.02 MONITORING DATA

A. General: Monitoring information shall be provided at graphic user interface. Provide all necessary controls/devices to provide the data indicated. Monitoring data listed is not a “points list” but is a list of items that shall be monitored and is in addition to data (or “points”) required by the sequence of operation and other specification requirements. A

complete “points list” shall be compiled by the Division 25 Contractor based on all system requirements and sequence.

B. Fluid Cooler:

1. Unit commanded on/off status.
2. Entering water temperature.
3. Leaving water temperature.
4. Water temperature setpoint.
5. Water temperature setpoint adjustment.

C. Heating Water Loop and Cooling Water Loops:

1. Main return temperature.
2. Main supply temperature before mixing valve (heating loop).
3. Main supply temperature after mixing valve (heating loop).
4. Main supply setpoint.
5. Boiler (and fluid cooler) main line supply temp.

D. Exhaust Fans:

1. Fan on/off status.
2. Fan commanded status (on/off).
3. Fan failure alarm; (i.e. not "proven" on when commanded on).

E. Air Handling Units (all units with fans and ability to heat or cool environmental air):

1. Zone temperature.
2. Zone temperature setpoint.
3. Unit commanded mode (heating/cooling).
4. Supply air temperature off unit.
5. Mixed air temperature at unit.
6. Percent commanded heating or cooling.
7. Override status.

8. Outside air and return damper positions (% commanded open).

9. Fan on/off.

10. Fan commanded position (on/off).

11. Alarm/trouble conditions, shall include as a minimum: freezestat alarm; fan not "proven" on when should be on; heat failure alarm - SA temp not warmer than ma and unit is in heating; cooling failure alarm - SA not cooler than ma and unit is in cooling; "false" cooling or heating call - i.e. Unit calls for heating when OA temperature is above 70 deg F, unit calls for cooling and OA temperature is below 30deg F).

12. Carbon dioxide levels (as noted on AHU schedule).

13. VFD commanded percentage (for units with VFD's).

F. Circulating Pumps:

1. On/Off status (by differential pressure device or flow switch).

2. Failure alarm (i.e. not "proven" on when commanded on).

3. Variable frequency drive (VFD) commanded position (as applicable).

G. Boiler:

1. Boiler commanded on/off status.

2. Alarm indication (connect to unit contacts).

3. Boiler leaving temperature.

4. Boiler control (local – hand/off/auto, EMCS – hand/off/auto).

H. Electric Heaters:

1. On/Off Status.

2. Space temperature.

3. Space temperature setpoint.

I. Miscellaneous:

1. Outside Air Temperature (two locations).

2. MDF Room Temperature. Indicate alarm if above setpoint.

3. Fire Alarm Status.

4. Cooler Temperature. Indicate alarm if above setpoint.

3.03 START-UP

A. Calibration and Commissioning: As each part of the systems become operational, this Contractor shall calibrate all sensing and readout devices and shall test and observe the operation of each and every air moving and/or heating unit and shall adjust all controls so that the items function according to the intent of the specifications. The control contractor shall commission all controls prior to the work of Section 20 08 00 being done. This commissioning work shall include a point-to-point check of all devices, check of sequences, check of proper wiring, and documentation substantiating the work.

B. Report/Statement: After making all necessary system testing and adjusting, the Contractor shall submit a report to the Engineer indicating all testing/adjustment work done and comment on how system is operating. Such report shall be signed by the individual directly responsible for supervision of the installation of the control system. When the Contractor feels that the system is complete and ready for review by the Engineer, Contractor shall submit a written statement (signed by same individuals as for report) stating that the system is in compliance with the project requirements and ready for review.

C. Owner Instruction: See Section 20 05 00.

D. Start-up Trend Logs: The Contractor shall submit to and review with the Engineer daily for a period of four weeks after substantial completion a hard copy log of the following:

1. Five Owner selected room temperature values at 15 minute intervals.

2. Outside air temperature values at 15 minute intervals.

E. Warranty Trend Logs: Two months after Owner acceptance of the work, the Contractor shall submit to and review with the Engineer a single tabulated 30 day hard copy printout of the systems historical data containing the following information:

1. Date.

2. Hour by hour zone temperature, for five Owner selected rooms.

3. Hour by hour OA temperature.

F. Documentation: Contractor shall provide a hard copy documentation of the software application program for each digital controller (TUC, NAC). Documentation provided shall include block software flow chart showing the interconnection between each of the control algorithms and sequences for systems utilizing program listings. A program listing shall be printed onto the same blueprint, along with the program flow chart, and description of the sequence of operation. A hard copy of this document shall be stored and maintained in each stand-alone digital controller panel. System acceptance shall not be completed until this documentation is provided and located in each panel.

END OF SECTION

PART 1 GENERAL

1.01 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 00 and Division 01 Specification Sections, apply to this Section.

B. Requirements of Section 20 05 00 apply to this Section.

1.02 WORK INCLUDED

A. Control System Design.

B. Control System Sequence of Operation.

1.03 SUBMITTALS

A. General: Comply with Section 20 05 00.

B. Sequences: Submit complete description of sequence of operation for all systems. Sequence submitted shall not be a direct copy of the sequence specified herein, but shall be written to reflect the actual control sequences provided and to more closely match the actual programming used.

C. Programming: Submit copy of system programming logic.

1.04 GENERAL REQUIREMENTS

A. Bidder Design: The control system is bidder designed subject to the requirements of the Contract Documents.

B. Modifications: Software, graphics, and sequences shall be revised and updated as necessary to reflect Owner or Engineer desired changes. Contractor to include in bid no less than 16 hours of control technician's/programmer's time to accomplish the required system modifications.

C. Sequence Terminology: Wherever the control sequences refer to an article, device or piece of equipment in the singular number, such reference shall mean to include as many of such articles, devices, or equipment as are shown on the plans, required for the sequence, or required to complete the installation. Wherever the control sequence refers to an operating stage in the singular number, such reference shall mean to include as many stages as are specified for the equipment and shall mean analog (i.e. proportional) type control where specified for the equipment (reference drawings and equipment specifications).

D. All DDC Control: All controls and sequences shall be provided by the Division 25 DDC control system, unless specifically noted otherwise. Where interval timer, switch control, or a similar manual control is indicated, the control device shall provide an input to the

DDC system with the DDC system providing an output for control. No line voltage controls or other controls which do not "pass through" the DDC control system are allowed, unless directly stated that is the method of control to be used. Exceptions to DDC Control: emergency shut-down and similar safety devices required (or noted) to be hard wired.

PART 2 PRODUCTS

NOT USED

PART 3 INSTALLATION

3.01 GENERAL

A. Complete System:

1. General: Provide complete control system design, all software, programming, wiring, and control devices as required to allow for automatic control of all mechanical equipment and other systems as indicated; with sequences of operation and features specified. Provide all control interconnections between indoor and outdoor units, all required control connections between equipment components, and to any other devices needed for proper operation. See also Section 25 50 00 for related requirements.

2. Various thermostats, motorized dampers, and other devices are not shown on the drawings but are required per the sequence of operation specified. Coordinate with Engineer for location of all such devices prior to installing. Indicate proposed locations on submittals.

B. Sequences:

1. Additional Sequences: See Section 25 50 00 for system requirements that relate to control sequences; see drawings for additional control sequences and requirements.

2. Control Action: Sequences which involve maintaining a setpoint in response to variable conditions shall use proportional-integral (PI) or proportional-integral-derivative (PID) control (unless noted otherwise). Sequences shall comply with the system performance requirements and other requirements of Section 25 50 00.

3. Missing Sequences: Where no sequence of operation is indicated submit a proposed sequence to the Engineer for review. Such sequences shall match the intended equipment use, code, and ASHRAE standards for the type of equipment and application. HVAC equipment shall have control of heating/cooling operation by area thermostats and control of unit components (i.e. fans dampers) to allow for distribution of heating/cooling and control of ventilation air; fans and similar on/off items shall have time schedule and thermostat control (unless the

application clearly implies a different method).

C. Settings:

1. Adjustability: All settings, setpoints, and differentials shall be adjustable. All setpoints indicated are initial settings.

2. Confirm Settings: Confirm with Owner all setpoints, all time schedules, and all other adjustable programming parameters before substantial completion.

3. Thermostat Setpoints: Shall be adjustable at operator's workstation, with initial settings as follows unless indicated otherwise:

Occupied Heating	70 degrees F
Unoccupied Heating	65 degrees F
Occupied Cooling	75 degrees F
Unoccupied Cooling	85 degrees F

D. Time Control:

1. Control system shall provide time schedules for occupied/unoccupied mode switching for all items having sequences with occupied/unoccupied modes, and for all items indicted as having time schedule control.

2. Provide independent time schedules for all mechanical equipment, except where equipment is indicated to be interlocked to other equipment.

3. Provide seasonal (i.e. time of year) control for all mechanical equipment.

4. Provide a single Holiday Schedule or Master Holiday schedule for logical equipment groups as directed by the Owner at submittal time and revised by the Owner during the Owner training. At the end of the warranty period readjust the grouping of equipment as directed by the Owner.

