

SPECIFICATIONS

FOR

**Shawnee HVAC Improvements
Spokane WA North Stake**

**5001 W Shawnee Ave
Spokane, WA 99208
Property # 5258391**

May 2023



Prepared
by
Engineered Systems Associates
1355 East Center
Pocatello, Idaho 83201
208-233-0501

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INVITATION TO BID (U.S.)

1. CONTRACTORS INVITED TO BID THE PROJECT:

JM Mechanical - (435) 563-6267 – Max – max@jmmech.com
Apollo Mechanical – (509) 467-6622 – Caitlin - caitlin.hendry@apollomech.com
Lake City HVAC – (208) 676-0667 – dispatch@lakecityheating.com
Basin Refrigeration – (509) 765-7138 - Sean - sean@basinservice.com
Hurliman Heating & Air – (509) 624-2373 – estimating@hulimanheating.com

2. PROJECT:

Shawnee HVAC Improvements

3. LOCATION:

5001 W Shawnee Ave, Spokane, WA 99208

4. OWNER:

The Church of Jesus Christ of Latter-day Saints, a Utah corporation sole
c/o Meetinghouse Project Management Office
50 E. North Temple Street, 12th Floor
Salt Lake City, UT 84150-0012

5. CONSULTANT:

Engineered Systems Associates
1355 East Center
Pocatello, ID 83201

6. DESCRIPTION OF PROJECT:

- A. This project is to replace (5) vandalized Condensing units, and upgrade (5) Gas fired furnaces from 80% to 95% efficient units, and associates piping and Electrical work.
- C. Mechanical contractors are the Prime Bidders, and may need subcontractors (Electrical, Controls, Test and Balance, etc.) to complete the entire work as described in the specifications and drawings.
- D. Products or systems may be provided under a Value Managed Relationship (VMR) the Owner has negotiated with the supplier. VMR products and systems are indicated as such in the Specifications.

7. **TYPE OF BID:** Bids will be on a lump-sum basis. Segregated bids will not be accepted.

8. **TIME OF SUBSTANTIAL COMPLETION:** The time limit for substantial completion of this work will be 45 calendar days and will be as noted in the Agreement.

9. **PRE-BID:** There will be a pre-bid walkthrough at the building site on May 23rd, 2023, at 1:30 PM. Attendance is highly recommended.

10. **BID OPENING:** Sealed bids will be received until June 6th, 2023, at 1:30 PM on Conslog. At which time bids will be publicly opened and read.

10. BIDDING DOCUMENTS:

- A. Bidding Documents may be examined at the following locations:
- 1) ESA Website: www.engsystems.com
 - 2) Conslog (by invitation only)
- B. Bidding Documents are available to invited Contractors with a deposit of \$50 per set. Deposit will be refunded if documents are returned complete and in good condition within five days of bid opening.

11. BIDDER'S QUALIFICATIONS: Bidding by the Contractors will be by invitation only.

12. OWNER'S RIGHT TO REJECT BIDS: Owner reserves the right to reject any or all bids and to waive any irregularity therein.

END OF DOCUMENT

INSTRUCTIONS TO BIDDERS (U.S.)

1. DOCUMENTS:

- A. Bidding Documents include Bidding Requirements and proposed Contract Documents. Proposed Contract Documents consist of:
 - 1) Agreement Between Owner and Contractor for Small Project (U.S.)
 - 2) Other documents included by reference
 - 3) Addenda.
- B. Bidding Requirements are those documents identified as such in proposed Project Manual.
- C. Addenda are written or graphic documents issued prior to execution of the Contract which modify or interpret the Bidding Documents. They become part of the Contract Documents as noted in the Agreement Between Owner and Contractor for Small Project (U.S.) upon execution of the Agreement by Owner.

2. BIDDER'S REPRESENTATIONS:

- A. By submitting a bid proposal, bidder represents that
 - 1) Bidder has carefully studied and compared Bidding Documents with each other. Bidder understands the Bidding Documents and the bid is fully in accordance with the requirements of those documents,
 - 2) Bidder has thoroughly examined the site and any building located thereon, has become familiar with local conditions which might directly or indirectly affect contract work, and has correlated its personal observations with requirements of proposed Contract Documents, and
 - 3) Bid is based on materials, equipment, and systems required by Bidding Documents without exception.

