

# PROJECT MANUAL

## MCLOUGHLIN HIGH SCHOOL GYM HVAC RENOVATION

Milton-Freewater, Oregon

July 8<sup>th</sup>, 2023

**OWNER:**

Milton-Freewater School District 7  
1020 South Mill Street  
Milton-Freewater, Oregon 97862

**Contact:**

Craig Gaines, Facilities  
Phone: (541) 938-3551  
Email: [Craig.Gaines@miltfree.k12.or.us](mailto:Craig.Gaines@miltfree.k12.or.us)

**MECHANICAL ENGINEER:**

Helix Energy Partners LLC  
PO Box 418 Helix, Oregon 97835

**Contact:**

Mike Lovejoy, PE  
Phone: (541) 379-0271  
Email: [ml@helix-engineers.net](mailto:ml@helix-engineers.net)

**ELECTRICAL ENGINEER:**

Connetix Engineering  
1430 N. 16<sup>th</sup> Ave  
Yakima, WA 98902

**Contact:**

Brad Bailey, PE  
Phone: (509) 965-9872  
Email: [bbb@coneng.com](mailto:bbb@coneng.com)



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**Invitation to Bid  
001116-1**

Firm Bid quotes for the **McLoughlin High School Gym HVAC Renovation** project are requested.

The owner is requesting a single, all-inclusive bid. Bidder is responsible for the following under this work:

Mechanical  
Electrical  
Controls

Please submit Bids to Milton-Freewater School District 7 1020 South Mill Street, Milton-Freewater OR 97862 by 3:00 pm on August 17th, 2022.

Bids received after the stated time will not be considered.

A optional pre-Bid walk-through will be held at 11:00 am on August 10, 2022.

Additional pre-bid walks may be coordinated with the owner, subject to availability.

Formal pre-qualifications are not required or desired.

No Bidder may withdraw their Bid within 30 days after the hour set for opening. The Owner will have the right to waive any formalities and to reject any and all Bids.

No Bid will be considered without a statement by the Bidder, as a part of the Bid, that the provisions required by ORS 279.300, General Policies and ORS279.800, Prevailing Wage Rates shall be included in this Contract.

A Bid Bond or certified check shall be executed in favor of Milton-Freewater Unified School District 7, and an amount of not less than 10 percent of the total basic Bid sum will be required.

**Instructions to Bidders  
002113-1**

**PART 1- GENERAL**

**1.1 DEFINITIONS**

- A. The following definitions shall apply to the various titles used in these Bid Documents:
1. Owner:  
Milton-Freewater School District 7  
1020 South Mill Street  
Milton-Freewater, Oregon 97862
  2. Site:  
McLoughlin High School  
1020 South Main Street  
Milton-Freewater, Oregon 97862
  3. Engineer:  
Helix Energy Partners LLC  
115 Main Street  
Helix, OR 97835  
(541) 379-0271 Phone
  4. Bid:  
A competitive offer, which is binding on the offerer, in which price, delivery (or project completion), and conformance to specification and the requirements of the Invitation to Bid, will be the predominant award criteria.
  5. Bidder:  
An individual, firm, or corporation, who submits a Bid in response to a contracting agency's Invitation to Bid.
  6. Contractor:  
The individual, firm, or corporation awarded the Contract for the Work contemplated.
  7. The Contract Documents:  
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 Document shall not be construed to create a contractual relation of any kind (1) between the Engineer and Contractor, (2) between the Owner and a Subcontractor, (3) between the Owner and Engineer, or (4) between any person or entities other than the Owner and contractor. The Engineers shall, however, be entitled to performance and enforcement of obligations under the contract intended to facilitate performance of the Engineer=s duties.

It is the intent to issue only one Contract for this project, even though several different trades may be involved. Therefore, only those Bidders qualified by registration and experience should Bid multi-trade projects.

**Instructions to Bidders**  
**002113-2**

8.     **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 Contract.
9.     **The Project:**  
The Project is the total construction of which the Work performed under the Contract Documents may be whole or a part and which may include construction by the Owner or by separate contractors.
10.    **The Drawings:**  
The Drawings are graphic and pictorial portions of the Contract Documents showing the design, location, and dimensions of the Work, generally including plans, elevations, sections, details, schedules, and diagrams.
11.    **The Specifications:**  
The Specifications are that portions of the Contract Documents consisting of the written requirements for materials, equipment systems, standards, and workmanship for the Work, and performance of related services.
12.    **The Project Manual:**  
The Project Manual is a volume assembled for the Work which may include bidding requirements, sample forms, Conditions of the Contract, Drawings, and Specifications.
13.    **Request for Information (RFI):**  
Contractor report form for a request for information to clarify any errors, inconsistencies or omissions discovered in the Contract Documents.
14.    **Shop Drawings:**  
Shop Drawings are drawings, diagrams, schedules, and other data specially prepared for the Work by the Contractor or a Subcontractor, Sub-subcontractor, manufacturer, supplier, or distributor to illustrate some portion of the Work.
15.    **Product Data:**  
Product Data are illustrations, standard schedules, performance charts, instructions, brochures, diagrams, and other information furnished by the Contractor to illustrate materials or equipment for some portion of the Work.
16.    **Sub-system Contractors:**  
The successful Bidder will be awarded the Contract. Subcontractors will be responsible to this Contractor.

**Instructions to Bidders  
002113-3**

**PART 2 - BIDDING PROCEDURE**

**2.1 EXAMINATION OF SITE AND CONTRACT DOCUMENTS**

- A. Bidders shall carefully examine the documents and the construction Site to obtain first-hand knowledge of existing conditions. Submit Bid with the understanding that prior to submission of Bid, Bidder has become acquainted with the requirements of the Contract Documents, the Site, and has obtained all information essential for completion of the work on or before the date specified. The Bidder shall not, at any time after the submission of Bid, set up any claims whatsoever based upon insufficient data or incorrectly assumed conditions. Nor shall Bidder claim any misunderstanding in regard to the nature, conditions, or character of Work to be done under the contract, and shall assume all risks resulting from any changes in conditions which may occur during the progress of the Work. Contractors will not be given extra payments for conditions which can be determined by examining the Site and Contract Documents.

**2.2 INTERPRETATION OF DOCUMENTS**

- A. The Engineer and Owner will not be responsible for oral clarification. Submit in writing to the Engineer, all questions regarding the Contract Documents. Replies in the form of Addenda will be issued to all Bidders of Record and will become a part of the Contract.

**2.3 COMPLETION REQUIREMENTS**

- A. In order to meet the Owner's schedule:
- |                                    |                   |
|------------------------------------|-------------------|
| 1. Mandatory Pre-Bid walk-through. | August 10, 2022   |
| 2. Bid due date.                   | August 17, 2022   |
| 3. Contract award.                 | August 24, 2022   |
| 4. Begin construction.             | June 10, 2023     |
| 5. Completion of heating system.   | August 22, 2023   |
| 6. Completion of cooling system.   | November 1, 2023  |
| 7. Final job closeout.             | December 16, 2023 |

**Instructions to Bidders**  
**002113-4**

**PART 3 - BIDS**

**3.1 BID FORMS**

- A. The Bidder shall submit Bid on the official Bid Form provided in the project Specifications. Correctly fill in all blank spaces in the Bid Form where indicated for each and every item for which a description is given. State the prices, either typed or written in ink, in words and numerals for proposed Work to be done by Bidder. In case of discrepancy, the written words shall be considered as being the Bid price. Completed forms shall contain no lineations, alterations, erasures or recapitulation of Work to be done.

**3.2 CORRECT SIGNATURES**

- A. If the Bidder is an individual trading under their own or a fictitious name, the Bid shall be signed by the Authorized Individual of the Contractor, and the exact mailing address and telephone number shall be given. If someone other than the Authorized Individual signs the Bid, then a notarized Certificate of Authority signed by the Authorized Individual of the Contractor shall accompany the Bid.
- B. If the Bidder is a firm or partnership trading under an individual or fictitious name, the Bid shall be signed by one or more partners with the exact names and mailing addresses of the firm or partnership members included. If someone other than a partner signs the Bid, then a notarized Certificate of Authority signed by all the partners shall accompany the Bid.
- C. If the Bidder is a corporation, the Bid proposal shall be signed by the President or Vice-President, or by an individual with a notarized Certificate of Authority shall accompany the Bid. Names, titles, telephone numbers, and business addresses of the president, secretary, and treasurer shall appear on the Certificate or Authority.
- D. The corporate Bidder shall include the name of the state under which it is incorporated.
- E. No agreement will be made with a Bidder who is a foreign corporation, or who is operating under a fictitious or assumed name, unless such Bidder has complied or agrees to comply with the proper qualifications and registration under the laws of the State of Oregon, and such compliance or agreement to comply has been communicated to the Engineer at the time of the Bid opening.

**3.3 BID ASSURANCE**

- A. The Bidder is to agree not to withdraw their Bid for a period of 30 days after the scheduled closing time. If the Bid is accepted, Bidder shall execute an Agreement with the Owner and deliver the specified Performance and Payment Bonds.



**Instructions to Bidders**  
**002113-5**

**3.4 BID SECURITY**

- A. Bid shall be accompanied by a Bid Bond or certified check, payable to the Owner, of not less than 10 percent of the total Lump Sum Basic Bid in the Bid From.
- B. Submit Bid Security with the understanding it shall guarantee that Bidder will not withdraw the Bid for a period of 30 days after the scheduled closing time. If the Bid is accepted, Bidder shall execute an Agreement with the Owner and deliver the specified Performance and Payment Bonds. In the event of withdrawal of the Bid within said period, failure to execute an Agreement, or failure to deliver Performance and Payment Bonds within 10 days after receiving notice of acceptance of the Bid, the Bid Security will be forfeited.
- C. The Bidder shall be liable to the Owner for the full amount of the Bid security as representing the damage to the Owner on account of the default of the Bidder in any particular hereof. The Bid Bond shall be satisfactory to the Owner and executed by a licensed bonding company doing business in the State of Oregon.

**3.5 PERFORMANCE BOND AND LABOR-MATERIAL PAYMENT BOND**

- A. The successful Bidder shall be bonded by Performance Bond and Labor-Material Payment Bond, each in an amount equal to 100% of the Contract. The bonds shall be satisfactory to the Owner and executed by a licensed bonding company doing business in the State of Oregon. The Bid shall include the cost of such Bonds. Deliver required bonds to Owner not later than the date of execution of the Agreement. Submit, with Bid, evidence satisfactory to the Owner that such bonds will be issued. The attorney who executes the required bonds on behalf of the surety shall affix to the bonds a certified and current copy of his/her power of attorney indicating the monetary limit of such power.

**Bid Form  
004100-1**

The following Bid Form shall be part of Contract Work.

**Project:** *McLoughlin High School Gym HVAC Renovation*

**Owner:** Milton-Freewater School District 7

1020 South Mill Street

Milton-Freewater Oregon 97862

**Bid Number:** \_\_\_\_\_

**Bid Opening:** \_\_\_\_\_

**Time:** \_\_\_\_\_

**Contractor:** \_\_\_\_\_

**Address:** \_\_\_\_\_

**Date:** \_\_\_\_\_

The Undersigned, having visited the Site of the proposed construction and having become familiarized with the conditions affecting the cost of the Work and all requirements of the Contract Documents, hereby proposes and agrees to provide any and all labor, materials, equipment, transportation, and services, and perform all Work for McLoughlin High School Gym HVAC Renovation. The Undersigned also agrees to perform all Work in strict accordance with the Plans and Specifications included in the Contract Documents and any Addenda issued prior to Bid closing date.

The Undersigned agrees, if awarded the Contract for the Project, to complete the Work not later than December 16, 2023.

The Undersigned further agrees not to withdraw the Bid for a period of thirty (30) days after the scheduled closing time. If awarded the Contract, the Undersigned further agrees to be bound by the Agreement with the Owner and present the required Performance Bond within five (5) days of the notification to proceed and to complete the same within the stipulated time after award on Contract.

In case the heating is not available by the start of school, August 29<sup>th</sup>, contractor is required to provide temporary heating to maintain space temperatures above 68°F during occupied hours.

Bid Security in an amount not less than ten (10) percent of the total Lump Sum Basic Bid in the Bid Form is enclosed. The Undersigned further agrees that the Bid Security, payable to the Owner, shall be left in escrow with the Owner; that if selected by the Owner as successful Bidder, the full amount of the Bid Security as the measure of liquidated damages which the Owner will sustain by failure of the Undersigned to execute and deliver the specified Contract and Performance Material-Payment Bond within five (5) days after written notification of such selection, shall be forfeited and become payable to the Owner if the Undersigned defaults by such failure.

**Lump Sum Basic Bid Price of**

**Bid Form  
004100-2**

Bid: \_\_\_\_\_ \$ \_\_\_\_\_  
(Bid Price in Words)

The following Addenda have been received, and their costs are included in this Bid:

Addendum # _____	Date _____
Addendum # _____	Date _____
Addendum # _____	Date _____

**Bid Form  
004100-3**

It is understood that the Contract is to be awarded to a single Bidder and for all items.

The Bidder specifically agrees to the provisions required by ORS 279 and 279C, General Policies and Prevailing Wage Rates that are required by this Contract.

Bidder has made optional inspection of Site: Yes \_\_\_\_\_ No \_\_\_\_\_

Bidder's Name \_\_\_\_\_

Bidder's Address \_\_\_\_\_

Federal Tax I.D. # \_\_\_\_\_

State of Oregon Construction Contractors Board Registration # \_\_\_\_\_

Expiration Date \_\_\_\_\_

Telephone # \_\_\_\_\_

Signature \_\_\_\_\_

Signing Officer \_\_\_\_\_

Office Held \_\_\_\_\_ Date \_\_\_\_\_

If a Partnership, Members of Firm \_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

If Firm Is Corporation, State in Which Incorporated \_\_\_\_\_

***Corporate Seal***

**Supplementary Conditions**  
**007300-1**

The following supplements modify, change, delete or add to the "General Conditions of the Contract for Construction," AIA Document A201 - 2007 Edition, which is part of these Specifications, Articles 1 through 14 inclusive. Where any part of the General Conditions is modified or voided by these Supplementary Conditions, the unaltered provisions of that part shall remain in effect.

**ARTICLE 1 - GENERAL PROVISIONS**

**1.1 BASIC DEFINITIONS**

**"1.1.1 THE CONTRACT DOCUMENTS**

Delete the third sentence:

Unless specifically enumerated in the Agreement, the Contract Documents do not include other documents such as bidding requirements (advertisement or invitation to bid, Instructions to Bidders, sample forms, the Contractor's bid or portion of Addenda relating to bidding requirements).@

Replace with:

Unless specifically enumerated in the Agreement, the Contract Documents does include other documents such as bidding requirements (advertisement or invitation to bid, Instructions to Bidders, sample forms, the Contractor's bid or portion of Addenda relating to bidding requirements).@

Add:

**"1.1.8 ADDITIONAL DEFINITIONS**

- 1.1.8.1 The term "Engineer" is to have been substituted for "Architect" under the Contract Documents and in Division 00, Section 00 72 00.
- 1.1.8.2 The term "provide" shall mean:  
Include all labor necessary to produce the construction, and all materials, tools, systems and equipment incorporated in the work of the specifications.
- 1.1.8.3 The term "furnish" shall mean:  
Supply (including delivery and unloading) to the Project Site, or other location indicated, the specified materials and equipment to be incorporated or placed in the construction.
- 1.1.8.4 The terms "directed" and "selected" shall mean:  
Directed by and selected by the "Engineer."

**Supplementary Conditions  
007300-2**

**ARTICLE 9 PAYMENTS AND COMPLETION**

Add:

"9.1.2 The Owner will make payment on account of the Contract Sum, based on the value of work estimated by the Contractor in the schedule of values, and approved by the Engineer to have been completed. Itemized application for payment shall be made, in triplicate on Application and Certificate for Payment Form, AIA Document G702A. Progress payments will be made only if:

- a) the Contract sum exceeds \$10,000, and
- b) the Contractor requests same. A final payment will be processed immediately following pickup of all Punch List items.@

Add to paragraph 9.3.1:

AThe Owner will retain from each progress payment, until Final Completion of the Work, [five (5)] percent of the amount as shown on the approved monthly Request for Payment Form. There will be no reduction in retainage made on the amounts earned after Substantial Completion."

**9.8 SUBSTANTIAL COMPLETION**

Delete paragraph 9.8.1. in its entirety and insert:

"9.8.1. The Date of Substantial Completion of the Work is the date certified by the Engineer when construction is sufficiently complete in accordance with the Contract Documents, accessible, operable and usable by the Owner; all parts, systems and Site work complete and cleaned for the Owner's full use; and the Contractor has delivered to the Owner the required Certificate of Occupancy issued by the Building Official. Only incidental corrective work under "Punch Lists and final cleaning beyond cleaning for Owner's full use may remain for "Final Completion."

**ARTICLE 11 INSURANCE AND BONDS**

Add to Paragraph 11.1.2:

"The Contractor agrees to furnish evidence of Public Liability Insurance and Vehicle Liability Coverage in Comprehensive General and Automobile Bodily Injury and Property Damage Policy Form (issued by an insurance company licensed to do business in the State of Oregon) and with limits for the Public and Vehicle Liability Insurance (Bodily Injury) and aggregate for Property Damage as follows:

1. Workmen's Compensation as required by all applicable Federal, State, Maritime, or other laws, including Employer's Liability, with a limit of at least \$300,000 or equivalent through umbrella.

**Supplementary Conditions  
007300-3**

2. Comprehensive General Liability including Contractor's Liability, Contingent Liability, Contractual Liability, Completed Operations and Products Liability, all on the occurrence basis with Personal Injury Coverage and Broad Form Property Damage. Remove the CU exclusion relating to Collapse and Underground Property Damage. Completed Operations Liability shall be kept in force for at least one year after the date of final completion.
3. Comprehensive Automobile Liability including non-ownership and hired car coverage, as well as owned vehicles for Bodily Injury and Property Damage.
4. All for a combined single limit coverage of \$1,000,000.

**ARTICLE 13 MISCELLANEOUS PROVISIONS**

Add new Paragraph:

**13.8 CIVIL RIGHTS**

- 13.8.1 "The Contractor shall comply with the provisions of all State and Federal laws relative to non-discrimination in employment."

**Wage Rate Requirements  
007343-1**

BOLI booklet can be accessed and printed from the internet at:

<https://www.oregon.gov/boli/employers/Pages/prevaling-wage-rates.aspx>

**END OF DIVISION**



**Summary**  
**001116-1**

**PART 1 - GENERAL**

**1.1 RELATED WORK**

- A. Work related to this Section is specified in other sections. Other sections of these Specifications also apply even though not described here.

**1.2 WORK COVERED BY CONTRACT DOCUMENTS**

- A. Work covers all labor and materials for the complete installation of McLoughlin High School Gym HVAC Renovation as specified herein and as shown on the Drawings. Work shall be performed by skilled workers, properly trained, qualified, and licensed for this Work.

**1.3 CONTRACTOR'S DUTIES**

- A. Except as specifically noted, each Contractor shall provide:
  - 1. Labor, superintendence, materials, equipment, supplies, tools, scaffolding, construction equipment, and machinery required for construction, transportation, and other facilities and services essential for proper execution and completion of the Work.
  - 2. Scheduling, coordination, cutting, and patching and all other items required by the Contract Documents to complete the Work.
  - 3. Temporary obstructions, enclosures, opening of streets for pipes, walls, etc., as stated in the Specifications and as shown on the Drawings
- B. The Contractor shall:
  - 1. Give required notices, comply with codes, ordinances, rules, regulations, and other legal requirements of public authorities which bear on performance of Work.
  - 2. As essential for proper execution and completion of Work, and as applicable at time of receipt of Bids, Contractor shall secure and pay for: permits, government fees, and licenses, except that Owner will pay all plan checking fees and Fire Marshall's fire and life safety fees.
  - 3. Be responsible for accessing areas to complete scope of work.
  - 4. Clean debris generated by Contractors Work and properly dispose.
  - 5. Patch and repair drywall damage to meet fire rating requirements in rooms designated in Scope of Work.
  - 6. Replace acoustical ceiling tile that are disturbed or damaged as a result of Contractor's work.
  - 7. Use care and not create unnecessary damage to existing surfaces.
- C. The Contractor shall be responsible for all violations of the law for any cause in connection with the construction of the Work or caused by obstruction of streets, sidewalks, or otherwise, and shall give all requisite notice to public authorities.
- D. Promptly submit written notice to Engineer of observed variance of Contract Documents from legal or code requirements.

**Summary**  
**001116-2**

- E. Review shop drawings and product data.
- F. Receive and unload products at site; inspect for completeness and for damage.
- G. Handle, store, install, and finish products. Coordinate storage of materials to be coordinated with the Owner.
- H. Repair or replace items damaged by Work of this Contract.
- I. Purchase and maintain liability insurance to protect Contractor from claims for not less than the limits of liability which Contractor is required to provide to Owner.
- J. Contractor to Conform to:
  - 1. General Conditions of the Contract for Construction, A. I. A. Document A201, Sixteenth Edition, 2007, Articles 1 through 14 inclusive, as approved by the State of Oregon.
- K. Enforce strict discipline and good order among employees.
- L. Do not employ on work unfit persons or persons not skilled in assigned tasks.

**1.4 COORDINATION**

- A. The Contractor is responsible for overall coordination of the Project described herein. Cooperation among the various crafts and contract is essential for the proper execution of the Work.
- B. Coordination sequence of work to accommodate Owner occupancy.
- C. Coordinate Work under direction of Engineer or Owner's Representative.
- D. Perform all essential Work to receive or join with Work of all trades, and make essential connections required to prevent interruption of service to existing facilities.
- E. Coordinate Work to provide adequate clearances for installation and maintenance of equipment.
- F. Relocate installed work which does not provide adequate accessibility.
- G. Coordinate space requirements and installation of mechanical, plumbing, and electrical work, which are indicated diagrammatically on Drawings. Follow routing as closely as practical; make runs parallel with line of building. Utilize spaces efficiently to maximize accessibility for other installations and maintenance.