5. Provide independent optimum start schedules (i.e. warm-up cycles) for mechanical equipment indicated to have (or required to have) optimum start.

6. VRF Heat Pump System: Shall operate under its own controls. See Section 23 81 27 for VRF sequences.

E. Hand-Off-Auto Control: Provide all control devices and connections to allow Hand-Off-Auto (HOA) control of all controlled items; where unit starters or VFD's provide HOA control no additional controls are required, but this Section controls shall be arranged to allow for HOA controls.

F. Alarms: Provide alarms for the following:

1. Status of item does not equal commanded status (where proof of status is monitored, e.g. supply fan not proven on when commanded on).

2. Equipment in alarm (where equipment alarm state is monitored).

3. System response is not consistent with commanded response (e.g. air handling unit SA temperature is not less than MA temperature and unit is commanded to cooling).

4. Freezestat alarm (for all hydronic coils).

5. Safety device alarm (where device is monitored by or connected to the control system).

6. Space temperature in alarm range (10 deg F or more above cooling setpoint; 10 deg F or more below heating setpoint).

7. Sensor failure (out of range).

G. Fire/Smoke Shutdown:

1. Smoke Detector: Provide necessary conduit, wiring, and accessories to shutdown each unit upon activation of that unit's smoke detectors. Connections shall be hardwired; independent of any control system logic, so that failure of control system or loss of control system will in no way prevent the shutdown of each unit. In addition to shutting down the unit with the alarmed smoke detector, all equipment interlocked or served by that unit shall be off. Other units shall also shut-off as required to avoid building pressure differentials and similar undesirable effects.

2. Fire Alarm System: Shut-down all air handling equipment when the building fire alarm system goes into alarm. Contacts in the fire alarm system are available for this purpose. This shut-down may be accomplished by use of control logic and is not required to be hardwired but shall be of a fail-safe nature so as to provide the necessary shut-down in case of control failure and the control components shall be rated for such purposes (as required by the AHJ).

H. Automatic Restart:

1. General: Equipment shall automatically restart after being shut-off by a power outage, fire alarm, smoke detector, or similar alarm (or fault); upon clearing of the alarm (or fault). System shall revert to its normal operation for the conditions at the time of restarting.

2. Controlled Restart: Provide controlled re-start by building wing or building floor and in a manner to prevent pressure differentials, equipment issues, or other undesirable effects. Provide time delay on the re-start of equipment 2.5 KW and larger to minimize electrical surges.

I. Interlocks: May be accomplished by software rather than field hard wired relays or other devices, except for: fire alarm shut-down of equipment 2000 cfm and greater, freezestat shutdown, boiler and chiller emergency shut-off switches, where required by manufactures, where required by AHJ, and where noted to be hard-wired.

3.02 HEAT PUMPS – SEQUENCE OF OPERATION

A. General:

1. Control unit's cooling, heating, and system dampers (economizer), in proper sequence to provide a supply air temperature that will satisfy space conditions.

2. Heating and cooling shall be properly sequenced so that there is no overlap between the use of heating and cooling.

3. Controls shall evaluate the space deviation from setpoint and rate of change of this deviation to determine heating/cooling and economizer operation to satisfy setpoint without excess variation in space temperatures.

B. Occupied Mode:

1. Fan: Fan shall run continuously.

2. Shall be activated by central time schedule or if any thermostat's override mode is activated.

3. Heating: Heat pump shall operate at initial stage of heating, with supplementary electric heater as final stage. Activate heater when outdoor unit goes into defrost.

4. Cooling: Heat pumps with economizers shall use outside air economizer as the first stage of cooling. Economizer shall be dry bulb or enthalpy type, using OA temperature sensor, Mixed Air (MA) temperature sensor and supply air (SA) temperature control scheme. Economizer shall be enabled only when OA temperature (or enthalpy) is less than the units Return Air (RA) temperature (or enthalpy). The OA/RA dampers shall be modulated as required to satisfy the SA temperature control scheme and shall be limited by a MA sensor low limit setpoint (initial setpoint 54 degrees F). Heat pump shall operate in the cooling mode as the final stage of cooling.

5. OA Dampers: OA dampers shall be in the minimum position when unit is in heating and under economizer control when unit is in cooling. OA damper shall not close below the minimum airflow setting indicated on the plans; coordinate with balancer for minimum setting.

6. Relief Dampers: Motorized relief dampers (where applicable) shall operate in unison with the OA dampers to progressively open as the OA dampers open; provide with an offset control so that the relief dampers do not begin opening until the OA dampers are at least 15% open.

C. Unoccupied Mode: Unit fan and heating/cooling shall cycle on and off as required to maintain unoccupied setpoints. OA dampers shall be fully closed unless economizer cooling is required.

D. Warm-up Mode: Unit shall run as in the unoccupied mode (OA fully closed) until the space temperature has warmed up to the occupied mode heating setpoint, then unit shall

operate as specified for the occupied mode.

E. Mode Control: Units' mode of operation shall be determined by time schedule and time schedule override; warm-up mode shall be initiated by optimum start controls.

3.03 PUMPS

A. Heating Pumps:

1. Lead Pump: Pump shall be activated when a boiler is enabled. Provide delay-on and delay-off control so that boiler is enabled after pump is commanded on, and pump continues to run after boiler is commanded off. Delay shall be 1 minute "on", 2 minutes "off".

2. Lead/Standby Sequence: Provide operator selection of which pump is lead and which is standby. Provide flow detection and time delay relay to allow automatic transfer to standby pump in case of lead pump failure; de-energize lead pump when transfer occurs. Provide manual reset means at GUI and in boiler room to restore normal pump operation after standby operation. Provide alarm indication at GUI and in boiler room (red light) to indicate lead pump failure. Automatically alternate lead and standby pumps weekly (provide means to manually override alternating schedule).

3. Pumps shall be controlled by variable frequency drive (VFD). Provide a VFD for each pump. Provide differential pressure sensor to control VFD (and pump speed) to maintain system differential. Locate differential pressure sensor in main HWS/HWR piping. Verify setpoint with balancer; setpoint will be approximately 40 to 50 feet (18 to 22 psi).

3.04 WATER SOURCE HEAT PUMP LOOP

A. General:

1. Operate boilers and fluid cooler to maintain loop temperature between limits. Boilers shall be off when fluid cooler is staged on.

2. Loop temperature shall be maintained between “high” and “low” setpoints. Initial setpoints (adjustable):

High	80 deg F
Low	65 deg F

B. Fluid Cooler:

1. General: Operate in stages to maintain system below “high” setpoint.

2. Operation: Provide 30 second delay between change in fan speeds. Controls shall stage fluid cooler as follows:

Stage	Operation
1	Dampers open and spray pump on

2 Fan On - Low Speed
3 Fan On - High Speed

3. Fluid Cooler Controls: Provide all control devices, power wiring, and control wiring to allow proper operation. Interface and coordinate with fluid cooler control panel; some control feature may be integral with unit panel. Controls include but are not limited to the following:

   a. Closure Dampers: Provide time delay relay and connections for dampers to close when unit is off and operate as first stage with unit operation. Time delay shall prevent unit operation until dampers are fully open. Provide damper actuator.

   b. Water Level Controls: Connect solenoid valve to operate and provide make-up water at proper levels and to be closed upon loss of power.

   c. Immersion Heater: Interlock with spray water pump to de-energize heaters when spray pump is running. Connect thermostat for operation at temperatures below 40°F.

   d. Power: Provide power wiring and fusing to all control devices requiring power. See electrical drawings for extent of Division 26 work.

C. Boilers:

1. General: Operate boiler(s) to maintain system above “low” setpoint. Boilers shall be off when OA temperature is above boiler lockout setpoint; initially set at 65°F.

2. Modes: Provide the following modes of operation selectable at the COS:

   a. Off: Boiler(s) shall be off.

   b. On: Boiler(s) shall be enabled to operate, and shall operate in stages (or modulate) with control by the boiler’s integral controls to maintain system “low” setpoint. Fluid cooler shall be disabled.

   c. Auto: Boiler shall be enabled to operate when fluid cooler is not enabled and the OA temperature is below an OA “lockout” setpoint (initial setpoint shall be 58 deg F). One OA temperature is 2 deg F or move above the “lockout” setpoint (or fluid cooler is enabled), the boiler shall be off. When enabled, boiler shall operate in stages (or modulate) with control by the boiler’s integral controls to maintain system “low” setpoint.

3. Provide controls to inter-tie boiler alarm indication into DDC system.

4. Emergency Boiler Shutdown: Connect boiler controls through a wall mounted emergency shutdown switch to completely stop boiler operation when switch is pressed.

D. Circulation Pumps:

1. General: One pump is a standby the other pump is the primary pump. Provide system occupied and unoccupied modes (i.e. time schedule). When system is in the occupied mode the primary pump shall run continuous. When in the unoccupied mode pump shall operate if any water source heat pump unit calls for heating or cooling. When OA temperature is blow the "Always On" setpoint (initial setpoint 40 deg F), primary pump shall run continuous.