3. BIDDING DOCUMENTS:

- A. Copies
 - 1) Owner will provide the Bidding Documents as set forth in the Invitation to Bid.
 - 2) Partial sets of Bidding Documents will not be issued.
- B. Interpretation or Correction of Bidding Documents
 - 1) Bidders will request interpretation or correction of any apparent errors, discrepancies, and omissions in the Bidding Documents.
 - 2) Corrections or changes to Bidding Documents will be made by written Addenda.
- C. Substitutions and Equal Products
 - 1) Equal products may be approved upon compliance with Contract Document requirements.
 - 2) Base bid only on materials, equipment, systems, suppliers or performance qualities specified in the Bidding documents.
 - 3) Where a specified product is identified as a "quality standard", products of other manufacturers that meet the performance, properties, and characteristics of the specified "quality standard" may be used without specific approval as a substitute.
- D. Addenda. Addenda will be sent to bidders and to locations where Bidding Documents are on file no later than one week prior to bid opening or by fax no later than 48 hours prior to bid opening.

4. BIDDING PROCEDURES:

- A. Form and Style of Bids
 - 1) Use Owner's Bid Form.
 - 2) Bid will be complete and executed by authorized representative of Bidder.
 - 3) Do not delete from or add to the information requested on bid form.

- B. Submission of Bids
 - 1) Submit bid in sealed opaque envelope containing only bid form.
 - 2) It is bidder's sole responsibility to see that its bid is received at or before the specified time. Bids received after specified bid opening time may be returned to bidders unopened.
 - 3) No oral, facsimile transmitted, telegraphic, or telephonic bids, modifications, or cancellations will be considered.

- C. Modification or Withdrawal of Bid
 - 1) Bidder guarantees there will be no revisions or withdrawal of bid amount for 45 days after bid opening.
 - 2) Prior to bid opening, bidders may withdraw bid by written request or by reclaiming bid envelope.
 - 3) Prior to bid opening, bidder may mark and sign on the sealed envelope that bidder acknowledges any or all Addenda.

5. CONSIDERATION OF BIDS:

- A. Opening Of Bids - See Invitation to Bid.

- B. Acceptance Of Bid
 - 1) No bidder will consider itself under contract after opening and reading of bids until Owner accepts Contractor's Bid Proposal by executing same.
 - 2) Bidder's past performance, organization, subcontractor selection, equipment, and ability to perform and complete its contract in manner and within time specified, together with amount of bid, will be elements considered in award of contract.

6. FORM OF AGREEMENT BETWEEN OWNER AND CONTRACTOR:

- A. Agreement form will be "Agreement Between Owner and Contractor for Small Project (U.S.)" provided by Owner.

7. MISCELLANEOUS:

- A. Pre-Bid Conference. A pre-bid conference will be held on May 23rd, 2023, at 1:30 PM at the building.

END OF DOCUMENT

BID FORM

FOR GENERAL CONTRACT WORK (U.S.)

PROJECT IDENTIFICATION:

5258391
5001 W Shawnee Ave, Spokane, WA 99208

OWNER:

The Church of Jesus Christ of Latter-day Saints, a Utah corporation sole ("Owner")

CONSULTANT:

Dwayne Sudweeks
ESA: Engineered Systems Associates
1355 E. Center St. Pocatello, ID 83202
(208) 233 0501

BID

1. In submitting this Bid, Bidder represents that:
 - a. If this Bid is accepted, Bidder will enter into an agreement with Owner to perform and furnish the Work described in the Bidding Documents for the Bid Price and within the Time of Substantial Completion indicated in this Bid and in accordance with the other terms and conditions of the Contract Documents.
 - b. Bidder has carefully examined the Bidding Documents consisting of the Project Manual containing the Bidding Requirements, the Conditions of the Contract, and the Specifications, entitled LDS Shawnee HVAC Improvements, the Drawings entitled HVAC Improvements for :LDS Shawnee Ward and dated May, 2023, and including sheets numbered ME-1, ME-2, and addenda numbers _____.
 - c. Bidder has examined the site of the work, existing conditions, and all other conditions affecting the work on the above-named Project.
 - d. Bidder has carefully correlated the information known to Bidder and information and observations obtained from visits to the site with the Bidding Documents.
 - e. Bidder is familiar with federal, State, and local laws and regulations applicable to Project.
 - f. Bidder guarantees there will be no revisions or withdrawal of bid amount for forty-five (45) days after the bid opening.