**Summary**  
**001116-3**

**1.5 JOB CONDITIONS**

- A. Contract Documents show and describe overall installation of equipment. Electrical or Mechanical Drawings are diagrammatic and do not show every offset, bend or elbow which may be required for installation in the space provided.
- B. Include all items required for a complete installation, whether or not shown or described.
- C. Follow indicated routing of pipes and ducts as closely as practicable. Provide clearances and headroom, and utilize spaces efficiently to maintain adequate accessibility for future maintenance, repairs, and additions.
- D. Existing facilities are located as accurately as can be determined from existing drawings and on-site inspections. Verify at Site.

**1.6 CONTRACTOR USE OF PREMISES**

- A. Confine operations at site to areas permitted by Contract Documents and as directed by Project Manager or Owner's Representative.
- B. Do not unreasonably encumber site with materials or equipment. Do not load structure with weight that will endanger structure.
- C. **The building will be occupied during final portions of the work; therefore, the Contractor must take precaution not to interfere with operation of occupants or shut down any building services during operating business hours without obtaining prior approval to do so by building maintenance. Allow for safe entry/exit of Owner's occupancy or public. Maintain building security as required by Owner.**
- D. Assume full responsibility for protection and safekeeping of products stored on premises. Move any stored products which interfere with operations of Owner or other Contractors. Obtain and pay for use of additional storage or work areas needed for operations.
- E. Limit Contractor's employee parking and storage to locations designated at the pre-construction conference.
- F. Conform to fire/life/safety requirements and fire equipment access.
- G. Allow for safe entry and exit for vehicles and pedestrians.
- H. Conduct operations in such a way to ensure the least inconvenience to the Owner's staff and general public, including:
  - 1. Limitations and easements.
  - 2. Emergency vehicle access.

**Summary**  
**001116-4**

3. Building access to the public, day and night.
4. Use of stairs.
5. Storage space available.
6. Work areas.

**1.7 TRANSPORTATION AND HANDLING**

- A. Arrange deliveries of products in accordance with construction schedules.
  1. Coordinate to avoid conflict with Work and conditions at the Site.
- B. Deliver products in undamaged condition in manufacturer's original containers or packaging with identifying labels intact and legible.
- C. Inspect shipments to assure compliance with requirements of Contract Documents and reviewed submittals, and that products are undamaged.
- D. Provide equipment and personnel to handle products by methods to prevent soiling or damage to products or packaging.

**1.8 STORAGE**

- A. Interior Storage:
  1. Store with seals and labels intact and legible and in weather tight enclosure when subject to damage by the elements.
  2. Maintain required temperature and humidity ranges in Contractor provided enclosures. Suitability of Owner furnished storage shall be judged and used by Contractor to meet manufacturer's requirements.
- B. Exterior Storage:
  1. Store materials above the ground on blocking or skids to prevent soiling, staining, and/or moisture infiltration. Cover materials with waterproof breathable sheet coverings, such as canvas tarps, when they are subject to deterioration by the elements; provide adequate ventilation to avoid condensation. Materials allowed to become damp or wet shall not be used in the project and shall be rejected. Storage locations shall be approved in advance by the Owner.
- C. Arrange storage in a manner to provide easy access for inspections of stored products to assure that products are maintained under specified conditions and free from damage or deterioration.
- D. Provide substantial coverings as necessary to protect installed products from damage from traffic and subsequent construction operations. Remove when no longer needed.
- E. Make arrangements and coordinate with Owner's Representative on-site storage activities. Security for on-site stored materials is the responsibility of the

**Summary**  
**001116-5**

Contractor.

- F. The Contractor is responsible for designating the delivery dates of Owner-furnished items in the Contractor's Construction Schedule and for receiving, unloading, and handling Owner-furnished items at the site. The Contractor is responsible for protecting Owner-furnished items from damage, including damage from exposure to the elements, and to repair or replace items damaged as a result of their operations.

**1.9 ASBESTOS AND OTHER HAZARDOUS MATERIALS**

- A. Asbestos does exist at the JOB SITE. Any asbestos interfering with the new work shall be removed by the Owner. Asbestos removal is not part of this Contract. If the Contractor and/or his subcontractors or subordinates observes or suspects the existence of asbestos or other hazardous materials that interfere with the Work under this Contract, notify the Owner and Engineer immediately. Under no circumstances is asbestos to be removed by anyone other than a qualified asbestos removal contractor approved by the Owner. The Contractor will be held responsible for additional asbestos cleanup costs caused by the improper handling of asbestos by the Contractor and/or his subcontractors or subordinates.
- B. The Contractor will be required to schedule ten (10) days of slack or "down" time for the removal of hazardous materials without penalty to Owner for the delay of the Contract.

**1.10 ALTERNATES**

- A. Alternates quoted on Bid Forms will be exercised as Owner option. Accepted alternates will be listed in Owner-Contractor Agreement.

**1.11 SALVAGE**

- A. Owner shall identify which items shall remain with site or for Owners salvage. Other equipment or material to be removed to accommodate new work or is indicated for demolition shall become the property of the Contractor. Contractor shall safely remove or dispose of property salvaged by Contractor.

**PART 2 - PRODUCTS**

**2.1 REUSE OF EXISTING MATERIAL**

- A. Except as specifically indicated or specified, materials and equipment removed from existing construction shall not be used in the completed Work.
- B. For material and equipment specifically indicated or specified to be reused in the Work.

**Summary**  
**001116-6**

1. Use special care in removal, handling, storage, and reinstallation to assure proper function in the completed Work.
2. Arrange for transportation, storage, and handling of products which require off site storage, restoration, or renovation. Pay all costs for such Work.
3. Contractor shall be responsible for (but not limited to) removing and reinstalling mechanical units, vents, guys, antennae, and electrical and grounding wires or conduits.

**2.2 MATERIALS AND EQUIPMENT**

- A. Unless otherwise specified, provided material and equipment shall be:
  1. new
  2. free from defects impairing strength, durability, and appearance
  3. of current manufacture.
- B. Items specified shall be considered minimum as to quality, function, capacity, and suitability for application intended.
- C. Items incorporated into the Work shall conform to applicable Specifications and designated standards, and shall be of size, make, type, and quality specified herein, unless otherwise approved in writing.

**2.3 MANUFACTURED AND FABRICATED PRODUCTS**

- A. Design, fabricate, and assemble in accordance with current best engineering, industry, and shop practices. Manufacture like parts of duplicate units to standard size and gauge to make them interchangeable.
- B. Two or more items of the same kind shall be identical and made by the same manufacturer.

**PART 3 - EXECUTION**

**3.1 PREPARATION**

- A. Inspect existing conditions, project requirements, and the Contract Documents. Verify that materials and equipment being furnished meet specified requirements.

**3.2 MATERIAL HANDLING**

- A. If cranes, hoists, towers, or other lifting devices are necessary for the proper and efficient movement of materials, comply with these requirements:
  1. Use only experienced personnel.

**Summary**  
**001116-7**

2. Remove equipment as soon as possible after task is ended.
3. Coordinate the placement of such equipment with the Owner's Representative to insure that utility tunnels, utilities, and surfaces are not damaged.
4. Obtain required permits and meet the requirements of governing authorities regarding street and sidewalk closures, safety, noise, and other applicable regulations.

**3.3 QUALITY OF WORK**

- A. Unless otherwise specified, perform the Work using workers skilled in the particular type of work involved.
- B. Should the Owner, in writing, deem anyone on the Work incompetent or unfit for the assigned duties, dismiss the worker immediately or reassign the worker to a different task requiring a lesser degree of competence.
- C. Work shall be first class in every respect and Work performed shall be according to the best trade practices.
- D. The Contractor shall maintain effective supervision on the project at all times Work is being performed. The Superintendent shall be the same person throughout the project and shall attend the preconstruction conference.

**3.4 TESTING**

- A. The Owner reserves the right to perform any testing as may be required to determine compliance with Project Contract Documents. Costs for such testing will be the Owner's responsibility unless testing indicates noncompliance. Cost for such testing indicating noncompliance shall be borne by the Contractor. Noncomplying Work shall be corrected and testing will be repeated until the Work complies with the Project Contract Documents. Contractor will pay the cost for retesting noncomplying Work.
- B. The Contractor shall cooperate in every respect with the activities of the testing agency.

**END OF SECTION**

**Substitution Procedures  
012500-1**

**PART 1 - GENERAL**

**1.1 DESCRIPTION**

- A. This section specifies general requirements for the Work in relation to substitutions and product options.
- B. Work related to this Section is specified in other sections. Other sections of these specifications also apply even though not described here.

**1.2 REQUESTS FOR SUBSTITUTIONS**

- A. Requests for substitution of products in place of those specified shall be in accordance with Section 013300, Submittal Procedures; and as specified herein.

**1.3 CONTRACTOR'S RESPONSIBILITIES**

- A. Investigate proposed products and determine that they are equal or superior in all respects to products specified.
- B. Provide same guarantee for accepted substitutions as for products specified.
- C. Coordinate installation of accepted substitutions into the Work, making such changes as may be required for the Work to be complete in all respects.

**PART 2 - REQUIREMENTS**

**2.1 SUBSTITUTION REQUIREMENTS DURING THE BIDDING PERIOD**

- A. Accompany written substitution requests with samples, catalog cuts, and complete technical data pertinent to the request. Include any other data the Engineer may require. Incomplete data will be cause for rejection of the request. No verbal acceptance will be given and all acceptable substitutions will be listed by the Engineer in the form of Addenda issued before the Bid date. All requests for substitutions are subject to complete compliance with requirements of the Contract Documents.
- B. Submit the following information with each request to the Engineer:
  - 1. Use substitution request form at end of this Section.
  - 2. Itemized comparison of proposed substitution with product or method specified.
  - 3. Complete data on each material and system for this project only, substantiating compliance of proposed substitution with the Contract Documents.
  - 4. Complete evidence, including test numbers and supporting reports, indicating compliance with referenced standards.
  - 5. A statement from the materials manufacturers stating that warrantee



## **Substitution Procedures 012500-2**

- requirements specified are acceptable and that such a warrantee shall be issued upon successful completion of the project.
6. A set of details for this project clearly indicating specific deviations proposed for the substitution. Copies of the Drawings and Details within this Project Manual shall be used for this purpose. Any and all deviations shall be indicated.
  7. Copies of related specification sections within the Project Manual clearly marked to indicate all deviations in materials, products and methods specified. Any and all deviations shall be indicated.
  8. Samples of all materials and products included accessories, anchors, and similar items.
- C. All substitution requests shall be received in the Owner's office no less than five (5) calendar days before Bid Opening. Requests received after this date will not be considered.

### **2.2 SUBSTITUTIONS REQUESTED AFTER AWARD OF CONTRACT**

- A. Substitutions will normally not be considered after date of contract, except when required, due to unforeseen circumstances. Within a period of thirty (30) days after date of Contract, the Owner may, at its option, consider formal written requests for substitution of products in place of those specified, when submitted in accordance with the requirements stipulated herein. To receive consideration, one or more of the following conditions must be documented in any such request.
1. The substitution is required for compliance with final interpretation of code requirements or insurance regulations.
  2. The substitution is required due to unavailability of a specified product, through no fault of the Contractor.
  3. The substitution is required because subsequent information disclosed the inability of the specified product to perform properly or to fit in the designated space.
  4. The substitution is required because it has become clearly evident, in the judgment of the Owner, that a substitute would be substantially in the best interest of the Owner in terms of cost, time, or other considerations.

### **2.3 SUBSTITUTIONS NOT PERMITTED**

- A. They are indicated or implied on shop drawings or product data submitted without first requesting approval thereof in accordance with requirements of this Section.
- B. Acceptance will require substantial revision of the Contract Documents, except as allowed by Paragraph 2.2, above.

### **2.4 PRODUCT OPTIONS**

- A. The specified products establish minimum qualities that substitutes shall meet to be considered acceptable. All requests for substitution are subject to complete

**Substitution Procedures  
012500-3**

compliance with requirements of the Contract Documents.

- B. Wherever the term "or approved" appears in these Specifications, the substitution shall be obtained by the bidder prior to the Bid date for Engineer's evaluation and approval. Bidders shall submit written requests for substitution upon request of the Engineer (Substitution Request Form at end of this Section).
- C. Products Specified by Reference Standards or by Description Only:
  - 1. May use any product meeting those standards.
  - 2. For products specified by association or trade standards, comply with requirements of the standard, except when more rigid requirements are specified or are required by applicable codes.
- D. Products Specified by Naming One or More Manufacturers with a Provision for Substitution:
  - 1. May request substitution for any manufacturer not specifically named.
  - 2. Request may be written or via electronic media, as directed by the Engineer.
- E. Products Specified by Naming Several Manufacturers with "or approved":
  - 1. Products of named manufacturers meeting Specifications; others require prior Bid approval.
- F. Products Specified by Naming Only One Manufacturer:
  - 1. No option; no substitution allowed.
- G. For products specified by association or trade standards, comply with requirements of the standard, except when more rigid requirements are specified or are required by applicable codes.

**Substitution Procedures  
012500-4**

**SUBSTITUTION REQUEST FORM**

To: \_\_\_\_\_

Project: \_\_\_\_\_

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 which proposed substitution will require for its proper installation.

The undersigned states that the following paragraphs, unless modified on 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:

For use by Design Consultant or District:

Firm: \_\_\_\_\_

☐ Accepted

☐ Accepted as noted

Address: \_\_\_\_\_

☐ Not Accepted

☐ Received too late

By: \_\_\_\_\_

By: \_\_\_\_\_

Please type or print name & title

Date: \_\_\_\_\_

Remarks: \_\_\_\_\_

Signature: \_\_\_\_\_

Phone: \_\_\_\_\_

Date: \_\_\_\_\_

Attachments:

**END OF SECTION**

**Progress Payment Procedures  
012976-1**

**PART 1 - GENERAL**

**1.1 DESCRIPTION**

- A. Work of this Section includes forms and procedures for progress payments.
- B. Related work Specified elsewhere:
  - 1. For the primary discussion of payments, refer to General Conditions.

**PART 2 - PRODUCTS**

**2.1 APPLICATION FORMS**

- A. For applications for payment, use sample contract payment request on company letterhead, or AIA Document G702, supported by AIA Document G702a, Continuation Sheet.
- B. Prepare the schedule of values in such a manner that each major item of Work and each subcontracted item of Work is shown as a line item broken down in terms of material and labor costs on AIA Document G702a, Application Certification of Payment, Continuation Sheet. The sample continuation Sheet shall be the minimum schedule of values breakdown.
- C. Payment request is to include the Contractor's Federal Tax Identification number and return address.

**PART 3 - EXECUTION**

**3.1 PAYMENTS**

- A. The Owner will make progress payments on account of the Contract once a month, based on the value of work accomplished or materials on the job site, as stated in the schedule of values on the Application and Certificate Payment. Complete and forward to the Owner on or about the 20th day of each month.
- B. Submit one (1) copy of forms requesting payment to the Owner. Submit copy to Engineer for approval prior to payment by Owner. Payments will be made on protected materials on hand at the job site properly stored, protected, and insured. Estimated quantities shall be subject to the Owner's review and judgment.

**3.2 EARLY PURCHASE AND PAYMENT OF MATERIALS AND EQUIPMENT**

- A. Order materials and equipment requiring a long lead or waiting time early so as not to delay progress of the Work.
- B. The Contractor will be reimbursed for early order materials or items upon receipt

**Progress Payment Procedures  
012976-2**

and verification of quality and quantity against submittals and shipping documents by the Owner's Representative. Receipt shall be to the job site or stored at Owner's other premises in an orderly and safe manner, secured from normal weather damage. Security remains the responsibility of the Contractor.

**END OF SECTION**

**Construction Progress Schedule  
013216-1**

**PART 1 - GENERAL**

- A. Work related to this Section is specified in other sections. Other sections of these Specifications also apply even though not described here.

**1.1 WORK SEQUENCE**

- A. Construct Work in stages to accommodate Owner's occupancy requirements during the construction period. Coordinate construction schedule and operations with Owner and Engineer as follows:
  - 1. Stage 1: Pre-construction coordination
  - 2. Stage 2: Installation
  - 3. Stage 3: System checkout; air balancing
  - 4. Stage 4: Punch list and final job close-out; initiate warranty period

**1.2 CONSTRUCTION SCHEDULE**

- A. After entering into the Contract, provide the Owner with a construction schedule in compliance with the requirements of this section.
- B. Work is to begin immediately following the end of the school year (not before June 10) and is to be fully completed by December 16. See also Section 002113 for completion dates.

**1.3 ORIGINAL PROJECT SCHEDULE AND UPDATES**

- A. Procedures for preparation and submittal of construction schedule and periodic updating.
- B. Original Schedule: Complete sequence of construction by activity, with dates for beginning and completion of each element of construction.
- C. Provide sub-schedules to define critical portions of entire schedule.
- D. Show delivery dates for products specified.
- E. Schedule Update: Show accumulated percentage of completion of each item, and total percentage of Work completed for progress meetings.
- F. Indicate progress of each activity to date and projected completion date of each activity.
- G. Identify activities modified since previous submittal, major changes in scope, and other identifiable changes.
- H. Provide report to define problem areas, anticipated delays, and impact on Schedule. Report corrective action taken, or proposed, and its effect, including the effect of changes on schedules of separate Contractors.

**Construction Progress Schedule  
013216-2**

**1.4 SUBMITTALS**

- A. Submit preliminary outline Schedules within 7 days after date of Owner-Contractor Contract for coordination with Owner's requirements and work of separate contracts.
- B. Submit revised Progress Schedules as changes occur.

**1.5 DISTRIBUTION**

- A. Distribute copies of reviewed Schedules to:
  - 1. Job site file
  - 2. Owner
  - 3. Engineer
  - 4. Other subcontractors
  - 5. Suppliers.
- B. Instruct recipients to promptly report, in writing, problems anticipated by projections shown in Schedules.

**PART 2 – PRODUCTS**

Section not used

**PART 3 – EXECUTION**

Section not used

**END OF SECTION**

**Submittal Procedures  
013300-1**

**PART 1 - GENERAL**

- A. Work related to this Section is specified in other sections. Other sections of these Specifications also apply even though not described here.

**1.2 DESCRIPTION**

- A. Submit, to the Engineer, project documentation required by Specification sections.
- B. Refer to Section 012500 for substitution options.

**1.3 SUBMITTALS**

- A. List of all sub-contractors, to include name(s) of principals, telephone number and Scope of Work to be performed by that sub-contractor.
- B. Weekly work schedule for all Work to be completed under this Contract.
- C. Manufacturer's catalog sheets, brochures, diagrams, schedules, performance charts, illustrations and other standard descriptive data. Clearly mark each copy to identify pertinent materials, products, or models. Show dimensions and clearances required, performance characteristics, capacities, wiring diagrams, and controls.
- D. All proposed and any future on-site personnel shall fill out the Criminal History Verification form contained herein.

**1.4 CONTRACTOR'S RESPONSIBILITIES**

- A. The Contractor shall review and approve shop drawings and project data prior to submission.
- B. Begin no work which requires submittals until return of submittals with Engineer's stamp, initials, or signature indicating approval.
- C. Delays caused by Contractor's failure to fully comply with requirements of this Section will not justify extensions in the construction schedule. Submittals which indicate less than full review by Contractor will be returned by Engineer for compliance.
- D. Shop drawings; showing installation and necessary clearances and access of equipment and materials in new work or existing structure.
- E. The Contractor shall verify field measurements, field construction criteria, catalog numbers, and similar data. Coordinate each submittal with requirements of Work and of Contract Documents. Notify Engineer, in writing at time of submission, of deviations in submittals from requirements of Contract Documents. Contractor's responsibility for errors and omissions in submittals is not relieved by Engineer's



**Submittal Procedures  
013300-2**

review of submittals, nor is the responsibility for deviations in submittals from requirements of Contract Documents relieved by Engineer's review of submittals unless Engineer gives written acceptance of specific deviations.

**1.5 SUBMITTAL SCHEDULING**

- A. Process submittals in ample time for review, as applicable, so as to not delay the Work. All submittals shall be received by the Owner within ten (10) days after pre-construction conference.
- B. Submittals shall be sent to the Owner at least 15 calendar days before the date each is required for fabrication or installation for items requiring review by the Owner only.
- C. Submittals involving Substitution Requests or other modifications requiring review by the Owner and/or the Owner's consultants shall be sent to the Owner at least 20 calendar days before the date each is required for fabrication or installation.

**1.6 SUBMISSION REQUIREMENT**

- A. Submit shop drawings and project data which Contractor requires for distribution, including a copy to be retained by Engineer.
- B. Accompany Submittals with dated transmittal letter containing Project title and number, Contractor's name and address, the number of each Shop Drawing, Project Data submitted, other pertinent data and notification of any deviations from Contract Documents.
- C. Submittals shall include current date, revision dates, Project title, and the names of the Engineer, Contractor, Supplier, and Manufacturer. Also include identification of product or material, relation to adjacent structure or materials, field dimensions (clearly identified as such) and any deviations from the Contract Documents.
- D. The Contractor shall initial or sign the submittals, certifying to review of submittal, verification of field measurements and compliance with Contract Documents.

**1.7 DISTRIBUTION OF SUBMITTALS AFTER APPROVAL**

- A. Distribute approved copies of Shop Drawings and Project Data to Contractor's file, Engineer, subcontractors, supplier, and Owner.

**1.8 ENGINEER'S DUTIES**

- A. Review submittals with reasonable promptness, for adherence to design concept of Project and information given in Contract Documents. Review of separate item does not constitute review of an assembly in which item functions.

**Submittal Procedures  
013300-3**

- B. Engineer will affix stamp and initials, or sign, to certify review of submittal and then will return submittals to Contractor for distribution.
- C. **Engineers approval of submittals do not supersede the Plans and Specification requirements.** Equipment not meeting design criteria is to be replaced at Contractors or suppliers cost. Any omission of equipment or materials in the submittals, but necessary for the work must be furnished and installed.

**1.9 AS-BUILT DRAWINGS**

- A. Contractor is to maintain one set of marked drawings showing all clarifications, deviations and actual routing and nomenclature for documentation of actual installation. Upon completion of the Project, submit as-built drawings to Engineer. Engineer will provide Owner with revised record drawings obtained from Contractor's marked construction drawing set.