2. Primary/Standby Sequence: Provide operator selection of which pump is primary and which is standby. Provide pressure switch and time delay relay to allow automatic transfer to standby pump in case of primary pump failure; de-energize primary pump when transfer occurs. Provide manual reset means at COS and in mechanical room to restore normal pump operation after standby operation. Provide alarm indication upon pump failure. Provide alarm light and reset button in mechanical room. Provide "alternator" sequence to allow for automatic alternating of pumps weekly (if selected at COS).

3. Speed Control: Pumps shall be controlled by variable frequency drive (VFD). Provide a VFD for each pump. Provide differential pressure sensor to control VFD (and pump speed) to maintain system differential. Locate differential pressure sensor in main S/R piping; verify setpoint and location with engineer.

3.05 ELECTRIC DUCT HEATERS

A. Heaters Serving DOAS Units Supply Air:

1. General: Heater shall be controlled by a duct mounted temperature sensor and outdoor air temperature sensor. Heater capacity shall be varied to meet the supply air setpoint. Heater shall have staged or proportional control as indicated.

2. Operation: Heater shall be allowed to operate once the outside air temperature has fallen below setpoint (initially set at 60 deg F) and duct air temperature (downstream of heater) has fallen below setpoint (initially set at 70 deg F).

3. Interlock: Shall be hard-wire interlocked with the supply fan on the unit which serves the heater, to only allow heater operation when the unit's fan is proven on. Provide differential pressure switch or CT's at unit fan to provide proof of operation.

3.06 MAKE-UP AIR UNIT

A. On/Off: Interlock unit with exhaust fan system served by unit, so that unit is on when system exhaust fan is on. Make-up air unit outside air damper shall be open when unit is on, and closed when unit is off. Provide time delay and proof of outside damper being open prior to allowing exhaust fan and make-up air unit to operate. Synchronize start-up of exhaust fan and make-up air unit fan to prevent pressure differentials in building due to varying start times.

B. Temperature Control: Control unit's heating (in stages or with modulating control) to satisfy the supply air temperature setpoint; initially set at 70 deg F.

3.07 ROOFTOP UNIT – GAS HEATING/ELECTRIC COOLING

A. General:

1. Control unit's cooling, heating and system dampers (economizer) in proper sequence to provide a supply air temperature that will satisfy space conditions.

2. Heating and cooling shall be properly sequenced so that there is no overlap between the use of heating and cooling.

1. Controls shall evaluate the space deviation from setpoint and rate of change of this deviation to determine heating/cooling and economizer operation to satisfy setpoint without excess variation in space temperatures.

B. Occupied Mode:

1. Fan: Fan shall run continuously.

2. Heating: Heating shall be activated as required to satisfy the space setpoint.

3. Cooling: Unit shall have a dry bulb economizer for use of Outside Air (OA) for cooling. Economizer shall be the dry bulb type, using OA temperature sensor, mixed air (MA) temperature sensor, and supply air (SA) temperature control scheme. Economizer shall be enabled only when OA temperature is less than the units return air (RA) temperature. The OA and RA dampers shall be modulated as required to satisfy the SA temperature control scheme and shall be limited by a MA sensor low limit setpoint (initial setpoint 54 degrees). Unit shall operate in the cooling mode as the final stage of cooling.

4. OA Dampers: OA dampers shall be in the minimum position when unit is in heating and under economizer control when unit is in cooling. OA damper shall not close below the minimum airflow setting indicated on the plans; coordinate with balancer for minimum setting.

C. Unoccupied Mode: Unit fan and heating/cooling shall cycle on and off as required to maintain unoccupied setpoints. Outdoor air dampers shall be fully closed unless economizer cooling is required.

D. Warm-up Mode: Unit shall run as in the unoccupied mode (outdoor air dampers fully closed) until the space temperature has warmed up to the occupied mode heating setpoint, then unit shall operate as specified for the occupied mode.

E. Mode Control: Units' mode of operation shall be determined by time schedule and time schedule override; warm-up mode shall be initiated by optimum start controls.

3.08 MISCELLANEOUS

A. Miscellaneous Dampers/Devices: See plans for other dampers and devices requiring control. Provide control indicated. Where control is not indicated provide standard sequence typical for such devices in similar projects/applications.

B. Unit Heaters: Control by space thermostat; when space is above setpoint operate heater fan and modulate valve to maintain space setpoint. When space temperature falls below setpoint heater fan shall be off and valve closed.

END OF SECTION

DIVISION 26

ELECTRICAL

PART 1 GENERAL

1.01 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 00 and Division 01 Specification Sections, apply to this Section.

1.02 SECTION INCLUDES

A. General requirements specifically applicable to Division 26.

1.03 SCOPE OF ELECTRICAL WORK

A. Provide electrical systems and Work described, identified, specified, referenced, and shown in the Project Documents that are covered under Divisions 26 of the Construction Specifications Institute (CSI) and/or as otherwise regulated by national, state, and local electrical codes. Electrical Work includes providing all equipment, materials, devices, appurtenances, and accessories necessary to provide complete and operating systems according to the intent of Project Documents.

B. Electrical work is not limited to Division 26 specifications and what is shown on the electrical drawings. The Contractor is responsible to review all Project Documents for additional Electrical Work and requirements and to include this work as part of their scope under the Contract.

1.04 REGULATORY REQUIREMENTS

A. Comply with requirements of the following codes as adopted and supplemented by authority having jurisdiction:

ANSI/NFPA 70 - National Electric Code (NEC)
NFPA 101 - Life Safety Code
International Building Code (IBC)
International Mechanical Code (IMC)
WAC 296-46B - Washington State Electrical Safety Standards, Administration, and Installation
Washington State Energy Code (WSEC)

B. Comply with additional codes and regulations referenced in other sections.

C. Comply with additional codes and regulations required by authority having jurisdiction.

D. Obtain and pay for permits, and inspections from authorities having jurisdiction over work included under applicable Division Sections.

E. Include all testing, shop drawings, and documentation required by the inspection authorities for permitting and final approval.

1.05 SUBMITTALS

A. Comply with requirements of Division 01. Unless otherwise specified, furnish product data and shop drawings to Architect/Engineer as follows:

1. Product information sheets shall be neat, readable, 8.5 x 11 inch, submitted in PDF format. Generic product sheets with multiple products or product descriptions shall clearly highlight or otherwise indicate which product is being furnished. Product sheets shall be reasonably limited to not include entire catalog sections.

2. Furnish product submittals with a cover sheet and table of contents. Furnish a separate submittal and number for each section of the specifications. Cover sheet shall indicate name of the Project, Owner, Architect, Engineer, Contractor, and Date of Submittal. Product table of contents shall list each item submitted. Bookmark each submittal to facilitate browsing according to the type of products.

3. Furnish systems design shop drawings in PDF format. Title block shall include Project, Owner, Contractor, and Date of Submittal.

4. Furnish product data and shop drawings specifically indicating any conflict or deviation from requirements of contract documents.

5. Edited Content: Submittals shall indicate the equipment and options that are to be provided. Copies of an unedited catalog will be Rejected. Pages/items that are not applicable shall be deleted prior to submittal to the Engineer.

B. Confirm dimensions, ratings, and specifications of electrical materials, devices, fixtures, and equipment conform to project requirements prior to furnishing submittals. Coordinate electrical requirements with utilization equipment submitted under other sections and verify that voltage, phase, and rating are compatible with work shown in the electrical project documents.

C. Do not order materials or commence Work until applicable submittal has been reviewed and the Architect/Engineer has accepted.

D. Re-Submittals: If submittals are marked ‘Rejected’ or ‘Revise and Resubmit’, the Contractor shall revise the submittal to satisfy the comments or conform to project requirements, and submit to the Engineer for review. Only those items that were rejected or required a resubmittal will be reviewed by the Engineer; All other items will not be reviewed. All re-submittals shall be at least one of the following:

1. Provide a ‘Re-Submittal Summary Sheet’ which indicates how each comment was addressed (it is acceptable to add the responses to a copy of the original submittal review comments).

2. Cloud (or otherwise clearly identify) the revised portions to indicate what is different from the original submittal.

1.06 SUBSTITUTIONS

A. Comply with requirements of Division 01. Products specified by naming one or more manufacturers establishes a basis for quality, styling, capacity, and function. Unless otherwise specified, written requests for substitution must be received at least 14 days prior to Bid Opening by Architect/Engineer who will determine acceptability of proposed substitution. Written acceptance must be obtained from Architect/Engineer prior to Bid Opening.

B. Substitution requests may be submitted for any manufacturer or named product unless specified as "no substitute".

C. Substitution approval does not relieve the Contractor of complying with the work requirements or the concept and intent of the project documents. Pay for any and all additional project costs that may be caused by Contractor requested substitutions, regardless of whether or not additional costs are overlooked, missed, or unforeseen, and regardless of when substitutions may be approved.

1.07 RECORD DOCUMENTS

A. Comply with requirements of Division 01. Maintain at project site one set of clean, dry, and legible red-lined record drawings for submittal at Contract Close-out. Record information concurrently with construction progress.