2. Bidder hereby proposes to furnish all materials, labor, equipment, tools, transportations, services, licenses, fees, permits, etc., required by said documents to complete the Work described by the Contract Documents for the lump-sum of: _____

Dollars (\$ _____).

3. Bidder agrees to achieve substantial completion of the Work within the number of days indicated in the Invitation to Bid.

RESPECTFULLY SUBMITTED:

	Signature
	Printed name
	Title
	Company name
	Business Address
Date	City, State, and Zip Code
License No.	Telephone Fax
	Contact Email Address

CONSTRUCTION MATERIAL ASBESTOS STATEMENT (U.S.)

**PROJECTS FOR:
THE CHURCH OF JESUS CHRIST OF LATTER-DAY SAINTS,
a Utah corporation sole**

Building Name: Shawnee Ward, Spokane West Stake

Building Plan Type: HVAC Improvements

Building Address: 5001 W Shawnee Ave, Spokane, WA 99208

Building Owner: The Church of Jesus Christ of Latter-day Saints, a Utah corporation sole.

Property Number: 5258391

Completion Date: _____

As PROJECT CONSULTANT and principal in charge; based on my best knowledge, information, inspection, and belief; I certify that on the above referenced Project, no asbestos-containing building materials were specified in the construction documents or given approval in shop drawings or submittals.

Project Consultant and Principal in Charge (signature) Date

Company Name

As GENERAL CONTRACTOR in charge of construction; based on my best knowledge, information, inspection, and belief; I affirm that on the above-referenced Project, no asbestos-containing building materials were used in the construction.

General Contractor (signature) Date

Company Name

SMALL PROJECT AGREEMENT BETWEEN OWNER AND CONTRACTOR Fixed Sum (U.S.)

The Church of Jesus Christ of Latter-day Saints, a Utah corporation sole ("Owner") and _____ ("Contractor") enter into this *Small Project Agreement Between Owner and Contractor (U.S.)* ("Agreement") and agree as follows:

1. **Property/Project.**

Property/Project Number: _____
Property Address ("Project Site"): _____
Project Type: _____
Project Name ("Project"): _____
Stake Name: _____

2. **Scope of Work.** Contractor will furnish all labor, materials, tools, and equipment necessary to complete the Work in accordance with the Contract Documents. The Work is all labor, materials, tools, equipment, construction, and services required by the Contract Documents (the "Work").

3. **Contract Documents.** Contract Documents consist of:

- a. This Agreement;
- b. Supplementary Conditions for Small Project Agreement Between Owner and Contractor (U.S.);
- c. The Specifications (Division 01 and Divisions _____);
- d. Drawings entitled and dated _____;
- e. Addendum No. with date(s) _____;
- g. All written Field Changes, written Construction Change Directives and written Change Orders when prepared and signed by Owner and Contractor.

4. **Compensation.** Owner will pay Contractor for performance of Contractor's obligations under the Contract Documents the sum of _____ Dollars (\$ _____) (the "Contract Sum"). This Contract Sum includes all labor, materials, equipment, tools, costs, expenses, work and services of Contractor and its subcontractors necessary to perform the Work in accordance with the terms of this Agreement, including without limitation travel, communications, and copying costs.