**1.10 DEFINITIONS**

- A. The Owner will mark reviewed materials as follows:
  - 1. "No Exception Taken," which means fabrication, manufacture and/or installation may proceed.
  - 2. "Make Revisions Noted," which means fabrication, manufacture and/or installation may proceed with revisions as noted.
  - 3. "Revise and Resubmit," which means that fabrication, manufacture and/or installation may not proceed.
  - 4. "Rejected," which means do not proceed; make arrangements for the re-review of the proposed Work with the Owner as soon as possible.

**PART 2 - PRODUCTS**

**2.1 SUBMITTAL CONTENT AND FORMAT**

- A. General Requirements:
  - 1. Shop Drawings:
    - a. Submit one (1) reproducible drawing and a digital copy of each drawing.
  - 2. Product Data:
    - a. Submit a digital copy.
- B. Submittals shall include:
  - 1. Date and revision dates, return date requested.
  - 2. Project title and number.
  - 3. The names of the Contractor, subcontractor, supplier, and manufacturer.
  - 4. Identification of product or material, with Specification Section number.
  - 5. Relation to adjacent critical features of work or materials.
  - 6. Field dimensions, clearly identified as such.

**Submittal Procedures  
013300-4**

7. Applicable standards, such as ASTM number or Federal Specification.
  8. Identification of deviations from Contract Documents, and for products, accompanied by Substitution Request as required.
  9. Contractor's stamp, legibly signed, essentially as follows:
    - a. The undersigned, acting on behalf of the Contractor, certifies that this submittal has been reviewed and is approved; products have been verified as being as specified, field measurements and field construction criteria have been or will be coordinated, and the submittal is in compliance with Contract documents.
- C. Re-submission Requirements:
1. Revise initial drawings as required and resubmit as specified for initial submittal.
  2. Indicate on drawings any changes which have been made other than those requested by the Owner or the Owner's consultants.
  3. The Owner may return without review any submittal not meeting the requirements listed above.
- D. Shop Drawings:
1. Present data in a clear and thorough manner.
  2. Details shall be identified by reference to sheet and detail, schedule or room numbers shown on Contract Documents.
  3. Structural items shall be identified by location in the completed structure.
  4. Identify details by reference to contract sheet and detail numbers.
  5. Minimum sheet Size: 8½" x 11"
- E. Product Data:
1. Manufacturer's catalog sheets, brochures, diagrams, schedules, performance charts, illustrations and other standard descriptive data.
    - a. Clearly mark each copy to identify pertinent product or models
    - b. Show dimensions, weights, and clearances required.
    - c. Show performance data consisting of capabilities, power ratings, pressure drops, design characteristics and consumption; conforming as closely as possible to the test methods referenced in the plans and specifications.
    - d. Show wiring or piping diagrams and controls.
- F. Manufacturer's standard schematic drawings and diagrams:
1. Modify to delete information which is not applicable.
  2. Supplement standard information to provide information specifically applicable to project.

**PART 3 - EXECUTION**

**3.1 GENERAL REQUIREMENTS**

- A. Review submittals, make necessary corrections, and become familiar with the content of the submittals prior to turning the material over to the Owner. Mark each item with a stamp or by some other means to indicate that such is the case.

**Submittal Procedures  
013300-5**

- B. Accompany submittals with a transmittal letter bearing the Project name, Contractor's name, number of items, and other pertinent data.
- C. Mark or tag each submittal to show the date, and the names of the Project, Contractor, or subcontractor, manufacturer or supplier, and separate detailer, if pertinent. Also, identify the Specification section where the particular item is specified in the Project Manual.
- D. Keep one copy of each reviewed submittal on the job site at all times.

**3.2 SPECIFIC REQUIREMENTS, SHOP DRAWINGS**

- A. Identify shop drawing details by reference to sheet and detail numbers shown on the Drawings.
- B. Unless otherwise specified in an individual Specification section, submit one reproducible transparency, and three prints of each shop drawing.
- C. Be responsible for obtaining and distributing prints of shop drawings to the various suppliers, and the Owner once approval is obtained. Make prints of reviewed shop drawings only from transparencies which carry the appropriate stamp and endorsement.

**3.3 SPECIFIC REQUIREMENTS, SAMPLES**

- A. Insure that samples are of sufficient size to indicate the general visual effect or color. Where samples must show a range of color, texture, finish, graining, or other property, submit sets of pairs illustrating the full scope of this range.
- B. One (1) sample or one (1) set of approved samples will be retained by the Owner; final work will be measured against approved samples.

**3.4 SPECIFIC REQUIREMENTS, PRODUCT DATA**

- A. Modify standard product data to delete information which is not applicable to this project. Supply additional data, if required to show clearly what is intended.
- B. Modify manufacturer's catalog sheets, brochures, diagrams, schedules, performance charts, illustrations, and other standard descriptive data to show the specific product application intended for the Project.
- C. Unless otherwise specified in an individual specification section, submit digital copies of each submittal item.

**3.5 CRIMINAL HISTORY VERIFICATION FORM:**

**Submittal Procedures  
013300-6**

Milton-Freewater Unified School District  
1020 S Mill, Milton-Freewater OR 97862

541-938-3551 (office)  
541-938-6704 (fax)

**Criminal History Verification**

**Please Print**

Name: \_\_\_\_\_ Date of Birth: \_\_\_\_\_ Sex: \_\_\_\_\_  
Last First Middle

Other Names Previously Used: \_\_\_\_\_

Social Security Number: \_\_\_\_\_ Driver's License#/State Issued \_\_\_\_\_

(Providing your social security number is voluntary. A denial of your application to volunteer will not be based on your choice to withhold this number. However, if you choose to withhold your social security number, you must provide your driver's license number. This information will only be used as an identifier to process this background check. State and federal laws protect the privacy of your records.)

Street Address: \_\_\_\_\_  
(Full Street Address)

City: \_\_\_\_\_ State: \_\_\_\_\_ Zip Code: \_\_\_\_\_

Please answer the following questions. Providing false information will result in an automatic denial of your application to volunteer for the district:

a. Have you **ever** been convicted of a sex-related crime? Yes\_\_\_ No\_\_\_

If yes, was the conviction in Oregon or another state? (Please specify State) \_\_\_\_\_

b. Have you **ever** been convicted of a crime involving violence or threat of violence? Yes\_\_\_ No\_\_\_

If yes, was the conviction in Oregon or another state? (Please specify State) \_\_\_\_\_

c. Have you **ever** been convicted of a crime involving criminal activity in drugs or alcoholic Yes\_\_\_ No\_\_\_

beverages?

d. Have you **ever** been convicted of any other crime except a minor traffic violation? Yes\_\_\_ No\_\_\_

e. Have you been arrested within the last three years for a crime for which there has not Yes\_\_\_ No\_\_\_

yet been an acquittal or dismissal?

**Advisory:** The Milton-Freewater Unified School District will perform a check of your criminal history to verify the responses to the preceding questions.

I hereby grant to the Milton-Freewater Unified School District permission to check civil or criminal records to verify any statement made on this form. Regardless of whether I grant consent, the District will conduct a criminal offender record check of all volunteers. The volunteer is entitled to review his/her criminal history for inaccurate or incomplete information. Discrimination by the district on the basis of arrest records alone may violate federal civil rights law. The volunteer may obtain further information concerning his/her rights by contacting the Bureau of Labor and Industries, Civil Rights Division, State Office Building, Suite 1070, Portland Oregon 97232, telephone (503) 731-4075

I acknowledge reading and the receipt of this notice.

Signature: \_\_\_\_\_ Date: \_\_\_\_\_

**Submittal Procedures  
013300-7**

**END OF SECTION**

**Special Project Procedures**  
**013513-1**

**PART 1 - GENERAL**

**1.1 CONTRACTOR'S USE OF PREMISES**

- A. Contractor shall limit his use of the Premises for work and storage to allow for:
  - 1. Owner's occupancy
  - 2. Public use
- B. If and where necessary and when directed, move any stored Products, Equipment, or Vehicles which are under Contractor's control, and which interfere with operations of Owner.
- C. Contractor shall conduct his operations as to insure the least reasonable inconvenience to the General Public.
- D. Cooperate with Owner during construction operations to minimize conflicts and to facilitate Owner's use of facilities.
- E. Schedule Work to maintain Owner's continuous operations. Include in Contract Sum sufficient funds as may be required for any "overtime" work caused by this requirement. No additional payment to Contractor required "overtime" work.
- F. The Contractor shall not load structures or permits structures to be loaded with weights that will endanger a structure.

**1.2 INTERRUPTIONS**

- A. Schedule ventilation and comfort control system's to effect one area at a time. Schedule HVAC system downtime for each zone with Owner prior to work.
- B. Work noise shall not interrupt the proceedings of the state court system and activities of the county departments.
- C. Interruptions include but not limited to excessive noise, strong odors, dust, obstruction to foot or vehicular traffic, and disruption to the building's utilities such as electrical, water and sewer.
- D. When such noise is unavoidable, notify Owner's Representative at least 24 hours prior to such noise and 72 hour notice for utility interruptions and comply with Owner's instructions.

**1.3 SECURITY**

- A. Owner security requires a Criminal History Verification check of all contractors, workers and helpers on this project. No person deemed as a security risk by any of the regulating authorities will be allowed to work on this project.
- B. Contractor shall fill out background information form supplied by Owner or found in Section 013300 of these specifications.

**Special Project Procedures  
013513-2**

- C. Any keys or access cards issued for after hour work are to be used for the sole purpose of accessing the project site and for execution of the project. No installer shall unlock doors to allow any other person into the project site.

**1.4 USE OF OWNER'S PROPERTY & EQUIPMENT**

- A. Do not use Owner's Property, Facilities, or Equipment such as Tools, Ladders, Furniture, Janitorial Equipment, Supplies, etc.

**1.5 CORRECTION PERIOD FOR NON-COMPLYING WORK**

- A. Contractor's response to notice of Work to be Corrected shall be accomplished during the following time periods:
  - 1. Emergency Work:
    - a. Failure or deficiencies constituting immediate danger or health hazard to People or likely damage to Property.
    - b. Response Time: 24 hours per day 7 days per week
  - 2. Urgent Work:
    - a. Failure or deficiencies which do not immediately endanger Persons or Property, but would soon do so if not corrected.
    - b. Response Time: Between 7:00 AM & 4:00 PM Mondays thru Fridays and within 3 calendar days following receipt of Notice.
  - 3. Routine Work:
    - a. Failure or deficiencies of less importance that do not meet criteria of Emergency or Urgent Work.
    - b. Response Time: Between 7:00 AM & 4:00 PM Mondays thru Fridays and within 5 calendar days following receipt of Notice.

**1.6 NOISE AND VIBRATION CONTROL**

- A. Work noise shall not interrupt the proceeding of the state court system and activities of the county departments.
- B. When such noise is unavoidable, notify Owner's Representative at least 24 hours prior to such noise, and comply with Owner's instructions.

**PART 2 – PRODUCTS**

Section not used

**PART 3 – EXECUTION**

Section not used



**Special Project Procedures  
013513-3**

**END OF SECTION**

**Project Requirements  
016000-1**

**PART 1 - GENERAL**

- A. Work related to this Section is specified in other sections. Other sections of these Specifications also apply even though not described here.

**PART 2 - PRODUCTS**

**2.1 MATERIALS**

- A. Furnish materials new and free from defects and of size, make, type and quality specified or an acceptable substitute.

**2.2 PRODUCTS AND EQUIPMENT**

- A. Meet the detailed requirements indicated in the various sections and provide products and equipment suitable for the installation shown. Products and equipment not meeting all specified requirements will not be accepted, even though specified by name along with other manufacturers.
- B. When two or more items of the same kind are required under this work, use items of a single manufacturer, except where specifically exempted. Unless otherwise indicated, component parts of an assembly need not be the product of a single manufacturer.
- C. Capacities and equipment sizes and dimensions shown or specified are minimum, unless otherwise indicated.
- D. Tolerances used in specified rating or testing standards will not be allowed in determining capacities of products and equipment.

**PART 3 - EXECUTION**

**3.1 PERFORMANCE**

- A. Unless otherwise indicated, perform work in accordance with manufacturer's recommendations for **BEST** results. Do not omit any preparatory step or installation procedure unless specifically modified or exempted by the Contract Documents.
- B. Install work in a neat and professional manner.

**3.2 QUALITY CONTROL, GENERAL**

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

**3.3 WORKMANSHIP**

**Project Requirements  
016000-2**

- A. Comply with industry standards, except when more restrictive tolerances or specified requirements indicate more rigid standards or more precise workmanship.
- B. Perform work by persons qualified to produce workmanship of specified quality.
- C. Secure products in place with positive anchorage devices designed and sized to withstand stresses, vibration, and racking.

**3.4 MANUFACTURER'S INSTRUCTIONS**

- A. Comply with instructions in full detail, including each step in sequence. Should instructions conflict with Contract Documents, request clarification from Engineer before proceeding.

**3.5 MANUFACTURER'S CERTIFICATES**

- A. When required by individual specifications section, submit manufacturer's certificate, in duplicate, showing that products meet or exceed specified requirements.

**END OF SECTION**

**Cutting and Patching**  
**017329-1**

**PART 1 - GENERAL**

- A. Work related to this Section is specified in other sections. Other sections of these Specifications also apply even though not described here.

**1.1 DESCRIPTION**

- A. Execute cutting, fitting, or patching of work required to install specified Work in existing construction.

**1.2 SUBMITTALS**

- A. Prior to cutting which affects structural safety of Project or Work of another Contractor, request consent to proceed with cutting by submitting written notice to Engineer and Owner. Include:
  - 1. Identification of work
  - 2. Location and description of affected work
  - 3. Necessity for cutting or alteration
  - 4. Effect on other Work or structural integrity of Project
- B. Submit written request 72 hours in advance of cutting or alteration which affects:
  - 1. Structural integrity of any element of Project.
  - 2. Integrity of weather-exposed or moisture-resistant element.
  - 3. Efficiency, maintenance, or safety of any operational element.
  - 4. Visual qualities of sight-exposed elements.
- C. Describe proposed Work and designate scope of:
  - 1. Cutting and patching
  - 2. Subcontractor and trades to execute work
  - 3. Products to be used
  - 4. Extent of refinishing
  - 5. Alternatives to cutting and patching.
    - a. Designate party responsible for cost of cutting and patching.
- D. Provide scheduling for each part of the Work to Engineer and Owner's Representative.
- E. Should conditions of Work or schedule require change of materials or methods, submit written recommendations to Engineer and Owner's Representative, including conditions requiring change, recommendations for alternative materials or methods, cost variances, and submittals as required for substitutions before proceeding with work.

**PART 2 - PRODUCTS**

**Cutting and Patching**  
**017329-2**

**2.1 MATERIALS**

- A. For replacement of materials, comply with Specifications for type of material to be replaced.

**PART 3 - EXECUTION**

**3.1 INSPECTION**

- A. Inspect existing conditions of Work including elements subject to movement or damage during cutting or patching. After uncovering Work, inspect conditions affecting installation of new products.

**3.2 PREPARATION**

- A. Prior to cutting, provide shoring, bracing, and support as required to maintain structural integrity of Project. Provide protection from elements for other portions of Project.

**3.3 PERFORMANCE**

- A. Execute fitting and adjustment of products to provide finished installation conforming with specified tolerances. Execute cutting and demolition by methods which will prevent damage and provide proper surfaces to receive installation of repairs and new Work.
- B. Restore Work which has been cut or removed; install new products to provide completed Work in accordance with requirements of Contract Documents. Refinish entire surface as necessary to provide an even finish and color to blend with adjacent surfaces. Refinish assemblies in entirety.
- C. Locate structural members accurately before cutting. Cut rigid materials using masonry saw or core drill. Pneumatic tools not allowed without prior approval. Do not over-cut corners.
- D. At penetrations of fire-rated wall, ceiling, or floor construction, completely seal voids with material approved by applicable codes for the full thickness of the construction element.
- E. Refinish exposed surfaces altered by Contract Work to blend with adjacent finishes and to match existing construction.

**END OF SECTION**

**Cleaning & Waste Management**  
**017400-1**

**PART 1 - GENERAL**

- A. Work related to this Section is specified in other sections. Other sections of these Specifications also apply even though not described here.

**1.1 DESCRIPTION**

- A. Maintain Owner's property and public properties free from accumulations of waste, debris and rubbish caused by operations. Remove waste materials from work areas at the end of each working day. Any occupied areas must be kept clean to minimize disruption to occupants. Coordinate with Owner should any operation or equipment become hazardous to staff or customers to allow staff to take necessary precautionary measures.
- B. Areas that will be inaccessible after completion of Project shall be left free of debris before space is closed in.
- C. Workers shall exercise caution to avoid marring, soiling, or otherwise defacing, finished surfaces. Clean and restore defaced surfaces to original condition.
- D. Clean up immediately following completion of each trade's work.
- E. At completion of Work, remove waste materials, rubbish, tools, equipment, machinery and surplus materials; clean all sight-exposed surfaces and leave work site clean and ready for occupancy.

**1.2 SAFETY REQUIREMENTS**

- A. Maintain Project in accordance with applicable safety and insurance standards. Prevent accumulations of waste, debris, and rubbish which create hazardous conditions. Provide adequate ventilation during use of volatile or noxious substances. Do not burn rubbish and waste materials; remove from Owner's property and dispose of legally.

**PART 2 - PRODUCTS**

**2.1 CLEANING MATERIALS**

- A. Use only those cleaning materials recommended by manufacturer for surface being cleaned.
- B. Use cleaning materials only on surfaces recommended by cleaning material manufacturer.

**PART 3 - EXECUTION**

**Cleaning & Waste Management  
017400-2**

**3.1 CLEANING DURING CONSTRUCTION**

- A. Execute cleaning to ensure that building, grounds, and public properties are maintained free from accumulations of waste materials and rubbish resulting from this work. Wet down dry materials and rubbish to lay dust and prevent blowing dust.
- B. Provide on-site containers for collection of waste materials, debris, and rubbish.
- C. Handle waste materials, debris and rubbish in a controlled manner with as few handlings as possible; do not drop or throw materials from heights.
- D. At reasonable intervals during progress of Work clean site and public properties, and dispose of waste materials, debris and rubbish.
- E. Remove waste materials, debris and rubbish from site and legally dispose of at public or private dumping areas off Owner's property.
- F. Vacuum clean interior building areas when ready to receive finish painting, and continue vacuum cleaning on an as-needed basis until project is ready for substantial completion or occupancy.
- G. Contractor is responsible for any damage to roof membrane resulting from this Work, debris from this Work, or cleaning.

**3.2 FINAL CLEANING**

- A. Employ experienced workers, or professional cleaners, for final cleaning.
- B. At completion of project, conduct final inspection of sight-exposed interior and exterior surfaces and accessible concealed spaces.
- C. Remove grease, dust, dirt, stains, labels, fingerprints and other foreign materials from sight-exposed interior and exterior finished surfaces. Remove putty, paint, labels, lubricants, etc., from windows, mirrors, and sash, and then polish, taking care not to scratch glass.
- D. Vacuum carpeting (shampoo where required), removing debris and excess nap.
- E. Repair, patch and touch up marred surfaces to specified finish, to match adjacent surfaces.
- F. Replace air conditioning filters where units were operated during construction.
- G. Paved surfaces are to be broomed clean. All other surfaces of the grounds are to be raked clean.
- H. Leave equipment in an undamaged, bright, clean, and polished condition.
- I. After completion of Work, remove temporary structures, fences, scaffolding, surplus materials and rubbish of every nature from Owner's property.

**Cleaning & Waste Management**  
**017400-3**

- J. Maintain cleaning until project, or portion thereof, is occupied by Owner.

**END OF SECTION**



**Closeout Requirements**  
**017700-1**

**PART 1 - GENERAL**

- A. Work related to this Section is specified in other sections. Other sections of these Specifications also apply even though not described here.

**1.1 DESCRIPTION**

- A. The requirements specified in this Section relate to all Contractors individually performing under these Contract Documents:
1. Project record documents
  2. Final review and payment including retainer
  3. Substantial completion date and warranty date as mutually agrees by Owner, Contractor, and Engineer of Record

**1.2 REQUIRED DOCUMENTS**

- A. Prior to issuance of Certificate of Completion and final payment, submit to Engineer the following documents:
1. Guarantees:
    - a. The guarantee required by the General Conditions
    - b. All other extended guarantees stated in the Specifications
  2. Release or Waiver of Liens:
    - a. Contractor's Affidavit of Release of Liens (AIA G706A)
    - b. Payments of Debts and Claims (AIA G706)
  3. Operation and Maintenance Manuals:
    - a. As required by each section of Division 22 (Plumbing), Division 23 (Mechanical), and Division 26 (Electrical).
    - b. Include inspection reports, if applicable.
  4. Project Record Documents:
    - a. Two sets of the Project Record Documents shall be submitted for review upon completion of the Work. Each shall be bound in a 3-ring binder with each section clearly indexed with tabbed divider pages.
    - b. The project team list shall include company name, address, and phone number of:
      - i. Owner
      - ii. Contractor
      - iii. Inspector
      - iv. Subcontractors
      - v. Materials manufacturers
- B. Legibly mark the Drawings to indicate actual as-built conditions. The Drawings shall clearly indicate changes in the Work made by Addenda or Change Order. Redraw or provide new drawings as required for a complete as-built set of drawings.

**1.3 FINAL REVIEW AND PAYMENT**

**Closeout Requirements**  
**017700-2**

- A. Prior to completion, the Contractor shall inspect the Work and make a "punch list" noting all items that are incomplete and/or incorrect.
- B. The Contractor shall notify all Subcontractors in writing of incomplete and/or incorrect items. Notify far enough in advance of the Completion Date that the Work can be completed on schedule. Said Work shall be immediately corrected.
- C. Should conditions prevail which prohibit some elements of the Work from being accomplished, but the work-in-place will perform the primary function (i.e., painting cannot be completed due to high moisture content of masonry walls.) the Contractor shall record the reason with this "punch list" item requesting temporary delay in completion from the Owner in writing.
- D. Notify the Owner in writing that all items are completed and ready for final review or else that the work product is fully usable, but some listed deficiencies remain to be completed. Submit all record documents at this time.
- E. The Owner will review all documents. When the documents include a Contractor's request for delay in completion, the Owner will review all Work which is certified as complete to the best knowledge of the Contractor. The Owner will also review the listed incomplete Work and assign a value to such uncompleted work.
- F. The Contractor shall make the required corrections to the Work expeditiously. Upon Owner Occupancy, sufficient retainage monies will be held to pay for incomplete Work, should the Contractor fail to perform. A letter will be addressed to the Contractor informing the Contractor of the project status and the monies available for a semi-final payment upon receipt of billing.
- G. When Contract closeout procedures are completed and all punch listed deficiencies have been corrected, final acceptance by the Owner will be documented. The contractor will receive written notice of acceptance of the Work and notification that final payment may be billed and released.
- H. All guarantees shall commence and become effective beginning on the date of Final Acceptance by the Owner.