B. Indicate electrical changes in the contract documents. Include change orders, revised branch circuit and feeder wiring layouts, revised circuit identification, pull & junction boxes added during construction, and actual dimensioned location and routing of each underground conduit on record drawings.

1.08 LABELING

A. Where labeling that includes room names and numbers is required for any system to identify devices or for programming purposes, use final room names and numbers determined during construction. Verify room names and numbers with Architect prior to manufacturing labels or programming software.

1.09 OPERATION AND MAINTENANCE MANUALS

A. Comply with requirements of Division 01. Unless otherwise specified, furnish one labeled CD in PDF format and two duplicate hard copy printed sets of Operation and Maintenance Manuals prior to completion of contract. Submit hard copy manuals in labeled and indexed 3-ring binder(s).

B. Include the following information as applicable:

1. Names, addresses, and telephone numbers of the contractor, the installing sub-contractor, and the local representative for each system or equipment.

2. All approved product data and shop drawings.

3. Identify all manufacturer warranties which exceed one year.

4. Model number and serial number of each piece of equipment provided.

5. Data from test results performed under the Contract.

C. Operation and maintenance data shall include complete parts lists, installation and maintenance instructions, safety precautions, operation sequence describing start- up, operation, and shut-down, internal and interconnecting wiring and control diagrams with data to explain detailed operation and control, and testing methods for each system and item of equipment.

D. Furnish a draft copy of Operations and Maintenance Manual for Architect/Engineer review and incorporate comments prior to final submittal. Allow 14 days for Architect/ Engineer review.

1.10 CONFLICTS

A. Notify the Architect/Engineer of any conflicts or discrepancies before proceeding with any work or the purchasing of any materials related to the conflict or discrepancy until requesting and obtaining written instructions from the Architect/Engineer on how to proceed. Where conflicts occur, the most expensive and stringent requirement as judged by the Architect/Engineer shall prevail. Any work done after discovery of such discrepancies or conflicts and prior to obtaining the Architect/Engineer's instructions on how to proceed shall be done at the Contractor's expense.

1.11 WARRANTY

A. In addition to requirements covered under General Conditions or Division 01, include manufacturer product warranties that exceed one year. Assemble or list warranties that exceed one year in Operation and Maintenance Manuals indicating start date. Certificates of extended warranty shall identify the Owner as the beneficiary.

B. If the Electrical Contractor does not have offices located within 150 miles of the project, provide a service/warranty work agreement with a local electrical subcontractor approved by the Owner. The service/warranty work agreement shall extend for the contract warranty period, and a copy shall be included in the Operation and Maintenance Manuals.

1.12 INTENT OF PROJECT DOCUMENTS

A. Drawings and specifications are complementary and what is called for in either is binding as if called for in both.

B. The drawings are diagrammatic and show the general arrangement of the construction and do not attempt to show all features of work, exact construction details, or actual routing of conduit and cable. Provide all necessary supports, off-sets, bends, risers, fittings, boxes, wiring, and accessories which are required for a complete and operating installation. Determine locations for required electrical outlets and connections prior to rough-in base on equipment product and installation submittal data and/or review of equipment on site.

C. The level of design presented in the documents represents the extent of the design being furnished to the Contractor; any additional design needed to perform the Work shall be provided by the Contractor. All design by the Contractor shall be performed by individuals skilled and experienced in such work, and where required by local code (or elsewhere in the documents) shall be performed by engineers licensed in the State where the project is located. Include in bid the costs of all such project design; including engineering, drafting, coordination, and all related activities and work. Contractor provided design services shall be included for but not limited to bidder design specifications, temporary electrical systems, layout routing to install the Work and share project space with other building systems, hanger and support systems, seismic bracing, preparation of shop drawings, locating and identifying requirements for equipment and fixture terminations, and methods/means of accomplishing the work.

1.13 COORDINATION

A. Examine architectural, civil, structural, and mechanical drawings and specifications and consult with other trades, as required to coordinate use of Project space and sequence of installation.

B. Arrange wiring and equipment to avoid interference with other work and to maximize accessibility for maintenance and repairs.

C. Coordinate with suppliers and installers to obtain product electrical data, shop drawings, and installation requirements for systems, equipment, and products furnished by Owner and/or other trades as required perform electrical work.

D. Contractor is responsible ensure that equipment, fixtures, and devices being furnished and installed shall fit the space available, taking into account connections, service access, and clearances required by product manufacturer and/or Code. Contractor shall make the necessary field measurements to ascertain the space requirements for proper installation, and shall furnish and/or install equipment so that final installation meets the intent of the Project Documents. If approval is received by Addendum or Change Order to use other than the originally specified items, Contractor shall be responsible for specified capacities and for ensuring that items to be furnished will fit the space available.

E. Contractor is responsible to review all the Project Documents and approved shop drawings provide under other divisions to identify and resolve conflicts between electrical systems and building construction, equipment, cabinets, counters, trim, and special finishes, prior to rough-in.

F. Facilitate coordination between low voltage system sub-contractors during construction. Include time for a minimum of one meeting with all sub-contractors prior to building rough-in to review requirements for each system per Section 26 05 30. Include a second meeting with all sub-contractors to review requirements for all systems utilizing IP structured cabling prior to cover.

1.14 REQUIREMENTS FOR EQUIPMENT FURNISHED UNDER OTHER SECTIONS OR BY OWNER

A. Provide power wiring, disconnect switches, electrical connection of equipment,

installation of furnished electrical controllers, parts, and accessories, and field wiring for systems, equipment, and products furnished under other divisions or by Owner. Install controllers, operator stations, and control devices such as limit and temperature switches furnished with equipment.

B. Review equipment submittals prior to electrical rough-in and installation. Verify location, rating, size, type of connections, and required space requirements. Coordinate field wiring requirements and details with supplier and installer. Notify Architect/Engineer of conflicts between requirements for actual equipment being furnished and equipment indicated in contract documents prior to commencing Work.

C. Provide motor controllers and operator stations unless otherwise indicated on the project drawings.

D. Make final connections to equipment. Provide cord and plug where required for plug-in connection.

E. Integrated automation systems covered under Division 25 are not included as part of electrical work.

1.15 DEFINITIONS

A. Electrical terms used in these specifications are as defined in NEC Art. 100 unless otherwise noted.

B. Abbreviations: Where not defined elsewhere in the Contract Documents, shall be as defined in RS Means Illustrated Construction Dictionary.

C. Accessible Ceiling: Signifies access that requires the removal of an access panel or similar removable obstruction.

D. The term "Architect," "Architect/Engineer" or "Engineer," means Hultz|BHU Engineers, 1111 Fawcett Avenue, Suite 100, Tacoma, WA, 98402.

E. As Required: As necessary to form a safe, neat, and complete working installation (or product), fulfilling all the requirements of the specifications and drawings and in compliance with all codes.

F. Concealed: Hidden from view as in walls, trenches, chases, furred spaces, crawl spaces, unfinished attics, and above suspended ceilings.

G. Conduit: Includes conduit and tubing raceways.

H. Coordinate: Accomplish the work with all others that are involved in the work by directly discussing the work with them, arranging and participating in special meetings with them to discuss and plan the work being done by each, obtaining and completing any necessary forms and documentation required for the work to proceed, reaching agreement on how parts of the work performed by each trade will be installed relative to each other both in physical location and in time sequence, exchanging all necessary information so as to allow the work to be accomplished with a united effort in accordance with the project

requirements.

I. Equipment Connection: Make branch circuit connection, mount and connect control devices as required. Provide disconnect and overcurrent protection when required by NEC and IMC, if not otherwise indicated or furnished with equipment.

J. Exposed: Exposed to view in any room, hallway, passageway or outdoors.

K. Finished Areas or Spaces: Areas and/or spaces receiving a finish coat of paint on one or more wall surface.

L. Furnish: Obtain and/or prepare and deliver to the project.

M. Indicated: Shown, scheduled, noted, or otherwise called out on the drawings.

N. Install: Enter permanently into the project complete and ready for service.

O. Open Cable or Wiring: Conductors above grade not installed in conduit or raceway.

P. Panel: Distribution panelboard, lighting and appliance panelboard, load center, and/or low voltage cabinet.

Q. Provide: Furnish and install complete and ready for service.

R. Wiring: The assembly of conductors, raceways, outlets, junction boxes, conduit bodies, fittings, and associated accessories, or an approved cable assembly.

S. Verify: Obtain, by a means independent of the project Architect/Engineer and Owner, the information noted and the information needed to properly perform the work.

PART 2 PRODUCTS

2.01 MATERIALS, EQUIPMENT

A. General: Furnish only products that are new and free from defects with a manufacture date that is less than six months from date of installation. Where product and applicable software updates or upgrades are available from the manufacturer, furnish the latest version unless otherwise specified. Furnishing discontinued products and/or products of manufacturers who are no longer in business is not permitted.