5. **Payment.**

- a. If the Contract Sum is over \$100,000 or if otherwise requested by Owner, Contractor will submit to Owner a schedule of values which allocates the Contractor's Bid Proposal Amount to various portions of the Work. This schedule, when accepted by Owner will be used as a basis for reviewing Contractor's payment requests.
- b. Not more than once each month, Contractor will submit a payment request to Owner. Owner will pay Contractor for work completed within thirty (30) days after Owner receives:
 - 1) Contractor's payment request for work to date;
 - 2) a certification by Contractor that Contractor has paid for all labor, materials, and equipment relating to the Work covered by prior payment requests and that Contractor will pay for all labor, materials, and equipment relating to the Work covered by the current payment request; and
 - 3) releases of all mechanics' liens and claims of subcontractors, laborers, or material suppliers who supplied labor and/or materials for the Work covered by the payment request.
 - 4) updated Construction Schedule.
- c. Owner may modify or reject the payment request if, in Owner's opinion, the Work for which payment is requested is not acceptable or is less complete than represented on the payment request.
- d. Contractor will timely pay subcontractors their portion of fees and expenses that Owner has paid to Contractor.

6. **Extras and Change Orders.** Owner may order changes in the Work by altering, adding to, or deducting from the Work. In the event of such a change, the Contract Sum and/or the time of completion will be adjusted to reflect the change by means of a written Change Order signed by Contractor and Owner. Contractor will not commence work on any change until either: (a) Contractor and Owner have executed a Change Order; or (b) Owner has issued a written order for the change acknowledging that there is a dispute regarding the compensation adjustment relating to the change. If Contractor proceeds with a change in the Work without complying with the preceding sentence, Contractor agrees that it will not be entitled to any additional compensation for such change.
7. **Warranty and Correction of Work.** For all Work, services, labor, materials, products, and equipment provided under the Contract Documents, Contractor provides and extends to Owner all statutory, common law, and standard industry warranties as well as those warranties set forth in Owner's Contract Documents. Unless a longer period is specified by Owner's Contract Documents or otherwise, Contractor, at a minimum and in addition to all other warranties, warrants all Work under the Contract Documents for at least one year. Specifically, and without limitation, Contractor will promptly correct at its own expense:
- a. any portion of the Work which
 - 1) fails to conform to the requirements of the Contract Documents, or
 - 2) is rejected by the Owner as defective or because it is damaged or rendered unsuitable during installation or resulting from failure to exercise proper protection.
 - b. any defects due to faulty materials, equipment, or workmanship which appear within a period of one year from the date of completion of the Work or within such longer period of time as may be prescribed by law or the terms of any applicable special warranty required by the Contract Documents.
8. **Time of Completion.** Contractor will complete the Work and have it ready for Owner's inspection within _____ (_____) calendar days from Notice to Proceed issued by Owner. Time is of the essence. If Contractor is delayed at any time in the progress of the Work by any act or neglect of Owner, or by changes in the Work, or by strikes, lockouts, unusual delay in transportation, unavoidable casualties, or acts of nature beyond Contractor's control, then the time for completion will be extended by the time that completion of the Work is delayed. However, Contractor expressly waives any damages for any such delays.
9. **Owner Provided Items.** Owner may provide furnishings, equipment, and/or other items for the Project. Contractor will install items furnished by Owner and/or receive, store, and protect such items on site until the date Owner accepts the Project.
10. **Product Requirements.** Contractor will provide products that comply with Contract Documents, are undamaged, and, unless otherwise indicated, are new and unused at time of installation. Contractor will provide products complete with accessories, trim, finish, safety guards, and other devices and details needed for complete installation and for intended use and effect.
11. **Permits, Surveys, and Taxes.** Contractor will obtain and pay for all permits and licenses, and also pay any applicable taxes. Contractor will also obtain and pay for any surveys it needs to perform the Work.
12. **Independent Contractor Relationship.** Contractor is not an agent or employee of Owner but is an independent contractor.
13. **Comply with Laws.** Contractor will comply, and ensure that all subcontractors comply, with all applicable laws, ordinances, rules, regulations, covenants, and restrictions.
14. **Indemnity and Hold Harmless.**
- a. Contractor will indemnify and hold harmless Owner and Owner's representatives, employees, agents, architects, and consultants from and against any and all claims, liens, damages, liability, demands, costs, judgments, awards, settlements, causes of action, losses and expenses (collectively "Claims" or "Claim"), including but not limited to attorney fees, consultant fees, expert fees, copy costs, and other expenses, arising out of or resulting from performance of or failure to perform the Work, attributable to bodily injury,