**PART 2 – PRODUCTS**

Section not used

**PART 3 – EXECUTION**

Section not used

**END OF SECTION**

**END OF DIVISION**

**Demolition  
024119-1**

**PART 1 - GENERAL**

**1.1 RELATED WORK**

- A. Work related to this section is specified in other sections. Other sections of these Specifications also apply even though not described here.

**1.2 DESCRIPTION**

- A. Perform alterations and related work as shown or specified and in accordance with the Contract Documents.

**1.3 STANDARDS**

- A. Comply with the applicable provisions and recommendations of OSHA and ANSI A10.2, Safety Code for Building Construction, except as modified by governing codes.

**1.4 SCHEDULING**

- A. Twenty-four (24) hours prior to starting any alteration or demolition work, submit for review by the Engineer and approval of the Owner, a schedule showing the commencing order, and completion dates for the various parts of this Work.
- B. Notify Engineer and Owner seventy-two (72) hours prior to starting any work relating to existing utilities (electrical, sewer, water, heat, gas, fire lines, etc.) that will temporarily discontinue or disrupt service to the existing building. Obtain Owner's approval before proceeding with this phase of the Work.

**1.5 PROTECTION**

- A. Before proceeding with demolition and removal, make explorations and probes as necessary to ascertain any required protective measures. Give particular attention to shoring and bracing requirements to prevent any damage to existing construction and structure.
- B. Provide, erect, and maintain catch platforms, lights, barriers, weather protection, warning signs, and other items essential for proper protection of:
  - 1. the workers engaged in demolition operations
  - 2. the occupants of the building
  - 3. the general public
  - 4. the adjacent construction
- C. Provide and maintain weather protection at exterior openings. Fully protect the interior premises against damage from the elements until exterior openings are closed by new construction.

**Demolition  
024119-2**

- D. Provide and maintain temporary protection of the existing structure designated to remain where:
  - 1. demolition removal and new work is being performed
  - 2. connections are made
  - 3. materials are handled
  - 4. equipment is moved
- E. Take necessary precautions to prevent dust and dirt from rising by wetting demolished masonry, concrete, plaster, and similar debris. Protect unaltered portions of the existing building affected by the operations under this Section with dustproof partitions and other adequate protection.
  - 1. Provide adequate fire protection in accordance with local Fire Department requirements.
  - 2. Do not close or obstruct walkways, stairways, or passageways without Engineer's authorization. Do not store materials in passageways, stairs, or other means of egress. Conduct operations with minimum traffic interference.
  - 3. Contractor will be responsible for any damage to the existing structure and contents of structure, resulting from inadequate protection.

**PART 2 – PRODUCTS**

Section not used

**PART 3 - EXECUTION**

**3.1 WORKMANSHIP**

- A. Perform demolition, removal, and alteration work as shown on the Drawings with due care including shoring and bracing. Contractor will be responsible for any damage that may be caused by such work to any part of existing structures or items designated for reuse. Perform patching, restoration, and new work in accordance with applicable sections of the Specifications.
- B. Materials or items, designated on the Drawings or indicated by Owner, which have been removed during construction, whether to be reinstalled or not, shall remain property of the Owner. Remove such items with care and store in a location on Site provided by the Owner.
- C. Materials or items designated to be reinstalled are indicated on the Drawings. Remove with care under the supervision of the trade responsible for reinstallation. Protect and store until required for reuse. Replace materials or items damaged in removal with similar new material of equivalent quality.
- D. Where existing equipment or fixtures are indicated to be reused, repair such equipment and/or fixtures to perfect working order. Refinish as directed by

**Demolition  
024119-3**

Owner and Engineer.

- E. Materials or items demolished and not designated to remain the property of the Owner, or to be reinstalled, shall become the property of the Contractor and shall be removed from the Owner's property.
- F. Execute the work in a careful and orderly manner, with the least possible disturbance to the general public and building occupants.
- G. In general, demolish masonry in small sections. Install temporary shores, struts, and bracings where necessary to prevent collapse of any construction.
- H. Where alterations occur (or new and old work join), cut, remove, patch, repair, or refinish adjacent surfaces, or so much thereof as is required by the involved conditions. All adjacent surfaces shall be repaired or replaced to the same condition as at the start of Work. The materials and workmanship employed in the alterations, unless otherwise shown or specified, shall conform to that of the original work. Alteration work shall be performed by the various trades that normally perform that particular type of Work.
- I. Finish new and adjacent surfaces as specified for new work. Clean existing surfaces of dirt, grease, loose paint, etc. before refinishing.
- J. Cut out embedded anchorage and attachment items as required to properly provide for patching and repair of the respective finishes.
- K. If applicable, cut existing roof areas only to the limits required for the proper installation of the new Work. Cut and fold back existing roofing. Cut and remove insulation. Provide temporary weather tight protection, as required, until new roofing and lashings are installed.

**3.2 CLEANING**

- A. Remove debris as the work progresses. Maintain the premises in a neat and clean condition.

**3.3 COMPLETION**

- A. At completion of Work, and prior to final acceptance, remove all temporary Work. Complete remainder of patching, refinishing, and joining new Work to existing work. Thoroughly clean both new and existing work.

**3.4 PIPE REMOVAL**

- A. Steam valves, hot water, and condensate piping is to be removed from building

**Demolition**  
**024119-4**

where required for installation of new work only. Install new caps or plugs on each of these fittings that remains from demolition of existing system.

**END OF SECTION**

**END OF DIVISION**

**Roof Curb  
077213-1**

**PART 1 - GENERAL**

- A. Work related to this Section is specified in other sections. Other sections of these Specifications also apply even though not described here.

**1.1 WORK INCLUDED**

- A. Furnish and install all materials and equipment as specified herein to support rooftop dehumidifying pool heater and condensing unit.

**1.2 FRAMING QUALITY ASSURANCE**

- A. Lumber grading rules of the West Coast Lumber Inspection Bureau (WCLIB) and Western Wood Products Association (WSPA) apply to materials furnished under this section.

**1.3 REQUIREMENTS OF REGULATORY AGENCIES**

- A. Preservative Treated Lumber and Plywood: American Wood Preservers Bureau (AWPB) Quality Mark.
- B. Pressure Treated Material: American Wood Preservers Bureau (AWPB) Standards.

**PART 2 - PRODUCTS**

**2.1 ROOF CURB**

- A. The roof curbs shall be of monolithic construction, heavy gauge galvanized steel, continuous mitered and welded corner seams, integral base plate, factory installed pressure treated wood nailer, and galvanized steel counter flashings.
- B. Manufacturer:
  - 1. Custom Curb, Inc.
  - 2. Pate Company
  - 3. or approved equal.
- C. The roof curb shall be designed to mate with the new unit, provide support, and complete weatherproof installation. Curb to comply with NRCA requirements.

**3 EXECUTION**

**3.1 INSTALLATION**

- A. Install roof curbs on concrete deck and fasten to deck in accordance with manufacturer's specification and details.

**Roof Curb  
077213-2**

- B. Provide pressure-treated wood for:
  - 1. All framing, blocking, furring, and nailing strips built into exterior masonry walls.
  - 2. Wood in contact with concrete.
  - 3. In conjunction with gravel stops and built-up roofing.
- C. Apply two brush coats of same preservative used in original treatment to all sawed or cut surfaces of treated lumber.

**END OF SECTION**

**END OF DIVISION**



**Basic Mechanical Materials & Methods**  
**230100-1**

**PART 1 - GENERAL**

**1.0 RELATED WORK**

- A. Work related to this Section is specified in other sections. Other sections of these Specifications also apply even though not described here.
- B. The Work under the Mechanical 230100 Section is to be finished and installed by experienced workers skilled in the disciplines as described herein. References to specific sections the mechanical are:
  - 1. Mechanical/HVAC:
    - a. Section 230100: Basic Mechanical Materials & Methods
    - b. Section 230500: Heating, Ventilation, & Air Conditioning (HVAC) - Mechanical / Sheet Metal Contractors
    - c. Section 230593: Testing, Adjusting, and Balancing
    - d. Section 230700: Insulation - External Ductwork Insulation
    - e. Section 230900: HVAC Controls
    - f. Section 232105: Fuel Piping
- C. The Contractor may be qualified for one or more of the disciplines listed. Where the Contractor is not qualified under the conditions of these specifications, Contractor must subcontract to a qualified firm as listed above to accomplish the Work.

**1.1 WORK INCLUDED**

- A. Mechanical/HVAC:
  - 1. Provide labor and materials for a complete installation of HVAC as specified and as described on the Drawings. HVAC systems to include electrical power, venting, ductwork, air terminal devices, balancing, insulation, supports, and controls as required for complete and functional systems. Contractor is required to remove existing ductwork and equipment as shown to accommodate new work.
- B. Piping:
  - 1. Provide labor and materials for a complete installation of Fuel Piping Systems as specified and as described on the Drawings. Piping systems to include piping, fittings, and supports as required for complete and functional system(s). Contractor is required to remove existing piping as shown to accommodate new work.
- C. The Contractor is responsible for installation, balancing, testing, startup, and operational checkout for a fully functional system. Provide check-out and start-up of all mechanical & piping systems in accordance with manufacturer procedures and specifications. Install all Work parallel and plumb to building lines, unless otherwise indicated.
- D. The Drawings and Work Scope are not intended to be comprehensive of all Work to be done under this Contract. Specifications, Drawings, and Work Scope must be used in their entirety to develop full understanding of the Work to be done

**Basic Mechanical Materials & Methods  
230100-2**

under this Contract.

- E. Roof Traffic: No Work on roof shall occur until protective plywood is laid down where walking or placement of equipment or materials occur.
- F. Roof Repair: Contractor shall keep the roof in good repair and make every effort to prevent leaks from occurring from construction activity on roof. At end of project, Contractor shall make all repairs necessary to stop leaks wherever construction traffic has occurred. Provide a written one year warranty to cover 100 percent labor and material to make necessary repairs of leaks that can be attributed to the work traffic on roof as a result of this Contract.

**1.2 RELATED WORK**

- A. The Contractor is responsible to provide all labor, equipment and materials to complete all mechanical and Piping work indicated, specified within Division 23, or obviously necessary and required for a fully operational system. The Contractor is also responsible for proper location and sizes for sleeves, building penetrations, hangers, and supports for mechanical materials and equipment.
- B. The Contractor is responsible for all work requiring subcontractors, such as Piping, HVAC controls, balancing, electrical, trenching plus backfilling, chases, framed openings, furring, patching, painting, roofing, curbing, blocking, and related general work.
- C. Where Work is primarily done by the mechanical, the Mechanical Contractor may be the prime Contractor which subcontracts to General Contractors for related general work.
- D. Coordinate all Work with various trades. Cutting of structural members not permitted, except as approved by Structural Engineer.

**1.3 REFERENCES AND STANDARDS**

- A. ANSI: American National Standards Institute
- B. ASHRAE: American Society of Heating, Refrigeration, and Air-Conditioning Engineers, Inc.
- C. ASME: American Society of Mechanical Engineers.
- D. ASTM: American Society for Testing and Materials.
- E. AWWA: American Water Works Association.
- F. Fed. Spec.: Federal Specifications
- G. IAPMO: International Association of Plumbing and Mechanical Officials.

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- H. OEF: 2021 Oregon Energy Efficiency Specialty Code based on the ASHRAE Standard 90.1-2019.
- I. OMSC: 2019 Oregon Mechanical Specialty Code based on 2018 International Mechanical Code & International Fuel Gas Code.
- J. OPC: 2021 Oregon Plumbing Specialty Code as amended by the 2021 Uniform Plumbing Code.
- K. OSC: 2019 Oregon Structural Specialty Code based on the 2018 International Building Code.
- L. OESC: 2021 Oregon Electrical Specialty Code based on 2020 NFPA 70 National Electric Code (NEC)
- M. NEMA: National Electrical Manufacturer's Association.
- N. NFPA: National Fire Protection Agency.
- O. UL: Underwriters' Laboratory.

**1.4 ELECTRICAL WORK**

- A. Division 26 specifies electrical work including wiring, conduit, disconnect switches, mounts starters, convenience outlets for equipment service, and makes line voltage connections to equipment furnished under Division 23, unless noted under specific item. Electrical to provide convenience outlet within 25-feet of all HVAC equipment for maintenance service per IMC adopted by Oregon Specialty Code.

**1.5 PERMITS, CODES, AND STANDARDS**

- A. Install all work in accordance with applicable codes and standards and in accordance with manufacturer's current specifications. Include all permits and inspections required by applicable codes pertaining to work in this Specification.

**1.6 OCCUPANCY**

- A. **Some work areas may be occupied. All Work scheduling which may interfere with the building operations must be coordinated with the Owner and Owner's representative. Do not shut down any utilities without 24 hours notice and approval of Owner.**

**1.7 VISITING JOB SITE**

- A. Site Visit:
  - 1. A visitation of job site is recommended prior to bidding.

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- B. Existing conditions may affect extent of Work. Additional costs will not be authorized for omission in Bid due to lack of understanding of the Scope of Work.

**1.8 SUBMITTALS**

- A. Shop Drawings:
1. After award of Contract, provide shop drawings which have been reviewed and approved by Contractor, and literature showing item used, size, dimensions, capacity, rough-in, etc.
  2. From manufacturer, detailing equipment assemblies and indicating dimensions, weights, loadings, required clearances, method of field assembly, components, and location and size of each field connection.
  3. Wiring Diagrams: Detail wiring for power, signal, and control systems and differentiate between manufacturer installed and field installed wiring.
  4. The Contract Drawings indicate the general layout of piping and various items of equipment. Coordination with other trades and with field conditions will be required. For this purpose, prepare Shop Drawings of all piping and equipment installations. Shop Drawings shall be drawings prepared by Contractor and not reproductions or tracings of Engineer's Drawings. Overlay drawings with shop drawings of other trades and check for conflicts. All drawings shall be same size as Engineer's Drawings with the title block similar to Contract Drawings and identifying Engineer's Drawing number or any reference drawings. All drawings shall be fully dimensioned including both plan and elevation dimensions. Shop drawings cannot be used to make scope changes.
  5. Shop drawings shall include but are not limited to:
    - a. Site plan to same scale as Engineer's Drawing.
    - b. Complete floor plans with sheet metal, HVAC, piping, control panels, and Piping to a minimum mechanical and fan rooms and sections of congested areas to a minimum of 1/4-inch scale.
    - c. Fabricated Equipment: Scale and drawing sizes to suit contractor except equipment shall not be less than a 1/4-inch scale.
  6. Submit shop drawings for review prior to beginning fabrication. Additional shop drawings may be requested when it appears that coordination issues are not being resolved in the field or when there is a question as to whether contract documents are being complied with or the design intent is being met.
- B. Product Data: Include rated capacities for each model; shipping, installed and operating weights; furnished specialties; and accessories for each type of product specified.
- C. Provide submittal data for the following items within 20 days of award of Contract for Contractor review and approval per Section 01300:
1. Mechanical/HVAC
    - a. Air Handler Systems
    - b. Variable Frequency Drive
    - c. Automatic Control Dampers

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**230100-5**

- d. Insulation - Duct
- e. Grilles and Registers
- f. Filters
- g. Certification of Balance Firm
- h. Controls
- i. Air Conditioning Condensers
- 2. Piping:
  - a. Fuel Piping

**1.9 CERTIFICATES**

- A. Furnish Owner with signed certificates stating that:
  - 1. Systems have been thoroughly cleaned as specified.
  - 2. Tests of piping have been made and satisfactorily concluded.
  - 3. Lubrication of items has been completed.
  - 4. Cleaned set of filter media is installed and **strainers** have been cleaned.

**1.10 DRAWINGS**

- A. Mechanical drawings are **diagrammatic** and are intended to show the approximate location of equipment and piping. Dimensions given in figures on the Drawings shall take precedence over scaled dimensions; and all dimensions, whether given in figures or scaled, shall be verified in the field. All piping and equipment shall be installed in a manner and in locations to avoid obstruction, preserve head room and keep openings and passageways clear. **Contractor is required to submit shop drawings of all work to be installed. Any changes or modifications from Bid documents must be approved by Engineer prior to installation.**

**1.11 GUARANTEE**

- A. Mechanical work, materials and equipment shall be free from defects and guaranteed for a period of one year from the date of final acceptance. Any workmanship, equipment or materials proved defective due to this Contract, shall be repaired or replaced without additional cost to the Owner.

**1.12 CLEAN-UP**

- A. Keep the Work area in a safe, neat, and orderly condition during construction. Upon completion of work, thoroughly clean all equipment, materials, and floor. Remove all debris or extra material resulting from the Work. Refer also to Section 017400.

**1.13 OPERATION AND MAINTENANCE MANUALS**

- A. Submit one (1) set of engineering data and/or specifications, operating and maintenance instructions, parts lists and other relevant data for mechanical

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equipment. One set shall be digitized and placed on a compact (optical) disc.

1. Equipment capacity (input and output) and required maintenance actions.
2. HVAC system control maintenance and calibration information, including wiring diagrams, schematics, and control sequence descriptions. Desired or field-determined setpoints shall be permanently recorded on control drawings, at control devices or, for digital control systems, in programming comments.
3. A complete written narrative of how each system is intended to operate.

**1.14 "AS BUILT" RECORD DRAWINGS**

- A. Maintain a marked set of prints at job site at all times. Show all changes from Contract Drawings, whether visible or concealed. Dimension accurately from building lines, floor or curb elevations. Show exact location, elevation and size of piping, conduit, access panels and door, and all other information pertinent to the Work.
- B. At project completion, submit one set of reproducible tracings to Engineer for approval.
- C. See Section 017700, Contract Close-out, for detailed requirements.

**PART 2 PRODUCTS**

**2.1 MOTORS**

- A. Fan motors and pump motors to be supplied by Contractor as listed on the mechanical equipment schedule on the Drawings.
- B. Motors to be NEMA standard with 115 percent minimum service factor and wound to operate on voltage and number of phases specified in the equipment schedule, with a plus or minus 10 percent safety factor.
- C. Motors to operate at a maximum of 1,750 RPM.
- D. Equip single-phase motors less than 2 Hp with internal thermal protection.
- E. Provide brake horsepower (bHp) required by equipment at design conditions not to exceed nameplate Hp of motor unless otherwise limited.
- F. Motors, unless otherwise noted, shall have permanently lubricated ball bearings.
- G. Motors to have NEMA Premium Efficiency designation unless otherwise specified.
- H. Motors with outside exposure shall have enclosures that are drip proof or weather proof as appropriate.
- I. Motors shall have internal maintenance free, shaft grounding that is rated for the

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life of the motor. The maximum instantaneous voltage potential across the motor bearings shall be less than 1 V over the life of the motor.

- J. Motors shall be rated for use with Variable Frequency Drives unless specifically stated otherwise on the equipment schedule.
- K. Approved Manufacturer/Model Numbers/Motors shall be:
  - 1. [Baldor Premium Efficiency series]
  - 2. or approved

**2.2 ROOF CURBS**

- A. Furnish roof curbs for support of all roof mounted HVAC equipment and pipe or duct penetrations as specified in Section 077213.

**2.3 SEISMIC RESTRAINTS AND BUILDING JOINTS**

- A. General: Provide resilient earthquake restraints with suitable structural support for all equipment as specified herein and shown on the Drawings. Restraints shall be attached to structural members capable of withstanding the design dynamic load specified below. Contractor shall be responsible for ensuring that the dynamic load capacity of the attachment bolts and supporting structure is greater than or equal to the capacity of the seismic restraint. Contractor shall also coordinate the size of concrete piers and housekeeping pads to ensure adequate space for the isolators and the restraints. Design of the seismic restraints shall be stamped and signed by a registered engineer.
- B. Suspended air handling units, fan coil units, and fans:
  - 1. Seismic Restraint: Slack cables rigidly attached to suspended equipment. Attachment to structure shall include an interlocking steel element with a minimum 1/4-inch thick neoprene pad between the interlocking steel members. Cable shall be sized to accommodate dynamic loads up to 1g in all directions without failure. Cables shall be slack during normal operation of equipment and shall not compromise the efficiency of the vibration isolation hangers.
  - 2. Floor or Platform-mounted Equipment: Equipment with or without isolators shall be anchored to floor or supporting platform structure.
  - 3. Roof-mounted Cooling Towers: Roof-mounted equipment shall be anchored to the roof curb with or without isolators, as specified or as shown on Drawing details.
- C. Piping and Ductwork (Excluding Fire Sprinkler and Equipment):
  - 1. All ductwork and piping shall be provided with seismic restraints in accordance with seismic Hazard Level (SHL C) of the *Seismic Restraint Manual: Guidelines for Mechanical Systems*, as published by the Sheet Metal and Air Conditioning Contractors National Association, Inc. and in accordance with the current State of Oregon, Structural Specialty Code.
  - 2. Approved Manufacturer/Model Numbers:
    - a. Pipe Shields Inc.

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**PART 3 - EXECUTION**

**3.1 MOTORS AND STARTERS**

- A. Motors to be factory installed with fans and pumps unless otherwise indicated for field installation by Contractor.
  - 1. Contractor is responsible for inspecting and ensuring proper alignment of motors with couplings, belts, and equipment.

**3.2 ROOF CURBS**

- A. Install custom or field fabricated roof curbs around all duct or pipe penetrations through roof or under entire footprint of roof mounted HVAC equipment. Roof curbs to elevate equipment and roof penetrations above snow accumulation levels. Provide cant blocking and sheet metal flashing for mating of roofing material and weatherstripping to roof curb.