B. Listing and Labeling: Furnish and install only products that are listed and labeled by one or more of the following testing laboratories as approved by the Authority Having Jurisdiction:

Underwriter's Laboratories, Inc.	(UL)
ETL Testing Laboratories, Inc.	(ETL)
Factory Mutual	(FM)

C. Each specified product and system to be furnished shall be from a single approved manufacturer. Providing multiple product brands or manufacturers for each type or

category, or for multiple units of the same specified product and/or system, is not permitted.

D. Products shall be delivered, handled, and stored per manufacturer recommendations. Protect fixtures, materials, and equipment from rain, water, dust, dirt, snow, and damage. Do not install products that have marred, scratched, deformed, or otherwise damaged. Do not install products that have been wet or exposed to the weather prior to assembly and/or installation.

PART 3 EXECUTION

3.01 WORKMANSHIP

A. Electrical work shall conform to requirements of ANSI/NECA 1-2015, Standard Practice of Good Workmanship in Electrical Construction.

3.02 INSTALLATION

A. Provide all electrical work as specified and shown in the Project Documents. Provide all labor, equipment, material, accessories, and testing for electrical systems complete and operating. Include all scaffolding, rigging, hoisting, and services necessary for delivery and installation of materials and equipment.

B. Include all required software applications, licensing and associated system programming for electronic products. Provide all software to owner for onsite programming and interfacing.

C. Provide as part of the Electrical Work all hangers, brackets, supports, framing, backing, accessories, incidentals, not specifically identified the project documents, but required to complete the system(s) in a safe and satisfactory working condition.

D. Quantity of materials and layout of the Work shall be provided based on field measurement of the actual project conditions and shall not be based on plan dimensions.

E. Provide all testing and documentation of electrical systems as required to demonstrate compliance with the Project Documents.

F. Provide testing, documentation, and filing required to comply with commissioning requirements of Section C408 of the Energy Code. Include documentation in Operation and Maintenance Manuals.

3.03 CUTTING AND PATCHING

A. Provide cutting and patching to complete electrical work and to provide openings in elements of Work for electrical penetrations. Comply with requirements of Division 01.

B. Locate and execute cuts so as not to damage other work or weaken structural components. Core drill or saw cut rigid materials.

C. Patch to restore to original condition. Refinish surfaces to match adjacent finishes. For continuous surfaces, refinish to nearest intersection; for an assembly, refinish entire unit.

END OF SECTION

PART 1 GENERAL

1.01 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 00 and Division 01 Specification Sections, apply to this Section.

1.02 SECTION INCLUDES

A. Demolition of systems applicable to Division 26.

B. Requirements for remodeling applicable to Division 26.

1.03 EXISTING CONDITIONS

A. The drawings show portions of existing electrical systems which are to remain, be removed, or be modified under the Contract. Concealed features of existing systems are based on field observation and existing record drawings. No guarantee is made as to their correctness.

B. Contractors shall visit the project site prior to bidding and become familiar with the existing conditions and all other factors which may affect the execution of the work. Include all costs related to existing site conditions in the initial bid proposal. Many systems may not comply with NETA or other maintenance standards and may require special precautions and procedures.

C. Failure to visit the project site prior to bid does not relieve the Contractor of the responsibility to provide all required work and a complete installation within the intent of the Contract Documents.

1.04 EXISTING UNDERGROUND UTILITIES

A. Existing utilities in areas of new construction must be identified and located by the Contractor prior to commencing Work. Location of underground utilities shown on plans, are diagrammatic and shall not be considered as a complete representation of all utilities that may exist on site.

B. Coordinate with Owner to identify and locate existing underground utilities including landscape irrigation in areas of Work.

C. Prior to excavation, contact and coordinate with local Utilities Underground Location Center to identify and locate existing underground public utility services in areas of Work, including power, water, sewer, telephone, gas, and cable TV.

D. Prior to excavation, obtain services of a utility locator service to scan areas of Work and to locate and mark where known and unknown private underground utilities or other interfering obstructions exist.

E. Hand excavate to expose located interfering underground utilities and interfering obstructions before trenching. Provide adequate means of support and protection of exposed utilities.

F. Existing active utilities damaged or interrupted by the Contractor during construction shall be replaced at the Contractor's expense. Repairs to power and signal systems using junction boxes or splices will not be accepted.

1.05 POWER AND SIGNAL OUTAGES

A. The facility will continue normal operations during the construction work. The Contractor shall schedule power outages with the Architect/Engineer. Include coordination, identification of affected areas, work schedule, and re-energizing of electrical systems with minimal disruption to facility operations.

B. Unscheduled power or signal outages to Owner occupied areas and systems essential to facility operation or life safety shall not be permitted at any time. In the event that the Contractor's work causes or contributes to a power outage or other system fault, the Contractor is responsible for immediately correcting the problem.

C. Schedule power and signal outages for evenings, weekends, or holidays unless otherwise approved; include costs for overtime and work outside regular hours.

1.06 FIRE ALARM SYSTEM

A. Maintain and operate the existing fire alarm system during construction. Comply with alarm, incident response, and fire watch requirements of the Authorities Having Jurisdiction for all areas served by the system. Plan and provide fire watch and/or temporary wiring where new construction interrupts required system operation.

B. Provide dust protection for installed smoke detectors located within the work area. Clean detectors after work is completed and dust protection is removed.

C. Coordinate all planned shutdowns and tests of the fire alarm system with the Fire Department and Alarm Reporting Center. Notify the Alarm Reporting Center of false alarms that occur during construction as required to mitigate Fire Department response.

D. Provide investigation, correction, and required repairs to the alarm system for false alarms and system trouble that occur during the project and for system failures cause by the Work. Fines and penalties for excessive false alarms that occur during the Project shall be the responsibility of the Contractor.

E. The Owner shall provide reimbursement for expenses associated with false alarms, system trouble, and system failure if the contractor can satisfactorily demonstrate that the incidents are not related to the Project.

1.07 INTRUSION ALARM SYSTEM

A. Maintain and operate the existing intrusion alarm system during construction. Comply with alarm and incident response requirements of the monitoring agency and Owner for

all areas served by the system. Provide temporary wiring where new construction interrupts required system operation.

B. Provide dust protection for installed motion sensors located within the work area. Clean detectors after work is completed and dust protection is removed.

C. Coordinate all planned shutdowns and tests of the alarm system with Alarm Reporting Center. Notify the Alarm Reporting Center of false alarms that occur during construction as required to mitigate police response.

D. Provide investigation, correction, and required repairs to the alarm system for false alarms and system trouble that occur during the project and for system failures cause by the Work. Fines and penalties for excessive false alarms that occur during the Project shall be the responsibility of the Contractor.

E. The Owner shall provide reimbursement for expenses associated with false alarms, system trouble, and system failure if the contractor can satisfactorily demonstrate that the incidents are not related to the Project.

PART 2 PRODUCTS

2.01 MATERIALS AND EQUIPMENT

A. New and Replacement Materials and Equipment: As specified in applicable sections, except product manufacture shall match existing for minor construction and for accessories to equipment that remains.

B. Materials and Equipment for Patching: Match existing products.

C. In finished spaces provide surface metal raceway systems as specified in other sections where existing construction does not permit concealed installation.

PART 3 EXECUTION

3.01 PREPARATION

A. Field verify wiring and cabling for existing power and signal systems back to source of supply as required to perform Work.

B. Cut and Patch conduit penetrations and required holes to access work at walls.

3.02 DEMOLITION AND EXTENSION OF EXISTING ELECTRICAL WORK

A. Remove, relocate, and extend existing systems to accommodate new construction. For selective demolition, refer to architectural and mechanical plans and include electrical demolition to support removal and replacement work not otherwise indicated in electrical drawings.

B. Electrical demolition includes the disconnecting, removal, and disposal of fixtures, devices and equipment where indicated, along with associated wiring.

C. The following shall be considered as abandoned unless otherwise indicated:

1. Wiring to fixtures, devices, and equipment being removed or disconnected.

2. Conduit containing conductors or cable that have been disconnected from a source of supply or left empty by the removal of conductors.

3. Open conductors or cable that have been disconnected from a source of supply.

4. Fixtures, devices, equipment, and outlets located in walls, ceilings, and floors indicated to be removed.

5. Fixtures, devices, and equipment identified as being replaced.

D. Remove abandoned wire and cable for power and signal systems to source of supply.

E. Remove abandoned conduit, cable, and outlets where exposed and within accessible ceiling, attic, crawl, plenum, and opened wall spaces. Cut conduit flush with walls and floors; patch surfaces in finished spaces. Outdoors remove abandoned conduit and cable down to 24 inches below grade and restore site to its original grade and finish.

F. Disconnect abandoned outlets and remove devices. Provide blank covers for abandoned outlet boxes in floors, walls, and hard ceilings to remain.

G. Disconnect and remove abandoned switchboards, panelboards, distribution equipment, and electrical devices.

H. Disconnect power to utilization equipment being removed or abandoned in place.

I. Disconnect and remove abandoned light fixtures, including brackets, stems, hangers, pole base and other accessories.

J. Repair adjacent construction and finishes damaged during demolition and extension work.

K. Cut-in flush outlet boxes and fish conduit in existing construction of remodeled areas where conditions permit. Flexible conduit is approved where fishing of conduit is required. Where existing construction does not permit flush installation, use surface metal raceway.