sickness, disease, or death, or to injury to or destruction of real or personal property, including loss of use resulting therefrom, except to the extent that such liability arises out of the negligence of Owner, its representatives, agents, and employees. This indemnity includes, without limitation, indemnification of Owner from all losses or injury to Owner's property, except to the extent that such loss or injury arises out of the negligence of Owner, its representatives, agents, and employees. This indemnity applies, without limitation, to include Claims occurring both during performance of the Work and/or subsequent to completion of the Work. In the event that any Claim is caused in part by a party indemnified hereunder, that party will bear the cost of such Claim to the extent it was the cause thereof. In the event that a claimant asserts a Claim for recovery against any party indemnified hereunder, the party indemnified hereunder may tender the defense of such Claim to Contractor. If Contractor rejects such tender of defense and it is later determined that the negligence of the party indemnified hereunder did not cause all of the Claim, Contractor will reimburse the party indemnified hereunder for all costs and expenses incurred by that party in defending against the Claim. Contractor will not be liable hereunder to indemnify any party for damages resulting from the sole negligence of that party.

- b. In addition to the foregoing, Contractor will be liable to defend Owner in any lawsuit filed by any Subcontractor relating to the Project. Where liens have been filed against Owner's property, Contractor (and/or its bonding company which has issued bonds for the Project) will obtain lien releases and record them in the appropriate county and/or local jurisdiction and provide Owner with a title free and clear from any liens of Subcontractors. In the event that Contractor and/or its bonding company are unable to obtain a lien release, Owner in its absolute discretion may require Contractor to provide a bond around the lien or a bond to discharge the lien, at Contractor's sole expense.
- c. In addition to the foregoing, Contractor will indemnify and hold Owner harmless from any claim of any other contractor resulting from the performance, nonperformance or delay in performance of the Work by Contractor.
- d. The indemnification obligation herein will not be limited by a limitation on the amount or type of damages, compensation or benefits payable by or for Contractor or a Subcontractor under workers compensation acts, disability benefit acts, or other employee benefit acts.

15. **Work Restrictions.** Contractor will ensure that Contractor, its agents, employees, and subcontractors:

- a. Do not use or consume alcohol or cannabis, or illegally use drugs, on the Project Site or enter on or perform any Work on the Project Site while under their influence.
- b. Do not smoke or vape anything on the Project Site. Do not use tobacco in any form on the Project Site.
- c. Do not perform Work on the Project Site on Sundays except for emergency work.
- d. Refrain from using profanity or being discourteous or uncivil to others on the Project Site or while performing Work under this Agreement.
- e. Do not view or allow pornographic or other indecent materials on the Project Site.
- f. Do not play obnoxious and/or loud music on the Project Site. Do not play any music within existing facilities.
- g. Refrain from wearing immodest, offensive, or obnoxious clothing, while on the Project Site.
- h. Do not bring weapons on the Project Site.

16. **Safety Hazards.** Contractor will ensure that no work or services will be performed that may pose an undue safety hazard to Contractor, Contractor's employees, or any other person.

17. **Contractor's Insurance.** Prior to performing any work, Contractor will obtain and maintain during the term of this Agreement the following insurance:

- a. Workers Compensation Insurance or evidence of exemption.
- b. Employers Liability Insurance with minimum limits of the greater of \$500,000 E.L. each accident, \$500,000 E. L. disease-each employee, \$500,000 E.L. disease-policy limit or as required by the law of the state in which the Project is located.
- c. Commercial General Liability Insurance – ISO Form CG 00 01 (12/07) or equivalent Occurrence policy which will provide primary coverage to the additional insureds (the Owner and the Architect) in the event of any Occurrence, Claim, or Suit with:
 - 1) Limits of the greater of: Contractor's actual coverage amounts or the following:

- a) \$2,000,000 General Aggregate;
 - b) \$2,000,000 Products - Comp/Ops Aggregate;
 - c) \$1,000,000 Personal and Advertising Liability;
 - d) \$1,000,000 Each Occurrence; and
 - e) \$50,000 Fire Damage to Rented Premises (Each Occurrence)
- 2) Endorsements attached to the General Liability policy including the following or their equivalent:
- a) ISO Form CG-25-03 (05/09), Amendment of Limits of Insurance (Designated Project or Premises) describing the Agreement and specifying limits as shown above.
 - b) ISO Form CG 20 10 (07/04), Additional Insured – Owners, Lessees, Or Contractors (Form B), naming Owner and Architect as additional insureds.
- d. Automobile Liability Insurance, with:
- 1) Combined Single Limit each accident in the amount of no less than \$500,000; and
 - 2) Coverage applying to "Any Auto" or its equivalent.