**3.3 SEISMIC BRACING**

- A. All new piping in the mechanical rooms shall comply with local codes and conform to the seismic requirements to SMACNA "Seismic Restraint Manual" Guidelines for mechanical Systems, Second Edition, specifically seismic bracing is required on all fuel pipe and all other piping that is 1.25 nominal inches and larger in mechanical rooms and 2.5-inches and larger outside mechanical rooms.
- B. All runs of pipe must have a minimum of two transverse braces and one longitudinal brace. A run is defined as a length of pipe without any change in direction. Branch lines may not be used to brace main lines.

**END OF SECTION**



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**PART 1 - GENERAL**

- A. Work related to this Section is specified in other Sections. Other Sections of these Specifications also apply even though not described here.

**1.1 WORK INCLUDED**

- A. Furnish and install all materials and equipment pertaining to the Heating, Ventilation, and Air Conditioning (HVAC) system. This includes items of a minor nature necessary to complete the installation for a fully functional system. Refer to Section 230100.

**1.2 REGULATIONS FOR DUCTWORK**

- A. Low-pressure ductwork shall be fabricated from galvanized steel. All gauges and duct construction requirements shall be in accordance with the latest editions of ASHRAE Handbook, SMACNA Manual of Duct and Sheet Metal Construction for Ventilating and Air Conditioning Systems, and the International Mechanical Code. Where a conflict among these references arises, the most stringent source shall be followed.
- B. Comply with the following regulations:
1. ASHRAE-Handbook 2021 Fundamentals; Chapter 21 - Duct Design.
  2. ASHRAE -Handbook 2020 Systems & Equipment; Chapter 19 - Duct Construction.
  3. ASTM A 90 -Weight of Coating on Zinc-Coated (Galvanized) Iron or Steel Articles.
  4. ASTM A 525-General Requirements for Steel Sheet, Zinc-Coated (Galvanized) by the Hot-Dip Process.
  5. ASTM A 527-Steel Sheet, Zinc-Coated (Galvanized) by Hot-Dip Process, Lock Forming Quality.
  6. SMACNA -Low Pressure Duct Construction Standards.
  7. UL 181 -Factory-Made Air Ducts and Connectors.
  8. Oregon Energy Specialty Code (2021)
  9. Oregon Mechanical Specialty Code (2019)
  10. Oregon Structural Specialty Code (2019)
  11. Oregon Plumbing Specialty Code (2021)
  12. Oregon Electrical Specialty Code (2021)

**1.3 SUBMITTALS**

- A. Refer to Section 230100, Basic Mechanical materials & Equipment, Item 1.8.

**PART 2 - PRODUCTS**

**2.1 GAS-FIRED UNIT HEATERS**

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- A. Provide gas-fired, propeller unit heaters. Units shall be UL listed. Fan motor to be open drip proof.
- B. The casing shall be minimum 20 gauge 430 stainless steel. The burner and heat exchanger shall be 409 stainless steel with brass and aluminum fins. Flue collector to be 321 stainless steel. Includes combustion blower and power ventor. Condensate trap and neutralizer.
- C. Safety controls to include: blocked inlet air pressure switch, blocked vent air pressure switch, direct spark ignition, high limit switch, external LED diagnostics, Modbus, negative pressure gas valve, condensate float switch.
- D. Controls: System shall receive analog input from building automation system to control discharge air temperature.
  - 1. Coordinate with section 260000 and the building owner for controls.
- E. The unit size and capacity shall be as noted on the Drawings.
- F. Minimum combustion efficiency to be 95% as tested in accordance with ANSI Z83.8 test procedures.
- G. 10-year warranty on heat exchanger, burner, and flue collector.
- H. Approved Manufacturer/Model Numbers:
  - 1. Sterling model HU
  - 2. Or by approved substitution request

**2.2 AIR-COOLED CONDENSING UNIT**

- A. Provide a complete air-cooled condensing unit with capacity as noted on the Drawings.
- B. The condensing unit shall be completely factory-assembled on a steel channel base and be individually performance tested at full and part load conditions. The unit shall be leak tested and shipped with a holding charge. Construction and ratings shall be in accordance with latest ARI Standard 520 and shall comply with ANSI/ASHRAE 15 Safety Code, National Electrical Code, CSA and ETL.
- C. Compressor shall be mounted on vibration isolators to minimize noise and vibration transmission.
- D. Field power connection, control inter-lock terminals and unit control system shall be centrally located in a weather-proof enclosure. A sheet metal barrier shall protect service personnel against accidental contact with line voltage components. Power and starting components shall include factory fusing of fan motors and control circuit, starting contactors including individual contactors for each fan motor, solid-state compressor sequence start timer, solid-state compressor overload protection in all three phases, inherent condenser fan motor overload protection, and unit power terminal block for field connection to

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remote disconnect switch.

- E. Safety and operating controls shall include unit controls top switch, recycling pump-down control, high and low pressure switches and fan cycling controls. Terminals shall be provided for field connection of power supply to the control circuit. Unit controls shall provide recycling pump-down protection at all times, including time clock system shutdowns on nights and weekends.
- F. Controls: BACnet compatible packaged controls shall interface with a building automation system. System shall receive analog input from building automation system to control discharge air temperature. System shall also be capable of mapping control points to monitor condensing unit display data.
  - 1. Coordinate with section 260000 and the building owner for controls.
- G. Unit shall be rated with automatic head pressure control to permit satisfactory operation at ambient air temperatures down to 50°F by cycling condenser fans in response to refrigerant head pressure and ambient air temperature.
- H. Performance shall be greater than or equal to that listed in the equipment schedule found on the drawings.
- I. Approved Manufacturer/Model Numbers:
  - 1. Johnson Controls Inc. YCC or YDC
  - 2. Or by approved substitution request
- J. Other Acceptable Manufacturers Similar to Approved:
  - 1. York
  - 2. Aeon
  - 3. Daikin
  - 4. Trane

**2.3 PACKAGED GAS - ELECTRIC ROOFTOP AIR CONDITIONING UNIT**

- A. Provide a packaged self-contained, factory assembled, pre-wired, gas/electric rooftop HVAC unit with downflow air flow. The cabinet shall be a steel suitable for outdoor installation, with a baked-on enamel finish. The base shall have provisions for forklift and crane lifting.
- B. The unit shall be provided with MERV 13 filters.
- C. The unit shall have a sealed, hermetic compressor with isolation, internal over-current, high-low pressure protection. Unit to be fully charged with refrigerant.
- D. The coils shall be copper tubes, mechanically bonded to aluminum plate fins. The heating section shall have corrosion resistant aluminized steel components. The outdoor fan shall be direct drive, statically and dynamically balanced. The motor shall be permanently lubricated. The indoor fan shall be direct driven with multi-speed motor.
- E. The unit shall be provided with a factory installed economizer with motorized relief air damper. Outside and exhaust air dampers shall be Class I, motorized

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dampers as required by current Energy Efficiency Specialty Code.

- F. Assembly:
  - 1. Down flow air delivery.
  - 2. Multi-speed, direct drive indoor fan.
  - 3. Frame and panels to be galvanized steel with baked enamel finish, easily removed access doors or panels with quick fasteners.
  - 4. Evaporator fan to be provided with permanently lubricated bearings, statically and dynamically balanced, resiliently mounted.
  - 5. Single point power connection with disconnect. Includes 120v AC GFCI NEMA 4 service receptacle with step-down transformer.
- G. BACnet compatible packaged controls shall interface with a building automation system.
  - 1. System shall receive signals from the building automation system for enable/disable, occupied, unoccupied, space temperature, and heating and cooling setpoints.
  - 2. Coordinate with section 260000 and the building owner for controls.
  - 3. An air quality sensor in the return air stream shall implement demand control ventilation to modulate the outside/exhaust air damper(s) to 50% of minimum outside air position.
- H. Approved Manufacturer/Model Numbers:
  - 1. Johnson Controls Inc. Core 3 ZYG
  - 2. Or by approved substitution request
- I. Acceptable Manufacturers Similar to Approved Manufacturer:
  - 1. York
  - 2. Aeon
  - 3. Daikin
  - 4. Trane

**2.4 REFRIGERANT PIPING**

- A. Seamless copper-type ACR, ASTM B280, for air conditioning and refrigeration field service. Size according to manufacturer's requirements.

**2.5 DIRECT EXPANSION COILS**

- A. The primary surface shall be a minimum 5/8-inch outside diameter seamless copper and expanded into the fin collars to provide a permanent mechanical bond. The fins shall be corrugated aluminum with spacing not closer than 10 fins per inch. Headers shall be non-ferrous copper and located outside of air stream. Casings shall be heavy gauge galvanized steel. Reinforcing rods shall be furnished so that the unsupported length does not exceed 60-inches.
- B. The coil shall be thermal counterflow construction with same end liquid and section connections. Refrigerant distributors shall be brass, pressure-type with copper distributor tubes factory-mounted.
- C. Approved Manufacturer/Model Numbers:

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1. Johnson Controls BDX DX
2. Or by approved substitution request

**2.6 DUCTWORK**

- A. Provide essentially air-tight ductwork conforming with recommendations of ASHRAE, latest edition, and constructed per SMACNA manual of HVAC Duct Construction Standards. Gauges, hanging, supporting and bracing per IMC Table 10-A, B, C, E, and SMACNA. Maintain SMACNA manual on job site for reference by workers and Engineer. Ducts, liners, sound attenuation, flexible ducts, flexible connections and adhesives carry label "Incombustible", flame spread 0 - 25, NFPA-90a.
- B. Sheet metal to comply with ASTM A-525, with 1-1/4 oz. coating and bear stamp of Manufacturer.
- C. Rectangular and Round Duct:
  1. Sheet metal rectangular duct shall be essentially air tight, conforming to ASHRAE and SMACNA low velocity standards, and International Mechanical Code, latest edition.

**2.7 DUCT ACCESSORIES**

- A. Turning Vanes:
  1. Turning vanes shall be airfoil, double thickness type.
  2. Approved Manufacturer/Model Numbers:
    - a. Duro-dyne "Air-Rail" frame or shop fabricated.
- B. Volume Dampers:
  1. Volume dampers shall be constructed in accordance with SMACNA details for butterfly-type dampers.
  2. Approved Manufacturer/Model Numbers:
    - a. Duro-Dyne 3/8-inch Quadline.
- C. Duct Connectors:
  1. Duct connectors shall be IMC, SMACNA, or approved manufactured joining system.
- D. Branch Connections:
  1. Provide 45 degree entry boots. Straight 90 degree taps are not allowed.
  2. For balancing, provide volume dampers at take-offs that terminate diffusers.
- E. Flexible Connectors:
  1. Flexible duct connectors shall be impregnated Duoprene glass fabric, low smoke development. Provide with the necessary angle, straps, bolts, or clips to secure the material to the equipment and ducts.
- F. Acceptable Manufacturers:
  1. Genflex
  2. J-M

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3. Fiberglass
  4. Thermaflex
  5. Clevaform SFV
  6. or approved
- G. As alternative, use up to 5-feet length of Clevaflex DB flexible, corrugated, aluminum-lined acoustical duct, self-supporting between end hangers. Limit to one 90° elbow.
- H. Access Doors:
1. Duct access doors shall be 12-inches X 12-inches unless otherwise indicated.
  2. Where size of duct does not accommodate this door size, the door shall be as large as practical and shall be constructed of a gage not less than that of the duct sheet. The doors shall be rigid and shall be provided with airtight gaskets. Doors shall be continuous hinge-type with vent lock latch on outside.

**2.8 BALANCING DAMPERS**

- A. Provide balancing damper(s) for each supply and return outlet.
- B. Balancing damper to be quadrant damper installed in ductwork with locking level for supply and return outlets.
- C. Opposed Blade Damper (OBD) located behind grille for return or exhaust outlets. OBD to be fully adjustable from back of grille without removing grille face.
- D. The use of OBDs may not be used for supply unless prior approved or except where shown on drawings.

**2.9 TERMINAL UNIT – FAN POWERED BOXES**

- A. Provide a new 22 gauge galvanized steel fan powered box with electric reheat coils as scheduled. Casing shall have full bottom access to primary air valve and fan assembly. The unit shall have integral electronic controls and factory-mounted, UL listed, resistance-type electric heater. Provide factory-installed access panel, disconnect switch, fuses and safety switch.
- B. Fan: Forward curved, dynamically balanced, galvanized wheel with a direct drive motor. The motor shall be permanent split capacitor type with three separate horsepower taps. Motor shall be mounted to the fan housing using torsion isolation mounts properly isolated to minimize vibration transfer. Includes an electronic (SCR) fan speed controller for aid in balancing the fan capacity.
- C. Electric Heater: Cabinet to be 20-gauge galvanized steel with hinged access to controls. A power disconnect shall be furnished to render the heater non-operational. Includes all controls necessary for safe operation and full compliance with UL 1995 and National Electric Code requirements. Includes single point electrical connection. It shall include a primary disc-type automatic reset high temperature limit, secondary high limit(s), Ni-Chrome elements, and

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fusing per UL and NEC.

- D. BACnet compatible packaged controls shall interface with a building automation system.
  - 1. System shall receive signals from the building automation system for enable/disable, occupied, unoccupied, space temperature, and heating and cooling setpoints.
  - 2. Coordinate with section 260000 and the building owner for controls.
- E. Size and performance as noted in the Equipment Schedule on the Drawings.
- F. Approved Manufacturer/Model Numbers:
  - 1. Johnson Controls Inc. TCS
  - 2. Or by approved substitution request.
- G. Acceptable Manufacturers Similar to Approved Manufacturer:
  - 1. Titus
  - 2. Price
  - 3. Enviro-Tec
  - 4. Nailor
  - 5. Krueger

**2.10 VARIABLE FREQUENCY DRIVES**

- A. The Variable Frequency Drive (VFD) shall convert three-phase, 60 hertz power to adjustable voltage and frequency, three-phase, AC power for motor control from 0 percent to 110 percent of base speed for each of the supply fans and hydronic pump motors.
- B. The VFD, together with all options and modifications, shall mount inside the fan system and within a standard NEMA-rated enclosure, suitable for continuous and intermittent operations at ambient temperatures between 32°F and 104°F. VFD to have storage temperature ratings of 0°F to 120°F. All high voltage components within enclosure shall be isolated with steel covers. The complete unit shall be UL approved and labeled.
- C. Circuitries shall provide protection for semi-conductors. The VFD shall be capable of starting into a rotating load without delay. Protective circuits shall use instantaneous trip (IET) should any of the following faults occur:
  - 1. 110 percent controller maximum sine wave current rating is exceeded.
  - 2. Output phase to phase short circuit condition.
  - 3. High input line voltage.
  - 4. Low input line voltage.
  - 5. Loss of input phase.
  - 6. External fault. This protective circuit shall permit, by means of the terminal strip, wiring of remote NC safety contacts such as high static, firestat, etc., to shut down the drive.
- D. The following adjustments shall be available in the controller:
  - 1. Maximum Frequency (55 to 66 Hz).
  - 2. Minimum Frequency (6 to 35 Hz).

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3. Acceleration (2 to 120 seconds).
  4. Deceleration (2 to 120 seconds).
  5. Volt/Hertz ratio.
  6. Voltage offset or boost torque.
  7. Current limit (50 percent to 110 percent sine wave current rating).
- E. The VFD shall be furnished with door-mounted operator controls, consisting of auto/manual switch, start/stop (reset) switch, and manual speed control. In automatic mode, controller will follow an external signal and respond to remote start/stop contact wired to terminal strip.
- F. VFD shall provide serial or network communication for connection to the BAS system. VFD shall provide BACnet, modbus, and N2 communication options. Coordinate VFD serial or network communication protocol with the controls contractor.
- G. Coordinate with supplier of fan system for factory-installed VFD.
- H. Motor leads shall not exceed maximum length recommended by the VFD manufacturer. Contractor shall follow all manufacturer recommendations including the installation of filters and reactors.
- I. Acceptable VFD Manufacturers / Other Acceptable Manufacturers Similar to Approved Manufacturer/Model Numbers:
1. ABB
  2. SafeTronics
  3. Yaskawa
  4. or approved

**2.11 GRILLES, DIFFUSERS, AND REGISTERS**

- A. Basis of design as scheduled in the drawings.
- B. Approved Manufacturers:
1. Shoemaker 905, 100, RS52-SC, & 600P
  2. Or by approved substitution request
- C. Acceptable Manufacturers Similar to Approved Manufacturer:
1. Price
  2. Titus
  3. Kruger

**2.12 FILTERS**

- A. Construction filters to be disposable-type, 30% minimum efficiency. Final filters to be MERV 13 (ASHRAE Standard 52.2), 80% minimum efficiency.
- B. Contractor shall provide two complete sets of filters for use during construction and balancing. A new, minimum 80% efficient, set shall be installed prior to final testing, adjustment, and balancing.



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- C. Where called out on the drawings, contractor shall provide minimum 16 gauge galvanized steel holding frame, equipped with foam gaskets and fasteners, to accommodate filters. Housing shall include access doors, tracks, and holding frames. It shall be assembled in such a manner that a rigid and durable enclosure is maintained for the filter pack.
- D. Approved Manufacturer/Model Numbers:
  - 1. Camfil
  - 2. American Air Filter Company
  - 3. Or by approved substitution request

**2.13 FIELD FABRICATED CONDENSATE PANS**

- A. All condensate pans shall be made of a minimum, 18 gauge, and made of galvanized steel.

**2.14 FLUE STACKS (FORCED DRAFT)**

- A. Provide UL listed, factory built, double wall vent stack for positive pressure exhaust gas at temperatures not to exceed 480°F continuous operation. Vent stack shall be AL 29-4C stainless steel.
- B. As a minimum, flue shall be insulated in the occupied space to 8' AFF, 1' either side of roof or wall penetrations and as required by code for clearance to combustibles.
- C. Flue shall be airtight and water tight and shall provide sloped drain back and catchment prior to connection to any Category I or III appliance.
- D. Substitutions may be approved by Engineer (subject to connecting equipment manufacturer approval): For low temperature, Category IV applications, ASTM D1785 schedule-40 solid core PVC/CPVC concentric vent. Pipe cement and primer to conform to ASTM D2564.
- E. Acceptable Manufacturers:
  - 1. Schebler model eVent SD
  - 2. Selkirk
  - 3. Metal-Fab
  - 4. Ampco Ci-Plus Saf-T (AL29-4C)

**PART 3 - EXECUTION**

**3.1 ROOFTOP AIR CONDITIONING UNIT**

- A. Install in accordance with manufacturer's instructions.
- B. Install the rooftop unit in locations shown on Drawings; plumb and square to building lines.

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- C. Provide flexible duct connectors at equipment connections.
- D. Unit to be on fabricated roof curb per Section 06114 (Roof Curbing and Blocking).
- E. Pipe condensate from drain pan to outlet near roof surface.

**3.2 REFRIGERANT LINES**

- A. Install refrigeration specialties in accordance with manufacturer's instructions. Properly insulate and support piping.

**3.3 DUCTWORK**

- A. Construct and install ductwork as described on the Drawings and in accordance with SMACNA, ASHRAE, and International Mechanical Code Standards. Keep ducts clean, and plug at all unused openings.
- B. The installation of duct accessories shall be by a skilled installer, trained and in the employ of a firm specializing in this type of work.
- C. Review space carefully, prior to construction of ductwork. Provide minor offsets as required in accordance with SMACNA details. Notify Engineer immediately if space conflicts arise. Install air-foil, double thickness turning vanes at all changes of direction greater than 45°.
- D. Duct dimensions shown on the Drawings are inside dimensions. Allow for metal and insulation thickness.
- E. All exposed fasteners to be stainless steel, round head, finished appearance, or otherwise approved.
- F. The inside of all ducts visible through grilles and registers shall be painted black.
- G. All ductwork shall be made airtight by taping with pressure-sensitive duct tape. Duct tape shall be Fasson 0805, Nashua 324, or equal. Apply duct tape in strict accordance with manufacturer's instructions. All surfaces shall be clean, dry and grease-free.
- H. All exterior ductwork shall be made waterproof, weatherproof, resistant to ultraviolet light, and have airtight surfaces. To receive sealant, surfaces should be free from oil, dust, dirt, rust, moisture, and other substances that inhibit or prevent bonding of sealant. Use United duct sealer, Hardcast, or approved equal. Foil tape allowed for indoor application only. Standard duct tape is not allowed. Apply sealant in accordance with manufacturer's recommendations and SMACNA standards.
- I. Paint duct exposed on roof to blend with surroundings. Paint exposed interior ductwork to blend with wall.

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- J. Weather cover: Fabricate weather-tight sheet metal covers to go over flexible connections. Provide deflections to prevent water from going down sides of flexible duct. Provide weather protection for other equipment exposed to outside sun or rain, such as automatic damper operators, PVC control tubing, linkages, or materials which deteriorate under this condition.

**3.4 DUCT ACCESSORIES**

- A. The installation of duct accessories shall be by a skilled installer, trained and in the employ of a firm specializing in this type of work.
- B. The Contractor is to install new, lined, sheet metal duct for a minimum of 4-feet downstream of volume dampers, and within 6-feet of all fan discharge.

**3.5 VOLUME BALANCING DAMPERS**

- A. Install balancing dampers in all new branch ducts, and where indicated on the Drawings.
- B. Install upstream of outlets, distant enough to prevent sound transition through opening. Shaft ends shall be slotted parallel to blades to indicate position of dampers' blades. Install dampers so they do not bind or interfere with duct liner. Manual dampers shall have mechanical stop to assist in balancing.
- C. Automatic dampers shall have operators installed by Controls Contractor.

**3.6 START-UP OF AIR HANDLER EQUIPMENT**

- A. Properly check air handler per manufacturer's installation and start-up procedures.
- B. During construction and start-up, use air handlers with filters in place and access doors closed. Provide one set of clean filters after acceptance of project completion. Any cleaning of coils or interior fan housing required, due to improper operation during construction, will be the responsibility of the Contractor.