L. Extend existing outlet boxes as required to accommodate new surface treatments or to extend wiring with surface raceway.

M. Maintain access to existing electrical systems to remain active. Modify installation or provide access panels as appropriate.

N. Replace, modify or extend existing outlet boxes to meet volume requirements. Cut surfaces as required to replace (or modify) existing outlet boxes and to install supports for new boxes and fixtures and patch to match adjacent surface.

O. Provide new supports for existing conduit and open cable accessed during construction and which is to remain or be reused, as required to comply with current Code. Comply with requirements of applicable signal system specifications for support of signal cables.

3.03 DISPOSITION OF MATERIALS

A. Prior to start of demolition, coordinate with Owner to identify materials and equipment for salvage. Disconnect and remove items to be salvaged and deliver to an area on site designated by the Owner. Disconnect, remove, and handle salvage material and equipment in a manner so as not to damage or otherwise render unusable.

B. Materials and equipment removed and not reused or salvaged to the Owner shall become the property of the Contractor unless otherwise indicated. Remove such material and equipment from the Owner's property and dispose legally off site.

3.04 NAMEPLATES AND CIRCUIT DIRECTORIES

A. Provide nameplates for existing distribution equipment to indicate new and revised equipment, circuit, and load designations.

B. Update panelboard and load center circuit directories to indicate changes and additions to each circuit. Updated and existing circuits shall be typewritten on new removable circuit index cards.

C. Nameplates and circuit directories shall comply with requirements of Section 26 20 00.

END OF SECTION

PART 1 GENERAL

1.01 RELATED DOCUMENTS

A. Section 26 01 00 - Electrical General Requirements.

B. Section 26 05 00 - Basic Materials and Methods.

1.02 SECTION INCLUDES

A. Conduit and Fittings.

B. Building Wire and Cable.

C. Wiring Connections and Terminations.

D. Boxes.

E. Supporting Devices.

F. Requirements for Fire Rated Construction.

1.03 SUBMITTALS

A. Submit product data for conduit fittings, wire and cable, watertight connectors, and wiring devices.

1.04 OPERATION AND MAINTENANCE DATA

A. Include data for wiring devices, floor boxes, smoke detectors, and cable tray in Operation and Maintenance Manuals.

PART 2 PRODUCTS

2.01 CONDUIT

A. Rigid Steel Conduit (RGS): ANSI C80.1; hot dipped galvanized.

B. Intermediate Metal Conduit (IMC): Hot dipped galvanized.

C. Electric Metallic Tubing (EMT): ANSI C80.3; galvanized tubing.

D. Flexible Metal Conduit: Galvanized steel. Heavy wall except reduced wall may be used where concealed in building construction.

E. Liquid Tight Flexible Metal Conduit: Galvanized steel, PVC jacket.

F. Non-Metallic Conduit: NEMA TC 2; EPC-40-PVC and EPC-80-PVC.

2.02 FITTINGS

A. RGS and IMC Conduit: ANSI/NEMA FB 1; threaded type. Provide bushings, hubs and connectors with insulated throat, for conduit terminations.

B. EMT Conduit: ANSI/NEMA FB 1; steel, compression type. Crimp-on, drive-on, indenter, and set screw type prohibited. Provide connectors with insulated throat for conduit larger than 3/4-inch diameter. Provide raintight fittings for conduit installed outdoors.

C. Flexible Conduit: ANSI/NEMA FB 1; steel, single screw squeeze type.

D. Liquid Tight Flexible Conduit: ANSI C33.84, steel. Provide PVC coated fitting where installed outdoors.

E. PVC Conduit: NEMA TC 3; solvent welded type, same manufacture as conduit. Provide bushings, hubs and connectors with insulated throat, for conduit terminations.

F. Water and Vapor Conduit Sealants: Hydra-Seal S-50 conduit sealing putty or approved; Tyco/Rachem/TE blank duct plug or approved; Polywater FST conduit sealing foam system or approved.

2.03 WIRE AND CABLE

A. Copper Building Wire, Interior: Type THWN-2, 600 volt insulation; conductors 8 AWG and larger shall be stranded. Type XHHW-2 may be substituted for conductor sizes 4 AWG and larger.

B. Copper Building Wire, Outdoors: Type RHW/USE-2, 600 volt insulation; conductor 8 AWG and larger shall be stranded.

C. Fire Rated Building Wire: Type RHH or RHW-2, UL2196, 600 volt insulation, copper conductor, UL classified 2-hour rated cable when installed in approved steel conduit system. Type RHH may be used only in dry locations.

2.04 WIRE CONNECTORS

A. Connectors for Wire Size 10 AWG and Smaller: Insulated steel spring twist-on pressure connector with plastic cap. Outdoors use watertight type with prefilled sealant gel.

B. Connectors for Wire Size 8 AWG and Larger: Solderless mechanical or compression type with pre-formed or shrink sleeve insulated cover. Outdoors make watertight using shrink sleeve or pigtail cap and sealing mastic.

C. Outdoor Taps Below Grade for Wire Size #6 AWG and Larger: Ilsco PED series underground multi-tap, wire range and number of ports as required.

D. Gutter/Wireway Taps for Wire Size #6 AWG and Larger: Ilsco type PDB series AL/CU lug type distribution block, number of poles and quantity/size of primary/secondary lug ports as required for the application.

2.05 BOXES

A. Junction and Pull Boxes: Outlet box with blank cover except boxes larger than 4 inch square shall be screw cover type, galvanized steel with grey enamel finish, NEMA 1 indoors and NEMA 3R outdoors, unless otherwise indicated.

B. Fire Rated Construction: Recessed outlet boxes and rough-in cans that are installed in 2 hour rated area separation walls shall be UL listed with 1-1/2 hour rating label.

C. Color Coding of Device and Junction Boxes for Special Systems: Field painted or otherwise manufactured in the specified color, both inside and outside of box and cover. Provide color identification for the following electrical systems: Fire Alarm System - RED, Emergency Systems (NEC 700) - ORANGE.

2.06 SUPPORTING DEVICES

A. Metal Conduit Clamps and Straps: Steel, screw type; zinc or cadmium plated minimum indoors, hot dipped galvanized minimum outdoors.

B. Support Channel: Slotted 12-gauge steel channel with fittings, fasteners, brackets, clamps, floor plates, and accessories required; Pre-galvanized zinc coated (G90) indoors, ASTM 123 hot dipped galvanized outdoors.

C. Fasteners: Expansion anchors in concrete and solid masonry; toggle bolts in hollow masonry, plaster, or gypsum board wall construction; sheet metal screws in metal construction; wood screws in wood construction; set screw type beam clamps on steel columns and beams; U.L. listed clips for metal studs. Metal parts and accessories to be zinc or cadmium plated minimum indoors and hot dipped galvanized minimum outdoors.

D. Support Wires: Support wires above accessible ceiling grids, steel #12 AWG minimum.

E. Roof Supports: Do not install conduit exposed on roofs.

2.07 ACCESSORIES

A. Pulling Wire:

1. Interior; continuous fiber pulling line, 190# tensile strength.

2. Below grade; Polyester measuring pulling tape 5/8 inch wide, 1800# tensile strength. Muletape.

2.08 FIRE RATED CONSTRUCTION

A. Products for Fire Stopping to Seal Around Enclosures and Annular Space between Conduit and Building Construction at Conduit Penetrations: ANSI/UL 1479; Comply with requirements of Division 07.

B. Conduit Sleeves for Open Cable: ANSI/UL 1479; Fire stop conduit sleeve kit, with mounting escutcheons, gaskets, end bushings, warning labels, and non-hardening fire

stop putty. SpecSeal READY SLEEVE, FS100 (1 inch diameter sleeve) and FS200 (2 inch diameter sleeve), or approved.

C. Pathway Sleeves for Open Cable, Greater than 2 Inch Diameter: ANSI/UL1497; Fire stop rectangular sleeve kit, 3-inch wide by 3-inch high by 10.5-inch length, expandable in 6-inch increments, self-contained integral fire sealing system that automatically adjusts to the installed cable loading. Provide radius control modules (each end of pathway), single or multiple gang wall kits, and expansion modules as required. Specified Technologies, Inc., EZ-Path System Series 33 or approved.

PART 3 EXECUTION

3.01 WIRING METHODS

A. General:

1. Fixed wiring shall be conductors installed in conduit.

2. Conceal all wiring within construction unless otherwise noted on drawings or specifically authorized by the Architect/Engineer.

3. Where contractor wiring methods require the application of conductor ampacity adjustment or correction factors under NEC 310.15, the contractor shall submit calculations that show Code compliance, except the adjusted ampacity of the conductors installed shall not be less than the circuit overcurrent device rating shown or specified.

4. Conduit sizes shall not be reduced to smaller size than shown or otherwise noted on plans.

5. Feeders shown or otherwise noted on plans shall not be combined to share a common conduit homerun. Branch circuit homeruns shown or otherwise noted on plans shall not be combined to share a common conduit with other circuits.