Contractor will provide evidence of these insurance coverages to Owner by providing an ACORD 25 (2010/05) Form or its equivalent: (1) listing Owner as the Certificate Holder and Additional Insured on the general liability and any excess liability policies, (2) listing the insurance companies providing coverage (all companies listed must be rated in A.M. Best Company Key Rating Guide-Property-Casualty and each company must have a rating of B+ Class VII or higher), (3) attaching the endorsements set forth above for the Certificate of Liability Insurance, and (4) bearing the name, address and telephone number of the producer and signed by an authorized representative of the producer. (The signature may be original, stamped, or electronic.) Notwithstanding the foregoing, Owner may, in writing and at its sole discretion, modify these insurance requirements.

18. **Resolution of Disputes.** In the event there is any dispute arising under the Contract Documents which cannot be resolved by agreement between the parties, either party may submit the dispute with all documentation upon which it relies to Director of Architecture, Engineering, and Construction, 50 East North Temple, Salt Lake City, Utah 84150, who will convene a dispute resolution conference within thirty (30) days. The dispute resolution conference will constitute settlement negotiations and any settlement proposal made pursuant to the conference will not be admissible as evidence of liability. In the event that the parties do not resolve their dispute pursuant to the dispute resolution conference, either party may commence legal action to resolve the dispute. Any such action must be commenced within six (6) months from the first day of the dispute resolution conference or be time barred. Submission of the dispute to the Director as outlined above is a condition precedent to the right to commence legal action to resolve any dispute. In the event that either party commences legal action to adjudicate any dispute without first submitting the dispute to the Director, the other party will be entitled to obtain an order dismissing the litigation without prejudice and awarding such other party any costs and attorney fees incurred by that party in obtaining the dismissal, including without limitation copy costs, and expert and consultant fees and expenses. Pending final resolution of a dispute hereunder, Contractor will proceed diligently with the performance of its obligations pursuant to this Agreement.
19. **Termination by Contractor.** In the event Owner materially breaches any term of the Contract Documents, Contractor will promptly give Written Notice of the breach to Owner. If Owner fails to cure the breach within ten (10) days of the Written Notice, Contractor may terminate this Agreement by giving Written Notice to Owner and recover from Owner the percentage of the Contract Sum represented by the Work completed on the Project site as of the date of termination together with any out of pocket loss Contractor has sustained with respect to materials and equipment as a result of the termination prior to completion of the Work, less any offsets. Contractor will not be entitled to unearned profits or any other compensation or damages as a result of the termination and hereby waives any claim therefor. Contractor will provide to Owner all warranty, as built, inspection, and other close out documents as well as materials that Contractor has in its possession or control at the time of termination. Without limitation, Contractor's indemnities and obligations as well as all warranties relative to Work provided through the date of termination survive a termination hereunder.