**3.7 MANUFACTURER'S FIELD SERVICES**

- A. Prepare and start systems. Perform HVAC unit checkout according to manufacturer's recommendation and in presence of Owner's Representative.
- B. Provide field representative for starting unit and training operator.
- C. Provide combustion test and submit report. Test shall include burner firing rate, overfire draft, gas flow rate, heat input, burner manifold gas pressure, percent carbon monoxide (CO), percent oxygen (O<sub>2</sub>), percent excess air, flue gas temperature at outlet, ambient temperature, net stack temperature, percent stack loss, percent combustion efficiency, and heat output.

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**END OF SECTION**

**Testing, Adjusting, & Balancing  
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**PART 1 - GENERAL**

**1.1 RELATED WORK**

- A. Work related to this Section is specified in other sections. Other sections of these Specifications also apply even though not described here.

**1.2 SUMMARY**

- A. The Work consists of air balancing. Set main fan unit for full recirculation, full outside and minimum outside air conditions. Take and record measurements required at each of the three conditions. Report any problem on obtaining design conditions to design engineer prior to complete balance for corrective action.
- B. Measure each air outlet and calibrate zone terminal unit for design air quantity at each zone. Set minimum and maximum conditions for fan powered box units. Set maximum volumes at full cooling conditions. Adjust volume dampers for each outlet to balance air quantities as shown on Drawings. Space balancing to be done with doors closed.
- C. Once all conditions have been tested, adjusted, and calibrated report any conditions outside 10% of design parameters to Engineer for appropriate action or correction.

**1.3 QUALIFICATIONS AND RESPONSIBILITY**

- A. The Contractor may perform pipe testing for leakage and functionality. A certified independent Balance Contractor is to perform and record the adjusting and balancing of flows, pressures, and recording of equipment data.
- B. Prior to start of Work, submit name of proposed subcontractor performing balancing services, and prepare final balance reports.
- C. For testing, adjusting, and balancing the system, the Contractor is responsible for the following:
  - 1. Prepare each system for testing and balancing.
  - 2. Cooperate with testing organization and provide access to equipment and systems. Operate systems at designated times, and under conditions required for proper testing, adjusting, and balancing.
  - 3. Notify testing organization prior to time system will be ready for testing, adjusting, and balancing in order to meet construction schedule.
  - 4. Verify installation of system to be tested is complete and in continuous operation.
  - 5. Verify ambient conditions and related facilities are in full operation.

**1.4 QUALITY CONTROL**

- A. Balance Contractor shall be an agency specializing in the adjusting and balancing of air and hydronic systems specified in this Section, and with

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minimum five years documented experience. Agency shall be certified or be pre-approved to perform Work under supervision of AABC (American Association of Balancing Contractors) or NEBB (National Environmental Balancing Bureau). Submit name of balancing firm to Engineer for approval, prior to the bid.

- B. Pre-approved balancing firms are:
  - 1. Air Introduction & Regulation (A.I.R)
  - 2. Northwest Engineering Service Inc. (NWESI)
  - 3. Precision Air Balance
  - 4. Professional Air Balance
  - 5. Pacific Coast Air Balance
  - 6. Testcomm LLC
- C. Total system balance shall be performed in accordance with AABC National Standards for Field Measurement and Instrumentation, ASHRAE - 2007 Applications Handbook Chapter 37, and NEBB Procedural Standards for Testing, Balancing and Adjusting of Environmental Systems.
- D. Each report form should bear signature of recorder and that of supervisor of reporting organization. The report should also identify each instrument used, and latest date of calibration of each.

**1.5 TESTING AND BALANCING**

- A. Provide Balance Data For:
  - 1. Air Handler Units and Exhaust Fans
  - 2. Supply Air Outlets
  - 3. Return/Exhaust Air Outlets
  - 4. Air Terminal Devices
- B. Sequence balancing work to commence after completion of systems and before substantial completion of Project.
- C. Forms shall include the following information:
  - 1. Title Page:
    - a. Company name, address and phone number
    - b. Project name and location
    - c. Project Engineer
    - d. Project Contractor
    - e. Project altitude
  - 2. Instrument List
    - a. Instrument Type
    - b. Manufacturer
    - c. Model
    - d. Serial Number
    - e. Range
    - f. Calibration date
  - 3. Electric Motors:
    - a. Manufacturer

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- b. HP/BHP
- c. Phase, voltage, amperage; nameplate, actual, no load
- d. RPM
- e. Service factor
- f. Starter size, rating, heater elements

**1.6 BALANCING - AIR**

- A. Air Moving Equipment:
  - 1. Location
  - 2. Manufacturer
  - 3. Model
  - 4. Air flow, specified and actual
  - 5. Return air flow, specified and actual
  - 6. Outside air flow, specified and actual
  - 7. Total static pressure (total external), specified and actual
  - 8. Inlet pressure
  - 9. Discharge pressure
  - 10. Fan RPM
- B. V-Belt Drive:
  - 1. Identification/location
  - 2. Required driven RPM
  - 3. Driven sheave, diameter and RPM
  - 4. Belt, size and quantity
  - 5. Motor sheave, diameter and RPM
  - 6. Center to center distance, maximum, minimum, and actual
- C. Air Distribution Terminal Unit:
  - 1. Air terminal number
  - 2. Room number/location
  - 3. Terminal type
  - 4. Terminal size
  - 5. Design velocity
  - 6. Design air flow
  - 7. Test (final) velocity
- D. Outlet (Grille, Register, Diffuser):
  - 1. Location
  - 2. Manufacturer
  - 3. Model
  - 4. Deflection/Pattern
  - 5. Air flow, specified and actual
  - 6. Area Factor
- E. Submit record documents as noted in Section 017700. Accurately record locations of flow measuring stations, balancing valves and rough setting.

**PART 2 - PRODUCTS**

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**2. 1 FAN BELTS AND SHEAVES**

- A. Provide one additional set of sheave and belt assemblies for adjustment of fans to meet design parameters if required.

**2. 2 PATCHING MATERIALS**

- A. Material:
  - 1. Seal, patch, and repair ductwork, piping, and equipment drilled or cut for testing purposes.
  - 2. Plastic plugs with retainers may be used to patch drilled holes in ductwork and housings.
  - 3. Piping shall be capped with materials the same as piping system.
  - 4. Insulation shall be neatly hemmed with metal or plastic edging, leaving test points visible for future testing.

**2. 3 TEST INSTRUMENTS**

- A. Standards: Utilize instruments and equipment of type, precision, and capacity as recommended in the NEBB "Procedural Standards for Testing, Adjusting, and Balancing of Environmental Systems" and AABC manual MN-1.
- B. Test Instruments:
  - 1. All instruments used for measurements shall be accurate and calibration histories for each instrument shall be available for examination.
  - 2. Each test instrument shall be calibrated by an approved laboratory or by the manufacturer.
  - 3. A representative has the right to request instrument recalibration, or the use of other instruments and test methodology, where accuracy of readings is questionable.
- C. Additional Instruments:
  - 1. Permanently installed measuring instruments, such as temperature and pressure gauges, shall be checked against transfer standard instruments.
  - 2. Any instrument which does not meet specification requirement shall be replaced or recalibrated.
- D. Cone Instruments:
  - 1. The Contractor shall employ manufactured enclosure type cones, capable of air volume direct readings, for all diffuser/grille/register air flow measurements.
  - 2. The readout meters shall meet calibration requirements.

**PART 3 - EXECUTION**

**3.1 GENERAL**

- A. Before commencing balance work, verify that systems are complete and



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operable. Ensure the following:

1. Equipment is operable and in a safe and normal condition.
2. Promptly report abnormal conditions in mechanical systems, or conditions which prevent system balance.
3. Temperature control systems are installed complete and operable.
4. Proper thermal overload protection is in place for electrical equipment.

### **3.2 AIR BALANCE**

- A. Ensure the following:
  1. Fan rotation is correct.
  2. Final filters are clean and in place. If required, install temporary media, in addition to final filters.
  3. Fire and volume dampers are in place and open.
  4. Coil fins have been cleaned and combed.
  5. Volume dampers are in place and open at beginning of balance.
  6. Air outlets are installed and connected.
  7. Duct system leakage has been minimized.
- B. Permanently mark settings of dampers and other adjustment devices, allowing settings to be restored. Set and lock memory stops.
- C. Measure air quantities at air inlets and outlets.
- D. Measure static air pressure conditions on air supply units, including filter and coil pressure drops, and total pressure across the fan. Make allowances for 50 percent loading of filters.
- E. Adjust air handling systems to plus or minus 5 percent for supply systems, and plus or minus 10 percent for return system, for figures indicated. Advise Engineer if deficiencies are generally noted to enable proper corrective actions.
- F. Measure air quantities, where indicated on the Drawings, and record duct traverse reports as indicated.
- G. Adjust outside air automatic dampers, outside air, return air, and exhaust dampers for design conditions.
- H. Where modulating dampers are provided, take measurements and balance at extreme conditions.
- I. Use volume control devices to regulate air quantities, only to extent that adjustments do not create objectionable air motion or sound levels. Effect volume control by duct internal devices, such as dampers and splitters.
- J. Vary total system air quantities by adjustment of fan speeds. Provide drive changes and increase fan motor sizes as required. Vary branch air quantities by damper regulation.
- K. After adjustment, take measurements to verify balance has not been disrupted or

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that such disruption has been rectified.

- L. Central Rooftop HVAC Systems: Adjust fan speeds and motor drives for required air volume, within  $\pm 5\%$  maximum. Set speed to provide air volume at farthest run without excess static pressure. Provide additional sheaves and belts as required to accomplish speed adjustment for new fans. Record fan rpm.
- M. Make Pitot Tube traverse of main supply ducts and obtain design CFM at fans. Read and adjust air supply, return, exhaust fan units to deliver design conditions at minimum OSA and at 100% OSA.
- N. Test Holes: Test holes shall be in a straight duct, as far as possible downstream from elbows, bends, take-offs, and other turbulence generating devices, to optimize reliability of flow measurements.
- O. Adjust all automatic dampers, outside air, return air, and exhaust dampers for design conditions.
- P. Where modulating dampers are provided, take measurements and balance at extreme conditions.
- Q. Read and record static air pressure conditions on all air handling equipment, including filters and coil pressure drops, and total pressure across the fan. A Dwyer Series 400 air velocity meter or equivalent shall be used for final static pressures at equipment and where critical readings are required. Make allowances for 50 percent loading of filters.
- R. Measure temperature conditions across all outside air, return air, and exhaust dampers to check leakage.
- S. Read and record motor data and amperage draw.
- T. Testing organization shall verify all controls for proper calibration and list controls requiring adjustment by control engineer.
- U. For Variable Air Volume (VAV) systems, establish minimum static pressure required at sensing point to permit operation over entire VAV range. Adjust fan speed so that at maximum demand is at 100% of VSD (variable speed drive). Adjust return fan speed so that return air volumes track with supply air volume at minimum exhaust air volume.
- V. Each grille, terminal unit, diffuser, and register shall be identified as to location and area served.
- W. Test and record entering and leaving air temperatures across all hydronic coils.
- X. Evaluate all building and room pressure conditions to determine adequate supply and return air conditions. Assure proper negative and positive pressure systems are within Engineer tolerances for specialty areas such as kitchen range hood and vapor hoods.

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- Y. Evaluate all building and room pressure conditions to determine adequate performance of the system to maintain temperatures without draft.

**3.3 COORDINATION**

- A. Deficiencies noted during the course of air balancing in the mechanical installation shall be promptly reported to the Engineer to allow corrective action to proceed.
- B. Periodic review of progress shall be provided as required or requested.

**3.4 PROCEDURES AND INSTRUMENTS, GENERAL**

- A. Requirements: All systems and components thereof shall be adjusted to perform as required by drawings, schedule, and specifications.
- B. Test Duration: Operating tests of heating and cooling coils, fans, and other equipment shall be of not less than four hours duration after stabilized operating conditions have been established. Capacities shall be based on temperature and air and water quantities measured during such tests.
- C. Instrumentation:
  - 1. Method of application of instrumentation shall be in accordance with the approved agenda.
  - 2. All instruments shall be applied in accordance with the manufacturer's certified instructions.
  - 3. All labor, instruments, and appliances required shall be furnished by the Contractor.
  - 4. Where duct's design velocity and air quantity are both less than 1,000 (fpm/cfm), air quantity may be determined by measurement at terminals served.
- D. Air Terminal Balancing: Generally, measurement of flow rates by means of velocity meters applied to individual terminals, with or without cones or other adapters, shall be used only for balancing. Measurement of air quantities at each type of air terminal (inlet and outlet) shall be determined by the method approved for the balancing agenda.
- E. Air Motion: Air motion and distribution shall be as shown on drawings.
- F. Special Procedures: Where available pump capacity (as designed) is less than total flow requirements of individual heat transfer units of system served, full flow may be simulated by the temporary restriction of flow to portions of the system; specific procedures shall be delineated in the agenda.

**3.5 CERTIFIED REPORTS**

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- A. Submittals: Five (5) copies of the reports described herein, covering air and water system performance, air motion (fpm), and sound pressure levels, shall be submitted prior to final tests and inspection.
- B. Instrument Records. Types, serial numbers, and dates of calibration of all instruments shall be included.
- C. Reports: Reports shall identify items not conforming to contract requirements, or obvious deficiencies.
- D. Certification: Certification shall include checking of adherence to agenda, of calculations, of procedures, and evaluation of final summaries.

**3.6 TEST INSPECTIONS**

- A. Leave systems in proper working order, replacing belt guards, closing access doors, closing doors to electrical switch boxes, and restoring thermostats to specified settings.
- B. Test shall be made to demonstrate that capacities and performance of air and water systems comply with contract requirements.
- C. At the time of final inspection, the Contractor shall recheck, random selection of data (water and air quantities and air motion) recorded in certified report. In addition, rooftop HVAC systems including exhaust/relief fans shall be rechecked.
- D. Sections for recheck (specific plus random), in general, will not exceed 10 percent of the total number tabulated in the report, except that special air systems may require a complete recheck for safety reasons.
- E. At final inspection, recheck random selections of data recorded in report. Recheck points or areas as selected and witnessed by the Owner.
- F. Retests: If random tests elicit a measured flow deviation of 10 percent or more from that recorded in the certified report listings, as 10 percent or more of the rechecked selections, the report shall be rejected. In the event the report is rejected, 25% of all systems shall be readjusted and tested, new data recorded, new certified reports submitted, and new inspection tests made, all at no additional cost. Retainage time shall be based on the date of the final acceptance of the certified report.
- G. Recorded data shall represent actually measured, or observed condition. Record actual locations of flow measuring stations, balancing valves and settings.
- H. Marking of Settings:
  - 1. Following final acceptance of certified reports, the settings of all valves, splitters, dampers, and other adjustment devices shall be permanently marked by the Contractor so that adjustment can be restored if disturbed at any time.
  - 2. Devices shall not be marked until after final acceptance.

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- I. Submit copies of the recorded data to the Engineer, and the Owner at final inspection. Report to include type of instruments used, actual date when readings are made, and outdoor temperature.
- J. Ensure the following:
  - 1. Leave systems in proper working order, replacing belt guards, closing access doors, closing doors to electrical switch boxes, and restoring thermostats to specified settings.
  - 2. At final inspection, recheck random selections of data recorded in report. Recheck points or areas as selected and witnessed by the Engineer, Commissioning Agent, or Owner's Representative.
  - 3. Recorded data shall represent actually measured, or observed condition. Record actual locations of flow measuring stations, balancing valves and settings.

**3.7 AT COMPLETION OF WORK**

- A. Leave systems in proper working order, replacing belt guards, closing access doors, closing doors to electrical switch boxes, and restoring thermostats to specified settings.
- B. At final inspection, recheck random selections of data recorded in report. Recheck points or areas as selected and witnessed by the Owner.
- C. Recorded data shall represent actually measured, or observed condition. Record actual locations of flow measuring stations, balancing valves and settings.
- D. Submit copies of the recorded data to the Engineer, and the Owner at final inspection. Report to include type of instruments used, actual date when readings are made, and outdoor temperature.

**END OF SECTION**

**Insulation - Mechanical  
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**PART 1 - GENERAL**

**1.1 RELATED WORK**

- A. Work related to this Section is specified in other sections. Other sections of these Specifications also apply even though not described here.

**1.2 WORK INCLUDED**

- A. Mechanical/HVAC:
1. Insulate all:
    - a. Refrigerant Pipe
    - b. Fittings
    - c. Valves
    - d. Flow Devices
    - e. Separators
    - f. Strainers
    - g. Connections
    - h. Unions
  2. Provide vapor barrier cover or jacket, except where noted otherwise.

**1.3 REFERENCES AND STANDARDS**

- A. ASTM B209: Aluminum and Aluminum-alloy Sheet and Plate.

**1.4 QUALITY ASSURANCE**

- A. Materials: Insulation must be labeled on shipping cartons to conform to NFPA-90A, ASTM E84, and have a permanent composite rating for insulation, jacket, adhesive of flame spread 25, and smoke developed 50.

**1.5 SUBMITTALS**

- A. Refer to Section 230100, Basic Mechanical Materials & Methods.
- B. Submit Contractor-approved project data for Engineer review and approval.
- C. Include product description, list of material, and thickness for each service and locations.
- D. Submit manufacturer's installation instructions.

**PART 2 - PRODUCTS**

**2.1 PIPE JACKETS**

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- A. For pipe insulation coverings exposed to weather, use minimum 0.016-inch thick aluminum for pipe insulation under 6-inches.
  - 1. Type: 0.016-inch thick aluminum for pipe insulation.
  - 2. Finish: Stucco embossed pattern.
  - 3. Shapes: Elbows, tees, valves, reducers, flanges, and end caps in various sizes.
  - 4. Moisture Barrier: Kraft or polyethylene.
- B. Acceptable Manufacturers / Other Acceptable Manufacturers Similar to Approved Manufacturer/Model Numbers:
  - 1. Childers
  - 2. Manville
- C. PVC Pipe Cover:
  - 1. In lieu of aluminum jackets for insulation not exposed to weather, the use of foil or PVC jackets is acceptable as approved by code authority.
    - a. Minimum PVC jacket should be 0.020-inches.

**2.2 VALVE INSULATION JACKETS**

- A. Jackets shall contain a non-combustible insulation, wool or fiberglass, between two layers of an asbestos-free fabric, and shall be silicon-coated. Jackets secured by hooks and wire, or similar methods, to facilitate removal.
- B. Install laced insulation jackets at valve and meter locations. Submit type for approval.
- C. Acceptable Manufacturers / Other Acceptable Manufacturers Similar to Approved Manufacturer/Model Numbers:
  - 1. Energy Control Services (ECS)

**2.3 ACCESSORIES**

- A. Insulated Pipe Clamps:
  - 1. Manufacturer: Klo-Shure
- B. Insulation Bands:
  - 1. 3/4-inch wide; stainless steel.
- C. Metal Jacket Bands:
  - 1. 3/8-inch wide; stainless steel.
- D. Adhesives:
  - 1. Compatible with insulation.
- E. Labeling:
  - 1. Stencil or pre-printed labels with adhesive backing.
- F. Acceptable Manufacturers:

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1. Insulation Supply Inc.

2.4 REFRIGERANT SUCTION (RS), REFRIGERANT LIQUID (RL)

- A. Inside equipment and Building:
  1. Type: Elastomeric foam
  2. Thickness as scheduled on drawings.
- B. Outside Equipment and Building:
  1. Thickness as scheduled on drawings.

**PART 3 - EXECUTION**

3.1 PERFORMANCE

- A. Provide and install insulation products in compliance with the manufacturer's recommendations by skilled applicators directly employed and supervised by a firm specializing in this type of work.

3.4 REFRIGERANT SUCTION (RS), REFRIGERANT LIQUID (RL)

- A. Install insulation, vapor barrier covers, jackets and labeling after piping has been tested, leaks have been fixed, and piping has been approved for service.

**END OF SECTION**



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**PART 1 - GENERAL**

**1.1 RELATED DOCUMENTS**

- A. Drawings and general provisions of this Contract apply to this Section.
- B. Work related to this Section is specified in other sections. Other sections of these Specifications also apply even though not described here.

**1.2 SUMMARY**

- A. This Section includes control equipment for HVAC systems and components, including control components not supplied with factory-wired controls.
- B. Related Sections include the following:
  - 1. Division 23 "Heating, Ventilation, & Air Conditioning"
  - 2. Division 26 "Electrical and Lighting"

**1.3 BUILDING MANAGEMENT DESCRIPTION**

- A. The Building Management System (BMS) shall be an extension of the existing Clima-Tech system. All supervisory controllers shall be added under the existing network. The BMS contractor shall provide a complete system designed for use with the enterprise IT systems. This functionality shall extend into the equipment rooms. Devices residing on the automation network located in equipment rooms and similar shall be fully IT compatible devices that mount and communicate directly on the IT infrastructure in the facility. Contractor shall be responsible for coordination with the owner's IT staff to ensure that the BMS will perform in the owner's environment without disruption to any of the other activities taking place on that LAN.
- B. Any and all components of the BMS that are connected via field bus or IP network, including the network controllers, field controllers, application specific controllers, server and user interface software, system and controller programming tools and software applications shall be designed, engineered, and tested to work together as a complete building management system.
- C. All points of user interface shall be on standard computing devices that do not require the purchase of any special software from the BMS manufacturer for use as a building operations terminal. The primary point of interface on these devices will be a standard Web Browser.
- D. The work of the single BMS Contractor shall be as defined individually and collectively in all Sections of this Division specification together with the associated Point Sheets and Drawings and the associated interfacing work as referenced in the related documents.