6. Device Plates: It is the electrical contractor’s responsibility to ensure that all line voltage and low voltage system faceplates and visible trim pieces are the same color. Exception: Where stainless steel device plates are used for line voltage systems, low voltage systems may use non-metallic plates of the same color.

B. Conduit Requirements:

1. Rigid Steel Conduit (RGS): May be used in all areas. Required at penetrations thru fire rated construction rated greater than 1 hour.

2. Intermediate Metal Conduit (IMC): May be used in all areas except where RGS is required or indicated.

3. Electrical Metallic Tubing (EMT): May be used in dry and damp locations where not subject to damage. May not be used in concrete, where in contact with

earth, or where RGS is required or indicated. May not be used for service entrance conductors inside a building. Maximum trade size 2 inches.

4. Flexible Conduit: Required for final equipment connections (maximum length 36 inches). Use liquid tight in damp or wet locations.

5. Rigid Non-Metallic Conduit (PVC): May be used underground. May be used within buildings where encased in not less than 2 inches of concrete. Terminate inside building using RGS or IMC elbow and riser to first coupling above slab on grade.

C. Wire and Cable Requirements:

1. Use copper conductors.

3.02 SUPPORT - GENERAL

A. Support wiring, conduit, raceways, boxes, equipment, and fixtures from building structural members. Provide additional framing, channel, or listed support attachments as required to span or support between structural members and to avoid interference from pipes, ducts, and other equipment.

B. Do not install support anchors to penetrate thru roof deck.

C. Do not violate the integrity or exceed the capacity of the building structure used for support. Provide/fabricate additional support elements to transmit loads to the floor or other parts of the building structure that can carry the load as approved by the Architect/Engineer.

3.03 CONDUIT SIZING, ARRANGEMENT, AND SUPPORT

A. Minimum conduit trade size 1/2-inch diameter except all homeruns and where installed below grade outdoors conduits shall be 3/4-inch minimum diameter. Prewired 3/8 inch diameter flexible conduit not to exceed 72 inches in length may be used for fixture whips from an outlet box to recessed light fixture.

B. Arrange conduit to maintain headroom and present a neat appearance.

C. Route conduit parallel and perpendicular to walls and adjacent piping.

D. Maintain 12-inch clearance between conduit and heat sources such as flues, steam pipes, and heating appliances.

E. Locate holes in joists within center third of member depth measured from the edge and at least 24 inches from load bearing points. Maximum hole diameter one inch.

F. Support conduits from building structure with conduit straps or rods and hangers. #8 solid wire and CADDY clips may be used to hang 3/4-inch diameter conduit and smaller above accessible ceiling spaces.

G. Group conduit in parallel runs where practical and use conduit rack constructed of steel channel with conduit straps or clamps. Provide space for 25 percent additional conduit.

H. Do not support conduit with perforated pipe straps or tie wraps. Remove all wire used for temporary conduit support during construction, before conductors are pulled.

I. Do not bore holes in truss members or notch structural members.

J. Steel conduit installed as part of a 2 hour fire rated wiring assembly shall be supported 5 feet on center where required by the cable system installation requirements.

3.04 CONDUIT INSTALLATION

A. Use conduit hubs or sealing locknuts for fastening conduit to cast boxes and for fastening conduit to sheet metal boxes in damp locations.

B. Use conduit bodies to make sharp changes in direction, as around beams.

C. Use factory elbows for PVC conduit and for bends in metal conduit larger than 1 inch. Conduit bends for signal systems that are greater than 45 degrees shall be minimum radius sweeps as follows:

Under 2 inches	Standard radius
2 inches - 3 inches	24 inch radius
Over 3 inches	36 inch radius

D. Use factory RGS elbows for PVC conduit runs below grade.

E. Install insulated bushings on each end of conduit larger than 1 inch.

F. Use suitable conduit caps to protect installed conduit against entrance of dirt and moisture.

G. Install pull wire in empty conduits.

H. Conduit in Concrete Slabs Above Grade: Do not install in concrete slabs above grade except where written approval and installation requirements are provided by the Architect/Engineer.

I. Metal Conduit Installed Below Grade: Provide 20 mil thick factory PVC coating or field wrapped using corrosion protection tape and primer system with 50 percent wrap overlap; extend 8 inches above grade at risers.

J. Install flexible conduit thru oversized bushed sleeve or cored opening where conduit crosses building wall expansion or seismic joints. Provide up to 54 inches of flexible wiring with 6 inches minimum of conduit slack each side of the wall assembly to allow for free movement across the joint.

K. Do not install conduit in concrete slab on grade.

L. Do not install conduit in direct contact with underside of roof deck.

M. Seal all underground conduits entering and terminating within a building or structure using approved non hardening duct seal putty or a sealing bushing. Seal spare conduits using a watertight blank plastic duct plug. Seal all underground conduits entering and terminating below grade, such as in a crawl space or basement, using an approved closed cell foam sealant system.

3.05 CONDUIT PENETRATIONS

A. Roof Penetrations: Provide sheet lead flashing (4 pounds per square foot) around each conduit which penetrates a roof. Extend 10" in all directions from conduit, and up 8" on conduit sized to match conduit diameter. Seal top of flashing around conduit with a weatherproof non-hardening mastic.

B. Exterior Walls: Core drill or cast sleeve for each conduit one size larger than conduit diameter. Seal all openings at each penetration with acrylic weatherproof caulking suitable for painting. Below grade seal with "Chase-Foam" silicone sealant or other approved method acceptable to Architect/Engineer.

C. Interior Walls and Partitions: Cut one size larger than conduit diameter.

D. Fire Rated Construction: Comply with requirements of paragraph, FIRE RATED CONSTRUCTION, this specification.

3.06 CONDUCTOR INSTALLATION

A. Minimum Conductor Size: #12 AWG, except #10 AWG minimum for outdoor and exterior building lighting circuits and #14 AWG minimum for control circuits and for lighting fixture taps not to exceed 72 inches.

B. Splice conductors only in junction or outlet boxes and handholes.

C. Arrange conductors neatly at termination such that a clamp-on ammeter may be used.

D. Clean conduit free of debris before conductor installation; install conductors using pulling lubricant.

3.07 CONDUCTOR IDENTIFICATION

A. Provide non-metallic wire markers on each conductor in panelboards and in junction boxes having more than 6 conductors. Identify branch circuit or feeder number for power and lighting circuits.

B. Color Coding of Insulated Equipment Ground: Solid green.

C. Color Coding of 208/120 Volt System: Phase A - black, Phase B - red, Phase C - blue, Neutral - white.

D. Color Coding of 480/277 Volt System: Phase A - brown, Phase B - orange Phase C - yellow, Neutral - gray.

E. Color Coding of Switch Legs: Pink.

F. Color Coding of Travelers (3-Way and 4-Way Switching): Purple.

G. Provide color tracers on neutrals to differentiate circuits on multi-wire branch circuits with separate neutrals.

3.08 BOX LOCATIONS

A. Provide electrical boxes for outlets, junctions and equipment connections as shown and as required for splices, taps, wire pulling, and code compliance.

B. Electrical box locations shown are approximate unless dimensioned. Obtain equipment outlet locations from equipment manufacturer prior to rough-in. Coordinate outlet and wall switch locations with casework and finish elements shown on Architectural drawings. Install to fit conditions or as directed.

C. Change location of wall outlets, wall switches, and lighting outlets up to fifteen feet without charge when requested by Architect/Engineer prior to installation.

D. Height of outlets unless otherwise directed: See Drawings.

3.09 BOX INSTALLATION

A. Set wall outlet and wall switch boxes vertically.

B. Support boxes independently of conduit, piping, and ductwork; securely fasten in place.

C. Provide recessed outlet boxes in finished areas. Flush front edge of box or plaster ring even with finished surface.

D. Provide blank cover plate over all boxes that do not contain devices or are not covered by equipment.

E. Do not install flush boxes on opposite sides of a wall within the same stud space. Maintain 24 inch minimum box separation in fire rated wall assemblies.

F. In-Ground Boxes: Set on 9 inch minimum deep gravel base extending 6 inches minimum beyond each side. Set flush with final grade.

3.10 WIRING DEVICES

A. Ground Fault Circuit Interrupter (GFCI) Protection: Provide for receptacles located outdoors, within 6 feet of sinks, in bathrooms, kitchens, indoor wet locations, locker rooms with associated shower facilities, elevator pits, elevator machine rooms, crawl spaces, garages, service bays, rooftops, at counters and work surfaces where food and/or

beverage preparation occurs, water coolers, and as otherwise indicated. GFCI receptacles are not required where branch circuit is protected by GFCI circuit breaker.

B. Ground Fault Circuit Interrupter (GFCI) Protection, Dwelling Units: Provide for receptacles located outdoors, within 6 feet of sinks, in bathrooms, indoor wet locations, crawl spaces, unfinished basements, garages and accessory buildings, at kitchen counters and work surfaces where food and/or beverage preparation occurs, water coolers, and as otherwise indicated. GFCI receptacles are not required where branch circuit is protected by GFCI circuit breaker.