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- E. The BMS work shall consist of the provision of all labor, materials, tools, equipment, software, software licenses, software configurations and database entries, interfaces, wiring, tubing, installation, labeling, engineering, calibration, documentation, samples, submittals, testing, commissioning, training services, permits and licenses, transportation, shipping, handling, administration, supervision, management, insurance, temporary protection, cleaning, cutting and patching, warranties, services, and items, even though these may not be specifically mentioned in these Division documents which are required for the complete, fully functional and commissioned BMS.
- F. Provide a complete, neat and workmanlike installation. Use only manufacturer employees who are skilled, experienced, trained, and familiar with the specific equipment, software, standards and configurations to be provided for this Project.
- G. Manage and coordinate the BMS work in a timely manner in consideration of the Project schedules. Coordinate with the associated work of other trades so as not to impede or delay the work of associated trades.
- H. The BMS as provided shall incorporate, at minimum, the following integrated features, functions and services:
  - 1. Operator information, alarm management and control functions.
  - 2. Information management including monitoring, transmission, archiving, retrieval, and reporting functions.
  - 3. Diagnostic monitoring and reporting of BMS functions.
  - 4. Energy management
  - 5. Standard applications for terminal HVAC systems.
  - 6. Enterprise-wide information and control access.
  - 7. Offsite monitoring and management access.
  - 8. Indoor Air Quality monitoring and control

**1.4 DESCRIPTION OF WORK**

- A. Contractor shall provide:
  - 1. Building automation system (BAS) panel, direct digital control (DDC) controllers, and all necessary network devices required for communication with their central office.
  - 2. Control panel wiring diagrams.
  - 3. Programming of the Sequence of Operations.
  - 4. Start up, pre-functional testing, and functional testing.
  - 5. All labor and materials for the installation of controls hardware and low voltage wiring to meet the functions and performance specified herein and indicated on the drawings.
  - 6. Line voltage wiring and conduit to Control Panels, damper actuators, valve actuators, control panels, and other control devices, are Work of this Section. Low voltage control wiring and line voltage, necessary for BAS control systems is Work of this Section.
  - 7. Work to comply with current national, state, and local codes. Obtain all permits necessary for work. All work must satisfy code authority with jurisdiction.

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8. Provide and locate control devices required to perform the specified Sequences of Operation. Provide assistance to owner for all programming and setup required to perform the Sequences of Operation.
9. Provide complete identification of all components and conductors. Color code and number conductors and terminals according to a consistent scheme throughout Project. Provide engraved identification or equivalent permanence on panel fronts. Use equipment identification same as indicated on Points List.
10. The Controls Contractor is required to coordinate with other trades including scheduling of work, meetings as necessary, and interaction of equipment.
11. Provide assistance to owner for adjustment and calibration of each component and entire system. Document system point to point check and provide Engineer with completed check sheets. Conduct verification testing.

**1.5 QUALITY ASSURANCE**

- A. Manufacturer: Subject to meeting all specified features and performance, acceptable manufacturers must be qualified as noted in the "Manufacturer" subsection.
- B. Installation shall be provided by a firm having been in business a minimum of 5 years with demonstrated qualifications in the installation of control systems of this type.
- C. Comply with requirements of applicable energy conservation codes.
- D. Meet all codes. Meet all requirements of local authorities and State Fire Marshal for normal mode and smoke mode functions, sequences, equipment, and software.
- E. Electrical standards: Provide electrical products which have been tested, listed and labeled by Underwriters' Laboratories (UL) and comply with NEMA standards. Electrical work shall be installed per NEC.
- F. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.
- G. Installation shall be by trained electricians and mechanics.

**1.6 SUBMITTALS**

- A. Product Data: Include manufacturer's technical literature for each control device. Indicate dimensions, capacities, performance characteristics, electrical characteristics, finishes for materials, and installation and startup instructions for each type of product indicated.
  1. DDC System Hardware: Bill of materials of equipment indicating quantity, manufacturer, and model number. Include technical data for transducers/transmitters, sensors, actuators, valves, and relays/switches.
- B. Test Log: Sample forms intended for use during checkout testing, to check off that each point is performing properly.

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- C. Maintenance and Operation Manuals: Organized, indexed, bound documents including following in record document form:
  - 1. Maintenance Instructions.
  - 2. Parts List.
- D. Identification:
  - 1. Provide complete identification of all components and conductors.
  - 2. Color code and number conductors and terminals according to a consistent scheme throughout Project.
  - 3. Provide engraved identification or equivalent permanence on panel fronts.
  - 4. Use Control Point Name as wiring and equipment identification. Example: "KND AHU1 MA T".

**1.7 DELIVERY, STORAGE, AND HANDLING**

- A. Factory-Mounted Components: Where control devices specified in this Section are indicated to be factory mounted on equipment, arrange for shipping of control devices to equipment manufacturer.
- B. Device Software: Update to latest version of software at Project completion.

**1.8 COORDINATION**

- A. Coordinate location of thermostats, humidistats, and other exposed control sensors with plans and room details before installation.
- B. Coordinate with other trades is necessary prior to any trade ordering equipment. Conflicts should be brought to the attention of the Engineer.
- C. In some instances, control devices may be installed by other trades. Coordination is imperative.

**1.9 CONTROL DRAWINGS**

- A. The control drawings are diagrammatic and are intended to show the design intent of the controls scheme. Every effort is taken to detail a fully functional system, however, the Engineer does not know beforehand the capability of the potential controls system. It is the responsibility of the controls contractor to review the proposed control scheme and the proposed equipment, and immediately notify the Engineer when something is missing, the control logic has a conflict of safety, or the sequence of operations cannot be performed with the available equipment.
- B. All equipment shall be installed in a manner and in locations to avoid obstruction, preserve head room and keep openings and passageways clear. Field verify dimensions and proposed equipment locations.
- C. Dimensions given in figures on the Drawings shall take precedence over scaled dimensions; and all dimensions, whether given in figures or scaled, shall be verified in

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the field. Contractor is required to submit shop drawings of all work to be installed. Any changes or modifications from Bid documents must be approved by the Engineer prior to installation.

**1.10 COMMUNICATIONS COMPATIBILITY**

- A. Where provided, control and monitoring of equipment with factory installed, self-contained control systems shall be provided with communications capabilities to share point data base with the DDC system using open communications protocol compatible with the approved DDC system such as LonMark, BACnet, or ModBus.
- B. Where work includes expansion or remodel of existing systems, new control systems shall be integrated with existing control systems, if applicable. If existing systems are not direct digital type or incompatible with DDC systems, the existing system shall be replaced as part of the work.

**1.11 CENTRAL CONTROL**

- A. Each of the existing approved control systems has a central monitoring and control station. These are the primary computers for each of the different control systems. Each system is configured to perform all the data gathering and processing functions, communication with the peripherals, and application packages. The control program provides for all operational needs, without requiring any program changes.

**1.12 NO PNEUMATIC CONTROLS**

- A. Buildings shall not utilize pneumatic control systems unless approved by Owner.

**PART 2 - PRODUCTS**

**2.1 GENERAL**

- A. All materials shall be new, of the quality herein specified, free from defects and approved by the Underwriters Laboratories, Inc. Each type of material of the same manufacturer shall appear throughout the building(s).

**2.2 ENERGY MANAGEMENT SYSTEM**

- A. The energy management system shall operate under the control of one or more microprocessors/microcomputers with peripheral hardware and software configured to perform the following functions:
  - 1. The system shall be a fully modular family of programs, peripherals, and application packages designed specifically for building management, including energy management, HVAC control and monitoring, and controlled access.

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2. The system shall be capable of interfacing with the existing installed primary computer system and shall allow for future expansion of both input/output points and processing/control functions and operating stations.
  - a. Specifically, it shall be easy to add components, including memory, peripherals, field devices, and software to the system to expand the size of the scope of automation.
- B. All materials and equipment used shall be standard components, regularly manufactured for this system and shall not be custom designed especially for this project. All systems and components shall have been thoroughly tested and proven in actual use.
- C. The EMS shall include full support for its compatibility with the system. In addition, the EMS shall use the latest product line offered by the EMS manufacturer.

**2.3 SOFTWARE: GENERAL**

- A. The system shall be a user-programmable, direct digital control system, utilizing P.I.D. (proportional-integral-derivative) algorithms for the control of all modulating equipment.
- B. The system shall support multiple users performing multiple tasks. System changes (add points, modify programs, etc.) shall be able to be performed while the system is on-line. Alarms shall be able to be printed while system changes are being made.
- C. The software shall include diagnostics to isolate failures and verify system operation.
- D. If the most current version of the system's graphic workstation software and programming tools already exists on the primary computer, the contractor is to be responsible for updating the graphic and software packages for incorporation of the new building's controls on the primary computer.
- E. If the workstation software and programming tools are not the latest versions on the primary computer, the contractor is responsible for updating the primary computer software and programming tools to the latest version and the incorporation of the new building's controls. In addition, each remote building computer on the contractor's network is to be updated to show the new building's control screen.

**2.4 OPERATOR COMMUNICATION AND ACCESS**

- A. Graphical Software: Provide personal computer-based software that is compatible with computer vendor-supplied and supported, unmodified real-time operating system.
- B. The software shall provide, as a minimum, the following functionality:
  1. Graphical viewing and control of environment.
  2. Scheduling and override of building operations.
  3. Collection and analysis of historical data.
  4. Definition and construction of dynamic color graphics.
  5. Editing, programming, storage, and downloading of controller database.

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- C. Software for the workstations shall provide for a windowed approach.
- D. Provide functionality to allow for any analog point value to be displayed as an individual dynamic display window for use as a convenient control and diagnostic tool. The display window shall include the following information as a minimum:
  - 1. Point name.
  - 2. Point description.
  - 3. Set point.
  - 4. Current value.
  - 5. Range of values.
  - 6. High and low limit set points.
- E. All values shall be displayed in both text and symbolic form, such as an analog bar, gauge or other standard measurement devices.
- F. Provide the capability to control any point from a dynamic graphic display.
- G. Provide a graphical spreadsheet-type format for simplification of time-of-day scheduling, and overrides of multiple like equipment. Provide the following spreadsheet graphic types as a minimum:
  - 1. Weekly schedule shall be provided for each building zone or piece of equipment with a specific occupancy schedule.
  - 2. Zone schedules shall be provided for each building zone as previously described.
  - 3. Monthly calendars for a 24-month period shall be provided to allow for simplified scheduling of holidays and special days in advance. Holidays and special days shall be user-selected with the pointing device and shall automatically reschedule equipment operation as previously defined on the weekly schedules.
- H. Provide trending capabilities that allow the user to easily monitor and preserve records of system activity over an extended period of time. Any system point may be trended automatically at time based intervals or changes of value, both of which shall be user-definable. Trend data may be stored on hard disk for future diagnostics and reporting.
  - 1. Trend data report graphics shall be provided to allow the user to view all trend point data.
    - a. Provided additional functionality to allow any trended data to be transferred easily to an off-the shelf spreadsheet package such as Microsoft Excel.
  - 2. A collection schedule function shall be provided to automatically collect trend data.
  - 3. Setup individual trending logs that record usage data every 15 minutes, as applicable, for the building electrical, steam, natural gas, condensate, domestic water, chilled and heating water flow, inlet and outlet temperatures and BTU.
  - 4. Provide additional functionality that allows the user to view trended data on trend graph displays: Displays shall be actual plots of both static and real-time dynamic point data.
- I. A full screen, forms-based point editor and programming functional shall allow for point additions, deletions, changes, program modification and creation and point and program storage. This program shall be similar to word-processing format such that full documentation of program changes may be available. This program shall provide the user with the capability to insert English narratives to describe the control program. Search, insert, find, cut and paste functions shall allow for quick program modifications.

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- J. Provide a general purpose graphic package which shall allow the user to quickly and easily define or construct color graphic displays.
- K. Provide the capability to backup and store all system databases on the PC hard disk. While the PC is on-line without disrupting other system operations.
- L. Provide context-sensitive help menus to provide instruction appropriate with the operation and applications currently being performed.
- M. Multiple user security levels shall be provided to allow for various degrees of system access and control.
  - 1. The workstation shall be provided with a key element display that records log-ons, log-offs, TOD overrides, alarms, and alarm acknowledgements.
  - 2. Provide a 500 element circular buffer for recording purposes.
  - 3. Key element reports may be filtered by operator name and may be run for a user defined time interval.

**2.5 SUMMARIES AND LOGS**

- A. The system shall be provides with a log function. This function shall provide the system operator with a means of requesting a single point, all points in a given system, or all points in the building.
- B. The system shall have the capability of generating the following reports as a minimum:
  - 1. Program Summary: Upon operator request, the system shall output a programmed start/stop, time summary. This summary shall contain all points, their associated programmed start/stop times and the respective days of week.
  - 2. Limit Summary: An Analog Differential Summary hall be provided that details the high and low limits and limit differentials for all analog points, or all analog points within a unique building system.
  - 3. System Log: A system Log shall be provided which contains the point status of all points specified by operator input.
  - 4. Trend Logs: trend Logs shall provide a means of producing a hard copy printout of points selected by the operator on a periodic time basis to form a trend log. The operator shall have the ability to add or delete points and select the reporting time interval.
  - 5. Alarm Summary: An Alarm Summary report shall be printed automatically each day. This shall contain all alarms for that day, any previous open alarms and acknowledgement of alarms.

**2.6 MONITORING AND ALARMS**

- A. The system shall automatically and continuously monitor and record the values of all inputs points, and the status of all controlled equipment. In the event of the following conditions, an alarm message is to be generated and displayed at the operator's terminal and an audible alarm started.
  - 1. If a binary point changes state without a command.
  - 2. High and low alarm for analog points.
  - 3. Field device failure, as sensed by a binary input point.



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4. Manual override of controlled equipment.

- B. The alarm display shall include a description of the alarm condition and its source. An alarm condition shall be displayed until the operator acknowledges it. The operator ID shall be recorded of an operator who acknowledges the alarm.

**2.7 WIRE**

- A. Low voltage wire for sensor inputs shall be 18 AWG Twisted Shielded Pair (TSP), Belden #8760 or equal, except as noted.
- B. Low voltage wire for outputs, or wire routed in panels with line voltage wiring, shall be minimum 18 AWG type THHN rated 600 Volt. Red and Black color coding required.
- C. Any exposed wire in any plenum area shall be plenum-rated as per applicable code.
- D. All wire to be installed to the applicable Codes and Regulations. Refer also to Electrical, Division 26.

**2.8 CONDUIT AND CHANNEL**

- A. Electrical metallic tubing (EMT) and fittings to be UL approved and installed as per applicable code (see Electrical, Division 26).
- B. Wire mold is acceptable for surface mounting in occupied areas where concrete or concrete block construction prevent routing wire through wall interior. All wire mold routing must be prior approved by Engineer before installation. Wire mold to be UL approved.
- C. Metal channel with snapping or hinged top cover for routing low voltage wiring shall be approved by Engineer.

**2.9 AUXILIARY CONTROL PANELS**

- A. Provide enameled steel enclosures meeting NEMA specifications for mounting auxiliary devices and miscellaneous components. This does not include sensors intended for direct mounting.

**2.10 ELECTRONIC ACTUATORS**

- A. Electronic actuators used on dampers shall be designed to directly couple and mount to a stem, shaft, or ISO style-mounting pad. Field installed linkage connecting valve and actuator is not acceptable.
- B. Actuators shall be fully modulating/proportional except where used for binary applications.
- C. Actuators shall have an operating range of -22°F to 122°F.

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- D. Proportional actuators shall accept, a 0-10 VDC signal and provide a 2-10 VDC operating range. The operating range shall be factory scalable for 2-10 VDC, 2-6 VDC, and 6-10VDC (see mechanical schedules for scaling requirements).
- E. Proportional actuators shall provide a 2-10 VDC position feedback signal. Binary actuators shall include end-switches where feedback is required. Refer to controls drawings.
- F. Actuators shall be capable of operating on 24VAC. Power consumption shall not exceed 10VA.
- G. Actuators will not produce more than 62dB.
- H. Actuator shall be capable of driving the valve/damper fully open or fully closed in less than 200 seconds.
- I. Provide weather protection for outdoor mounted actuators. Protect against sun, wind, rain, snow, and ambient temperatures between 0°F and 120°F. Protection devices may be fabricated, but shall provide means for quick visual inspection and ease of maintenance. Submit protection design to Engineer for approval.
- J. Acceptable manufacturers:
  - 1. Belimo
  - 2. Or approved substitution

**2.11 SENSORS**

- A. Sensor Quality: All sensors and controllers shall be of commercial grade quality and shall be installed according to the Manufacturer's recommendations.
- B. Sensor Specifications: Overall system accuracy over specified range, including electronic analog sensing elements, shall meet or exceed the following minimum values, except as indicated elsewhere.

Description	Minimum Accuracy	Minimum Range	Recommended Type
Room Temperature	+/- 0.75°F	55 – 85°F	Thermistor
Outside Air Temperature	+/- 1°F	0 – 120°F	RTD
Chilled Water	+/- 0.75°F	30 – 90°F	RTD
Heating Water	+/- 2°F	30 – 200°F	RTD
Duct Temperature Sensors	+/- 1°F	35 – 150°F	Thermistor
Outside Relative Humidity	+/- 2%RH	20 – 95% RH	Polymer
Duct & Space Relative Humidity	+/- 2.5%RH	10 – 90% RH (72-82°F)	Polymer
	+/- 5%RH	10 – 90% RH (60-90°F)	Polymer

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kWh and kW demand	+/- 1%	Full Scale
Pressure	+/- 2%	Full Scale

- C. Temperature Sensors: Temperature sensors shall have ranges appropriate for applications, accurate within +/- 1 degree F. over the entire span.
1. Thermistors shall be acceptable for room temperature sensors and for applications in the approved temperature range. RTD type sensors shall be used for other temperature-sensing applications.
  2. Room sensors shall be available with setpoint adjustment and override switch where specifically called out. Unless noted, the sensor shall be a plain cover without any buttons, adjustment devices, or indicators.
  3. Duct mounted averaging sensors shall utilize a sensing element incorporated in a metallic tubing. The sensor shall be installed according to manufacturers recommendation and looped and fastened at a minimum of every 36 inches. This type sensor shall also be used in plenums, such as for AHU mixed air.
  4. Water temperature sensors shall be immersion-type. All transducers shall be industrial-grade quality.
  5. Sensors located outdoors shall have suitable weather shields to provide protection from wind, rain, solar effects, and radiation from nearby buildings.
- D. Outdoor (ambient) Relative Humidity Sensor: Accurate to  $\pm 2\%$  between 20 to 95% RH. Operating range of 0 to 99% RH and 15 to 250 degree F. Output signal 4-20 ma DC or 1-5 vdc, 0-100% linear, proportional. Install with protective weather shield.
- E. Humidity Sensors: Humidity sensors shall be of the solid-state type using a hygroscopic polymer sensing element. The sensor shall vary the output voltage with a change in relative humidity. Sensors shall be available for room or duct mounting. Accuracy of +/- 2.5% RH from 10% to 90% RH between 72-82 degree F., and +/-5% RH from 10% to 90% RH between 60-90 degree F. Room sensors shall have integral locking cover with concealed adjustment and without visible logo or humidity indication.
- F. Static Pressure Sensors:
1. Pressure sensors shall be suitable for static pressure measurements. Sensors shall be factory calibrated, and fully temperature compensated over a 50°F – 200°F temperature range with signal conditioning. Sensor shall accept 24 VAC or VDC supply voltage and shall be able to transmit 4-20 mA (DC), or 1-5 VDC. Error shall be no greater than 1% of full scale output.
  2. Manufacturers: Veris Industries, PW series or approved equal.

## 2.12 MATERIALS AND EQUIPMENT

- A. General: Provide temperature control products conforming to manufacturer's standard materials and components as published in their product information, designed and constructed as recommended by manufacturer and as required for application indicated.

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**PART 3 - EXECUTION**

**3.1 WORKMANSHIP**

- A. Work to be done by workers skilled and qualified to install control systems.

**3.2 SENSOR LOCATIONS**

- A. Refer to Drawings and confirm sensor locations with Engineer and Owners Representative.
- B. Protect outdoor temperature sensing devices from sun effect, direct or indirect.

**3.3 INSTRUMENT MOUNTING**

- A. Controls are to be securely mounted. Equipment shall be installed in accordance with the manufacturer's prescribed procedure. Instrument mounting locations must be free of vibration. Mounting of operators directly to sheet metal, lighter than 18 gauge, is prohibited, unless adequately reinforced.

**3.4 EQUIPMENT LOCATION**

- A. Equipment shall be located to allow for easy access of maintenance and replacement. Equipment shall be installed such that it does not interfere in any way with access to adjacent equipment, or personnel traffic in the surrounding space.
- B. Equipment shall be located for adequate ambient conditions, allowing for ventilation, temperature, and away from water, and electrical, or other hazards.

**3.5 CONDUIT, WIRING, AND CABLING**

- A. All wiring between the automation system and sensors and control devices including any power wiring of devices and necessary conduit shall be provided.
- B. Run electrical wiring in conduit in exposed areas. All low voltage connections above suspended ceiling, 7-feet-0-inches above floor, or through vertical duct chases, may be run in neatly bundled cables, adequately supported at 2-foot intervals. Room sensors in finished areas to be fed through walls where feasible. Any wire mold must be prior approved by Engineer before installation.
- C. All equipment shall be installed by skilled electricians and mechanics, who are properly trained and qualified for this work, and who shall be in accordance with governing codes.
- D. Labeling: All wiring and tubing shall be labeled end to end with point address and point descriptor using mechanically printed permanent label.
  - 1. Label all pull boxes and junction boxes with permanent marker.

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- 2. Plenum cable to be color coded for easy identification.
- E. Run all wiring and conduit parallel to building lines.
- F. Size of conduit and size/type of wire shall be the design responsibility of the Controls Contractor, except as noted.
- G. Provide for flexible connections to moving or vibrating equipment.
- H. Run all control wiring as follows:
  - 1. Mechanical Rooms: In conduit
  - 2. Exposed in building spaces: In conduit
  - 3. Concealed in building walls and hard ceilings: In conduit
  - 4. Concealed in t-bar ceilings: Plenum rated cable supported every 5 feet with j-hooks.
- I. Conduit to be EMT type, except as specified by Specifications or Engineer. Terminate all conduit with end protectors.
- J. Transient protection of system power supplies, data communication lines, digital hardware and controllers shall be provided. This protection shall consist of surge arresters which shall provide a low impedance ground path for surge voltages and lighting.
- K. Grounding:
  - 1. Equipment shall have a power ground.
  - 2. Communications and instrumentation systems shall have a separate single point ground in addition to the power ground.
- L. Provide strain reliefs where plenum cable enters junction boxes, pull boxes, and cabinets.

**3.6 BENDS AND PENETRATIONS**

- A. Conform to Code for radii. Avoid damage or flattening. Run through walls, floors or foundations. Sleeves furnished and installed by the Contractor, make watertight. All sleeves and all conduits passing through sleeves shall be caulked and grouted to maintain fire-rating of wall, or ceiling.

**3.7 AUXILIARY PANELS**

- A. Provide adequate support. Set plumb and in line, where indicated on the Drawings. Mount 6-feet-0-inches above floor to highest point.

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**3.8 DAMPER ACTUATOR CONTROLS**

- A. Mount damper actuators. Provide protection against rooftop weather conditions, as per manufacturer's recommendations. Route and connect 24 VAC power and control signal.

**3.9 GENERAL INSTALLATION**

- A. Install system and materials in accordance with manufacturer's instructions, roughing-in drawings and details on Drawings.
- B. During installation, Owner's maintenance personnel may be assigned to observe and participate. Personnel shall be allowed to fully observe all aspects of the process.
- C. Coordinate with electrical contractor for installation of proper electrical devices such as hand-off-automatic switches, momentary start-stops, on-off switches, and auxiliary contacts for proper system operation.
- D. Integrate controls with equipment furnished controls for proper system operation.
- E. Coordinate with Section 230593, "Testing, Adjusting and Balancing" prior to commencement of balancing. Advise balancing agency regarding related controls.
- F. Calibrate all sensors, thermostats, and instruments. Provide complete sensor calibration checkout reports to Owner and Engineer via electronic media.
- G. Control Enclosures: All auxiliary enclosures shall be labeled with permanent plastic engraved labels or other approved label. Enclosures larger than 10" x 10" shall have hinged locking doors. All control panels and enclosures, other than junction boxes, shall have the following:
  - 1. Laminated wiring or component identification schematic shall be affixed to the inside of the enclosure door.
  - 2. All wiring entering or exiting the panel or enclosure shall be terminated on a terminal strip with terminal labeled and identified.
  - 3. All wiring in the enclosure shall be neatly bundled and strapped. Wiring channels shall be used to separate and enclose terminated wiring.
- H. Final adjustment of equipment: After completion of installation, adjust thermostats, actuators, sensors, control valves, dampers, motors and similar equipment which are part of the Control Systems.
  - 1. Final adjustment shall be performed by specially trained personnel in direct employ of manufacturer of primary temperature control system.
  - 2. Adjust and calibrate each component and entire system.
- I. All safety control circuits interlocked with motor starters or VFDs shall be hardwired and shall function in all operating modes. (Automatic, Hand, and Manual Bypass)

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**3.10 SUPERVISION AND CHECKOUT**

- A. This process shall be conducted by factory-trained engineers and technicians directly employed by the Contractor.
- B. EOU will review the controls shop drawings concurrently with the engineer's review.

**3.11 ACCEPTANCE TESTING**

- A. An acceptance test in the presence of the commissioning agent and/or the engineer shall be performed. This test shall include, but not be limited to:
  - 1. Complete verification of transmission media operation.
  - 2. Cross-check of each sensor and control point.
  - 3. Final calibration of the sensor.
  - 4. Verification of failure mode operation.
  - 5. Verification of program loading/unloading capability.
  - 6. When the system performance is deemed in accordance with these specifications, it shall be accepted and placed under warranty.
  - 7. Control sequence.
  - 8. Control loop performance alarm activation and reporting.

**3.12 TRAINING**

- A. The contractor shall provide full instruction to the Owner's designated representatives in these procedures during the start-up and test period. These instructions are to be conducted during normal working hours. The instruction shall consist of hands-on at the job site. Training on the functional operation of the system shall include:
  - 1. Operation of equipment.
  - 2. Programming.
  - 3. Diagnostics.
  - 4. Failure recovery procedures.
  - 5. Alarm formats.
  - 6. Maintenance and calibration.
  - 7. Troubleshooting, diagnostics, and repair instructions.

**3.13 CONTROL POWER**

- A. Provide a duplex outlet at each building's automation system panel.
- B. Each outlet must be on a dedicated circuit feed from the life safety power system.
- C. Feed all global controllers, critical air handling unit controllers, chillers and boiler controllers, from the Life Safety Power System.
- D. Provide a monitored uninterruptable power supply for control system serving critical building functions.

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**3.14 CONTROL SYSTEM DESIGN AND PROGRAMMING**

- A. Control setpoints and parameters listed in control sequences are initial values. Adjust setpoints and control parameters as directed by Engineer to achieved desired environment conditions, optimum system performance, and as recommended by TAB contractor.
- B. Control setpoints shall be adjustable from the Operator Workstation without modification of control programming or use of proprietary software. All setpoints which are necessary for normal operation and optimization of system performance as required by Owner shall be adjustable, and shall include, but not limited to: time schedules; temperature, pressure, humidity, and CO2 setpoints, time delay settings, safety sequence setpoints, and alarming parameters.
- C. Where BAS network communications are provided to networkable control systems or equipment, Contractor shall configure accessible points for control, monitoring, and alarm as required to provide specified sequences and as directed by the Owner's Authorized Representative for trending and monitoring.
- D. All cascade control sequences and closed control loops shall have proportional-integral action and derivative capability, except where approved otherwise.
- E. Provide BAS alarm functions and configuration as detailed in plans and specifications, and as directed by Owner's Authorized Representative. Alarm functions may include:
  - 1. Visual display on workstation graphic
  - 2. Audible alarm at workstation computer
  - 3. Listing in workstation alarm log
  - 4. "Pop-up" alarm notification at workstation computer
  - 5. Dial-out alarm to Owner's security staff or alarm monitoring service.
- F. Control systems shall be designed so that the system will remain in operation if any single control devices or associated system fails. Critical control functions including input/output points and software programming for redundant equipment shall be service by independent controllers and be provided the UPS power supply. Critical systems required for continuous operation for institutional services as defined by the owner.
- G. Control system shall be design to automatically and reliably restore HVAC system to normal operation when a utility power interruption occurs and when utility power is restored. Normal operation shall be fully restored for critical systems within time designated by the owner after the automatic transfer switch transfers power to the generator and when the power is transferred back to utility service. Equipment start-up shall be managed to prevent excessive start-up load on the generator.

**END OF SECTION**



**Fuel Piping  
231123-1**

**PART 1 - GENERAL**

1.1 RELATED WORK

- A. Work related to this Section is specified in other sections. Other sections of these Specifications also apply even though not described here.
- B. The Contractor may be qualified for one or more of the disciplines listed in these specifications. Where the Contractor is not qualified under the conditions of these specifications, Contractor must subcontract to a qualified firm as listed above to accomplish the Work.

1.2 WORK INCLUDED

- A. Furnish and install all materials and equipment pertaining to the piping system specified herein and in Basic Mechanical Materials & Methods, Section 230100. This includes all items of a minor nature, necessary to complete the installation, for a fully functional system.
- B. Work scope outlined on Drawings.

**PART 2 - PRODUCTS**

2.1 NATURAL GAS PIPING

- A. Per Code as enforced by the governing bodies.
- B. Above grade, 3-inches and larger shall be black steel pipe ASTM A53 or ~~A120~~ ASME B36.10, Schedule 40 with malleable iron fittings. Cast-iron fittings are not allowed. Paint above-ground exterior gas piping to new outside service.
- C. 2-1/2-inches and smaller shall be black steel pipe ASTM A53 or ~~A120~~ ASME B36.10, Schedule 40 with malleable iron fittings and threaded joints. Cast-iron fittings are not allowed.
- D. Vent Piping: Gas vent piping to be copper or black steel pipe.

2.2 GAS VALVES

- A. Iron body, brass plugs and washers, air tested, solder or screw ends.

2.3 GAS REGULATORS

- A. Provide medium to low gas regulator where shown on the Drawings. Regulators to be approved by the regulating authority and natural gas utility supplier.
- B. Gas regulators shall vent to the outside in a safe location shown on Drawings. Vents from natural gas equipment, regulators, and trains may not be mainfolded.
- C. Approved Manufacturer/Model Numbers:

**Fuel Piping**  
**231123-2**

1. Maxitrol
2. or equal

**PART 3 - EXECUTION**

**3.1 NATURAL GAS PIPE**

- A. The natural gas pipe shall undergo an air, CO<sub>2</sub>, or nitrogen pressure test in the presence of a building official. A minimum pressure of 60 psig shall be maintained for not less than 30 minutes.
- B. Equipment Service: Prepare piping connections to equipment with flanges or unions.
- C. Cleaning and Chemical Treatment:
  1. After completion, fill and flush, then treat system where required.
- D. Finish:
  1. Prepare pipe, fittings, supports, and accessories not pre-finished, for finish painting where pipe is exposed in finished area.
  2. Paint above-ground exterior gas piping to new outside service.
- E. Gas regulators shall vent to the outside is a safe location shown on Drawings. Vents from natural gas equipment, regulators, and trains may not be manifolded.

**3.2 GAS REGULATORS**

- A. Medium (2 psi) gas regulators larger than 1-inch in diameter to be directly vented outside.
- B. Gas regulators 1-inch or smaller may be vented to atmosphere if provided with vent limiters.

**END OF SECTION**

**Basic Electrical Requirements  
260000-1**

**PART 1 - GENERAL**

**1.1 RELATED WORK**

- A. Work related to this Section is specified in other Sections. Other Sections of these Specifications also apply even though not described here.

**1.2 WORK INCLUDED**

- A. This Division of the Specification covers procedures, products, methods, and other electrical aspects of this Contract.
- B. Apply for permits, coordinate design, and provide for connection to existing electrical power services.
- C. Contractor shall provide all required line voltage connections from existing electrical panels to equipment. Contractor to supply required disconnects for all equipment. Line voltage electrical service shall be provided to:
  - 1. Rooftop Unit
  - 2. Condensing Units
  - 3. Variable Frequency Drives
  - 4. Fan Motors
  - 5. Unit Heaters
  - 6. Fan Powered Boxes
  - 7. Transfer Switch and Generator
- D. Furnish and install all materials and equipment pertaining to the mechanical systems shown. This includes items of a minor nature necessary to complete the installation for a fully functional system.

**1.3 DEFINITIONS**

- A. In modification of definitions made elsewhere in this Specification, where the words "furnish", "provide", and "install" appear in this Division, or a manufacturer is indicated with item or product catalog number listed, install and furnish the item complete and operating for the purpose of function intended, unless otherwise noted.
- B. All references to power system voltages are RMS per definition in NEC Article 100.
- C. "Engineer" means the designated person or firm assigned to be the Owner's representative regarding the electrical portions of the Contract.

**1.4 DELIVERY, STORAGE, AND HANDLING**

- A. Acceptance at site: Do not use scratched, marred, or deformed materials.
- B. Do not use fixtures, materials, or equipment in wet cartons or boxes, stored in, or

**Basic Electrical Requirements  
260000-2**

exposed to rain, water, dust, dirt, or snow.

**1.5 SEQUENCING AND SCHEDULING**

- A. Cooperation with Other Crafts: Cooperate with other crafts and/or contracts as may be necessary for the proper execution of the Work in the construction.
- B. Prior to the installation and connection of the Division 26 Work, verify the requirements indicated in Division 26 with the requirements and characteristics of the other Divisions, the Owner, and/or other contractor's equipment.
- C. Obtain wiring or schematic diagrams for confirmation and connections. Bring deviations to the attention of the Engineer.
- D. Consult the Drawings of all other trades or crafts to avoid conflicts with cabinets, counters, equipment, structural members, etc. Conflicts shall be resolved with the Engineer, prior to rough in.
- E. Safety: In accordance with generally accepted construction practices, the Contractor is solely and completely responsible for conditions of the job site, including the safety of all persons and property during performance of the Work. This requirement applies continuously and is not limited to normal working hours.

**1.6 WARRANTY**

- A. General Warranty: Without additional charge, replace any work or material which develops defects, except from abuse, within one (1) year from final acceptance, unless otherwise noted.

**1.7 STANDARDS**

- A. Modifications to the building/s shall support building services, structures, and systems; conform to codes and be safe for occupants. They shall be cost effective in construction, installation, maintenance, and operation.

**1.8 PERMITS**

- A. Permits shall be obtained for all work through the authority having jurisdiction and shall be copied to owner.

**1.9 CODES**

- A. All low voltage cabling work shall comply with current standards NEC, NFPA and any current ANSI standards such as TIA/EIA 568 B, 569, 606A and 607.

**PART 2 - PRODUCTS**

**2.1 DEVICES**

- A. All switches and receptacles shall be at least 20-amp spec grade, with metal yokes.

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260000-3**

- B. All receptacle cover plates shall be stainless steel or nylon unless otherwise noted.

**2.2 CONDUITS, RACEWAYS, BOXES, AND FITTINGS**

- A. All conduits shall be GRC, IMC, EMT, FMC, FNMC, or PVC.
- B. All 4" square and 4 11/16 boxes shall be at least 2 1/8 inches deep.
- C. All conduit fittings and locknuts shall be steel. Die cast fittings are prohibited.
- D. All flexible conduit used outdoors shall be UV rated liquid-tight flex.
- E. All Conduits shall be Galvanized iron or PVC, Aluminum and Die cast are not permitted.

**2.3 CONDUCTORS AND CONNECTORS**

- A. Insulation displacement type connectors are prohibited.
- B. All conductors for panel feeders and branch circuits shall be copper and stranded with non-reversible compression lugs.
- C. Type AC and MC cable may only be used by special approval from the owner.
- D. Conductors for main service feeders may be aluminum by special permission, but if used, they shall have installed non-reversible compression adapters on both ends of each conductor.

**2.4 PANEL BOARDS AND SWITCHBOARDS**

- A. All panels and panel boards shall be 42 circuit to allow for expansion and filled with breakers (except by approval for specific needs).
- B. All circuit breakers are to be of bolt-in type and SWD rated.
- C. Panel boards shall be at least 6 inches deep with solid top and bottom. Pre-punched knockouts are not approved for use.
- D. Panel boards and switchboards shall use copper busses.
- E. Panel board covers shall be "door within a door" type using a continuous hinge.
- F. All switchgear disconnects shall be heavy-duty rated.

**2.5 TRANSFORMERS**

- A. Transformers shall have copper windings and conform to NEMA TP-1 efficiency standards.

**PART 3 - EXECUTION**

**3.1 CONDUITS, RACEWAYS, BOXES, AND FITTINGS**

- A. All junction boxes shall be labeled with panel and circuit number.

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- B. All junction and pull boxes shall be properly sized and approved for their purpose according to the National Electrical Code (NEC).
- C. All flexible conduit used in mechanical rooms and electrical rooms shall be liquid-tight flex. Steel flex may be used in all other locations requiring flexible conduit.
- D. All conduit runs shall have at least one grounding conductor installed.
- E. All conduits for fire alarm, data, and security shall have steel couplings, and steel connectors with insulated throats installed on both ends of the conduit run.
- F. All wiring in mechanical or electric rooms shall be raceway enclosed.
- G. Security, data, or fire alarm cables that are exposed, (below ceilings) shall be raceway enclosed, except on backboards provided for the purpose.
- H. All GRC and IMC conduit shall have plastic bushings installed.
- I. All conduit runs from a panel shall be at least 3/4inch diameter.
- J. All conduit fittings shall be steel with insulated throats using set screws or compression connectors. (No die-cast fittings will be allowed.)
- K. Conduit fill shall be based on a maximum of 30 percent for all sub panel feeder and branch circuit conduits to allow for expansion.
- L. All metal boxes shall have a grounding pigtail installed.

**3.2 CONDUCTORS AND CONNECTORS**

- A. All cables entering and leaving boxes were exposed shall be installed with 2-screw steel connectors, metal chase nipple or an approved equivalent. Snap in plastic fittings are not approved for use.
- B. All splices in #8 and larger shall be non-reversible crimp type. Set screw splices are prohibited.
- C. Splices shall occur only in approved junction boxes or gutters
- D. All connections for motors above one horsepower shall be made with non-reversible compression lugs and bolted together.
- E. Splicing devices within H.I.D. fixtures shall be 105 degree Centigrade rated, or higher.
- F. All feeders shall be tested with a Megohm-meter and documented.
- G. Neutrals shall be oversized at least one wire size gauge to minimize harmonics.

**3.3 PANEL BOARDS AND SWITCHBOARDS**

- A. All conduit runs from a panel shall be at least 3/4inch diameter.

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- B. A minimum of (3) 1-inch diameter empty spare conduits shall be stubbed up in an accessible location above ceiling height, and under floor (where raised floor systems are used), from electrical panels that are not surface mounted.
- C. A maximum of 270 degrees of bend shall be allowed between pull points in conduit run.
- D. All conduit runs greater than 100 feet shall have at least one pull point per 100 feet of conduit.
- E. All conduit and cables are to be run parallel and perpendicular to structure, with no diagonal runs.
- F. Type AC and MC Cable shall only be used with special approval.
- G. Conductors for main service feeders may be aluminum by special permission, but if used, they shall have installed non-reversible compression adapters on both ends of each conductor.
- H. Panel boards and panels locations shall not interfere with ingress and egress through doorways or exits.
- I. Keep switchgear, panels, and equipment clean during construction.

**3.4 SUPPORTS**

- A. All wire for conduit and cable ceiling supports shall be at least 9-gauge wire and shall be secured independently at each end.
- B. Fasteners or anchors shall only be used if such application is recommended by manufacturer.
- C. Dedicated messenger conduits or an approved support (such as Caddy supports) shall independently support all security, data, and fire alarm wiring.
- D. Where possible, data, security and telephone wiring shall be installed in cable tray to allow for future expansion.

**3.5 IDENTIFICATION**

- A. All cables and branch circuit wiring shall be marked with an approved permanent means of identification (such as Brady or Panduit labeling machine). Labels shall be at each end and each junction point to indicate panel and circuit number.
- B. All Switch and receptacle covers shall be labeled with panel and circuit number. Labels shall be made by machine (such as P-touch labeler) with at least 1/2 inch wide tape. The tape shall be clear with black lettering.
- C. Wire color codes
  - 1. Switch legs shall be pink.
  - 2. Travelers for three and four way switches shall be purple.

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3. 120/208 color code shall be black, red, blue and white.
  4. 480/277 color code shall be brown, orange, yellow and white w/ tracer.
- D. Cable color codes:
1. Voice shall be White.
  2. Computer Data from Patch Panel to Field Device shall be Blue
  3. Computer Data from Router or Switch to Patch Panel shall be Pink
  4. Building Automation System (HVAC) LAN shall be Yellow.
  5. Building Automation System Riser shall be Purple.
  6. Building Automation Lighting shall be Orange.
  7. Low Voltage Cables for Electronic Security Access
  8. (card key and keypad access systems) shall be Green.
  9. Fire Alarm cabling shall be red.
  10. Multi-wire branch circuits must have separate neutrals and shall use tracers on neutrals to help differentiate between circuits.
- E. All cables, no matter what length, shall be labeled at both ends with a machine-produced label, indicating location of both termination points (floor, room, etc.).
- F. All cabling installed in environmental air spaces shall be plenum rated per current NEC and NFPA.
- G. When inner duct is used, it shall be plenum rated where used in environmental air spaces.
- H. All unused cabling shall be removed and not abandoned in place.
- I. All temporary wiring shall be tagged so as to indicate installation date and identify installer.

**3.6 PENETRATIONS**

- A. All penetrations through fire rated walls, floors, partitions, ceilings, or smoke barriers shall be sealed with approved methods. Penetration sleeves shall be mechanically secured so as to maintain the integrity of the fire stopping materials and building finished surfaces.

**3.7 LOW VOLTAGE CABLING STANDARDS (FIRE, TELEPHONE, DATA, SECURITY, ETC.)**

- A. Fire, Telephone, Data, Security
1. All work shall comply with current standards NEC , NFPA and any current ANSI standards such as TIA/EIA 568 A & B , 569, 606 and 607.
  2. Permits shall be obtained for all work through the authority having jurisdiction, and shall be copied to owner.
  3. All conduits for fire alarm, data, and security shall have steel connectors with insulated throats installed on both ends of the conduit run.



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4. All wiring in mechanical or electric rooms shall be in conduit.
5. Security, data, or fire alarm cables that are exposed, (below ceilings) shall be protected by a raceway, except on backboards provided for the purpose.
6. Either messenger conduits or an approved support (such as Caddy supports) shall independently support all security, data, and fire alarm.
7. Where possible, data, security and telephone wiring shall be installed in cable tray to allow for expansion.
8. All cables, no matter what length, shall be labeled at both ends with a machine-produced label, indicating location of both termination points (floor, room, etc.).
9. All cabling installed in environmental air spaces shall be plenum rated per current NEC and NFPA.
10. When Interduct is used, it shall be plenum rated where used in environmental air spaces.
11. All unused cabling shall be removed and not abandoned in place.

**3.8 CLEARANCE AND ACCESS**

- A. All control panels, disconnects, dampers, and valves, installed above a ceiling, shall be located no more than 18" in height above the ceiling grid.
- B. A minimum of 18" of clearance, from control panel front, to nearest obstruction is required. All control valves, isolation and flow control valves shall have a minimum clearance of 18" from the device to nearest obstruction.
- C. Maximum installed height of all terminal units, VAV's, fan powered boxes, etc. shall be no more than 18" from the top of suspended ceiling grid to bottom edge of the box.
- D. No lighting fixtures, ceiling diffusers, fire sprinklers, conduit, or seismic bracing, shall impede access to terminal unit control and service panels, water control and isolation valves and dampers.
- E. Where terminal units, VAV's, etc. are located above a "hard ceiling" suitable access shall be provided and a platform or walkway installed to safely service the equipment.
- F. There shall be a minimum of 36" of clearance for all service access panels on HVAC air handling/air conditioning equipment, or hatches. Install hatches for complete access.
- G. Ceiling suspended equipment shall not be installed where building structure or permanently mounted equipment in the space below will impede access to

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control panels, disconnects and other serviceable items on the equipment. An exception is made where overhead access and working platforms/walkways to the equipment are provided.

- H. Supports and seismic restraints shall be installed in such a manner as to not impede access to service panels.
- I. Work platforms shall be provided for servicing built up rooftop air handlers and cooling tower components, when area to be serviced is higher than 4 feet.
- J. In mechanical spaces, all fans, pumps and serviceable equipment shall be located for easiest access, i.e.- not near ceiling.

**END OF SECTION**