3.11 FIRE RATED CONSTRUCTION

A. Verify location of fire rated walls and ceilings with Architectural plans prior to rough-in.

B. Installation of boxes, rough-in cans, conduits, and sleeves that result in membrane or through penetrations shall comply with IBC 712.1 through 712.4 as required to maintain fire rating of construction assembly. Coordinate locations and construction requirements with General Contractor.

C. Provide approved conduit and/or pathway sleeve kits for installation of open cable through fire rated construction.

3.12 LABELING

A. Outlets: Identify panel and circuit number on faceplate of convenience and special purpose outlets. Use self-adhesive, polyester or vinyl laminated labels with machine generated alpha-numeric circuit identification, 1/4-inch high black letters on clear background. Exception: Use white letters on black or brown color device plates.

B. Junction Boxes: Label or mark cover with panel and circuit number. Locate on inside of cover except locate on outside of junction box cover in attics, crawl spaces, equipment rooms and above accessible ceilings.

3.13 TESTS

A. Perform continuity test on all feeder and branch circuit conductors. Verify proper phasing and that no short circuits or accidental grounds exist.

B. Check all convenience outlets for correct wiring connections using a polarity circuit tester. Test AFCI and GFCI circuits for proper operation with an approved tester.

C. Torque test conductor lug terminations to manufacturers recommended values.

D. Test straight-blade convenience outlets in patient-care areas for the retention force of the grounding blade according to NFPA 99. Retention force shall be no less than 4 oz. (115 g).

END OF SECTION

PART 1 GENERAL

1.01 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 00 and Division 01 Specification Sections, apply to this Section.

B. Concrete for Equipment Pads: Comply with Division 03 - Concrete.

C. Commissioning of Electrical Energy Metering: Comply with Division 01.

1.02 SECTION INCLUDES

A. Disconnect Switches.

B. Fuses.

C. Enclosed Circuit Breakers.

D. Nameplates.

1.03 SUBMITTALS

A. Submit product data for enclosed circuit breakers. Dry type transformer submittal must indicate compliance with minimum efficiency requirements specified.

B. Submit shop drawings for dry type transformers. Include installation requirements for anchoring and bracing meeting requirements of the International Building Code for Seismic Design Category F.

C. Coordinate dimensions of equipment with site and project space dimensions to verify equipment will fit, conform to indicated layout, and meet NEC and manufacturer clearance requirements.

D. Submit reports for tests required under Part 3 of this section. Submit manufacturer's performance testing instructions and signed written performance test records for equipment ground fault protection systems.

E. Submit product data and shop drawings for service switchboard to serving utility for review and approval in addition to Architect/Engineer submittal requirements.

1.04 OPERATION AND MAINTENANCE DATA

A. Include data for switchboards, panelboards, circuit breakers, motor controllers, transformers, fuses, contactors, busway, studies, and tests in Operation & Maintenance Manuals.

1.05 SPARE PARTS

A. Fuses: Furnish to Owner 3 spare fuses of each type and rating installed.

B. Fuse Pullers: Furnish 2 fuse pullers to the Owner.

PART 2 PRODUCTS

2.01 ACCEPTABLE MANUFACTURERS

A. Switchboards, Panelboards, Circuit Breakers and Disconnects: Square 'D', Siemens, Cutler-Hammer, General Electric - ABB.

B. Fuses: Bussman and Littelfuse.

C. Dry Type Transformers: Square 'D', General Electric - ABB, Siemens, Cutler-Hammer, Federal Pacific.

2.02 ENCLOSED CIRCUIT BREAKERS

A. Circuit Breakers: UL 489; molded case circuit breaker with thermal magnetic trip fixed mounted, single handle common pole operation, AIC rating greater than available symmetrical short circuit amperes.

B. Electrical Ratings, Configuration, and Special Features: As shown on drawings. The indicated ampere interrupting capacity (AIC) shown on the drawings is the full rms symmetrical equipment short circuit rating of bussing and of all overcurrent devices installed.

C. Enclosures: NEMA ICS6; Type 1 for dry locations, Type 3R for damp or outdoor, with pad locking provisions, and suitable for use as service equipment. Include neutral and/or ground kits as required.

2.03 DISCONNECT SWITCHES

A. Safety Switches: NEMA KS 1; heavy duty, quick make, quick break, handle with lock out / tag out provisions. Provide rating, number of poles, and fusing required for load served.

B. Safety Switches for Variable Frequency Drives (VFD): Safety switches installed on the load side of VFD controllers shall include an interlock to disable controller operation when the safety switch handle is operated to the open positon.

C. Toggle Switches for Small Motors and Appliances: NEMA WD 1; horsepower rated 20 ampere general use snap switch with lock-out attachment.

D. Switch Enclosures: NEMA ICS 6; Type 1 for dry locations, Type 3R for damp or outdoor locations.

2.04 FUSES

A. Approved Fuses, 600 Amperes and Less, for Branch Circuits and Power Distribution:

1. ANSI/UL 198C Class J low peak with time delay unless otherwise indicated except ANSI/UL 198E Class RK5 may be used in safety switches for protection of motors and transformers.

2. For Protection of Circuit Breakers: Fuses must comply with NEC 240.86 series rating requirements for load side circuit breakers that are not rated for the available fault current. Coordinate series rating requirements with published manufacturer's listings for circuit breakers installed.

B. Approved Fuses, Over 600 Amperes, for Branch Circuits and Power Distribution:

1. ANSI/UL 198C Class L low peak with time delay unless otherwise indicated.

2. For Protection of Circuit Breakers: Fuses must comply with NEC 240.86 series rating requirements for load side circuit breakers that are not rated for the available fault current. Coordinate series rating requirements with published manufacturer's listings for circuit breakers installed.

2.05 NAMEPLATES AND LABELS

A. Nameplates: Engraved three-layer laminated plastic, white letters on black background, affixed with stainless steel screws, adhesive acceptable in dry locations. Use black letters on yellow background for series combination rating identification.

B. Letter Height: 1/2 inch for series combination rating identification. 1/4 inch for switchboards, panelboards, motor control centers, circuit breakers, switches, and disconnecting means; 1/8 inch for motor starters, contactors, time switches, and equipment served.

C. Arc Flash Protection Labels: ANSI Z535.4; Self adhesive vinyl label factory installed by the equipment manufacturer with ANSI header to read WARNING or DANGER and informational text to include:

Electric Arc Flash Hazard
Turn off all power before opening.
Follow all requirements in NFPA 70E for safe work practices and for Personal Protective Equipment.
Failure to comply can result in death or injury.

PART 3 EXECUTION

3.01 DISCONNECTS

A. Provide a disconnect in addition to the controller disconnecting means at installed motor loads that are not in sight of motor controller as required by NEC 430.102(B).

B. Safety Switches for Variable Frequency Drives (VFD): Provide two (2) #12 600 volt rated conductors with the motor feeder between VFD and load side motor disconnect

interlock to disable controller operation when the safety switch handle is operated to the open position.

3.02 FUSES

A. Install fuses in fusible switches.

B. Size fuses for motor loads at 150% of nameplate full load amperes; size fuses for air conditioning and refrigeration equipment at maximum recommended nameplate rating.

3.03 CIRCUIT BREAKERS

A. Install circuit breakers in accordance with manufacturer instructions and recommendations.

B. Set adjustable breakers to comply with the approved protective device coordination study or as directed by the Engineer.

3.04 NAMEPLATES AND LABELS

A. Individual Enclosed Circuit Breakers, Safety Switches, and Disconnecting Means: Provide nameplate to identify load served and circuit source and circuit number.

B. Equipment Served: Provide nameplate to identify equipment designation corresponding with nameplate of serving overcurrent device, disconnect switch, or controller when there is more than one of same type of equipment being served, e.g. Air Handler No. 2. Coordinate with Architect/Engineer to assign numbers when not designated in equipment schedules.

C. Nameplate and Label Location: Secure to equipment fronts, except recessed panelboards in finished locations secure nameplates and labels to inside face of door.

D. Service Equipment: Provide label identifying short circuit rating indicated along with date of construction documents.

3.05 TESTS

A. Motors and Compressors: Record all nameplate data. Measure actual voltage and running amperes for each phase. Record manufacturer and catalog number of overload thermal units installed.

B. Dry Type Transformers: Measure primary and secondary voltages after loads are connected and systems are energized. Adjust taps for -1% to +2% of rated secondary voltage.

C. Equipment Ground Fault Protection Systems: Test prior to being placed into service to verify proper installation and operation of the system as determined by the equipment manufacturer’s published instructions. Set pick up for 300 amps and time delay for zero (instantaneous) unless otherwise indicated or directed. Record test results.

D. Outdoor Dry Transformer Ground Electrode System: ANSI/IEEE 81; measure and record ohmic value by performing fall of potential tests using a ground testing megger. Tests shall be performed with the ground electrode system disconnected/isolated from neutral and with the test current probe located at least 100 feet from the nearest ground system electrode.

END OF SECTION