20. **Termination by Owner for Cause.** Should Contractor fail to timely provide Owner with the certificates of insurance, make a general assignment for the benefit of its creditors, fail to apply enough properly skilled workmen or specified materials to properly prosecute the Work in accordance with Contractor's schedule, or otherwise materially breach any provision of the Contract Documents, then Owner may, without any prejudice to any other right or remedy, give Contractor Written Notice thereof. If Contractor fails to cure its default within ten (10) days, Owner may terminate this Agreement by giving Written Notice to Contractor. In such case, Owner may, in Owner's sole discretion, take legal assignment of subcontracts and other contractual rights of Contractor and/or take possession of the premises and all materials, tools, equipment, and appliances thereon, and finish the Work by whatever method Owner deems expedient. Contractor will not be entitled to receive any further payment until the Work is finished. If the unpaid balance of the Contract Sum exceeds the expense of finishing the Work, including compensation for additional administrative, architectural, consultant, and legal services (including without limitation attorney fees, expert fees, copy costs, and other expenses), such excess will be paid to Contractor, less any offsets. If such expense exceeds the unpaid balance, Contractor will pay the difference to Owner. Contractor will provide to Owner all warranty, as built, inspection, and other close out documents as well as materials that Contractor has in its possession or control at the time of termination. Without limitation, Contractor's indemnities and obligations as well as all warranties relative to Work provided through the date of termination survive a termination hereunder.
21. **Termination by Owner for Convenience.** Notwithstanding any other provision contained in the Contract Documents, Owner may, without cause and in its absolute discretion, terminate this Agreement at any time. In the event of such termination, Contractor will be entitled to recover from Owner the percentage of the Contract Sum equal to the percentage of the Work which Owner and/or its architect determines has been completed on the Project site as of the date of termination together with any out of pocket loss Contractor has sustained with respect to materials and equipment as a result of the termination prior to completion of the Work, less any offsets. Contractor will not be entitled to unearned profits or any other compensation as a result of the termination and hereby waives any claim therefor. Contractor will provide to Owner all warranty, as built, inspection, and other close out documents as well as materials that Contractor has in its possession or control at the time of termination. Owner may, in Owner's sole discretion, take legal assignment of subcontracts and other contractual rights of Contractor. Without limitation, Contractor's indemnities and obligations as well as all warranties relative to Work provided through the date of termination survive a termination hereunder.
22. **Enforcement.** In the event either party commences legal action to enforce or rescind any term of this Agreement, the prevailing party will be entitled to recover its attorney fees, costs and legal expenses, including without limitation all copy costs and expert and consultant fees and expenses, incurred in that action and on all appeals, from the other party.
23. **Ownership of Materials, Products, and Intellectual Property Rights.** Owner will retain ownership and intellectual property rights in all plans, designs, drawings, documents, concepts, and materials provided by or on behalf of Owner to Contractor and to all work products of Contractor and its subcontractors for products, services, and Work provided under this Agreement, such products, services, and Work of Contractor and its subcontractors constituting works made for hire. Neither Contractor nor its subcontractors will reuse any portion of such items provided by Owner or work products developed by Contractor or its subcontractors for Owner pursuant to this Agreement or disclose any such items to any third party without the prior written consent of Owner. Owner may withhold its consent in its absolute discretion. Contractor shall obtain the written agreement of each of its subcontractors to the terms of this section prior to permitting the subcontractor to perform any services contemplated by this Agreement.
24. **Comply with Intellectual Property Rights of Others.** Contractor represents and warrants that no Work or services (with its means, methods, goods, and services attendant thereto), provided to Owner will infringe or violate any right of any third party and that Owner may use and exploit such Work, means, methods, goods, and services without liability or obligation to any person or entity (specifically and without limitation, such Work, means, methods, goods, and services will not violate rights under any patent, copyright, trademark, or other intellectual property right or application for the same).

25. **Ownership and Use of Renderings and Photographs.** Renderings, photographs, and/or other images of or representing the services, Work, or any improvement on or relative to the Project Site, whether created before, during, or at completion of construction (and whether created by Owner, Contractor, or Contractor's subcontractors), are the property of the Owner. Contractor hereby transfers and assigns to Owner all ownership and intellectual property rights that Contractor and/or its subcontractors may have in and to all such renderings, photographs, and other images. The Owner reserves all rights including copyrights and other intellectual property rights to such renderings, photographs, and other images. No such renderings, photographs, or other images shall be used or distributed without written consent of the Owner.
26. **Public Statements.** Contractor will not make any statements or provide any information to the media about the Project or Work without the prior written consent of Owner. If Contractor receives any requests for information from media, Contractor will refer such requests to Owner.
27. **Confidentiality.** Contractor shall ensure that Contractor and its subcontractors, and the employees, agents and representatives of Contractor and its subcontractors, maintain in strict confidence, and shall use and disclose only as authorized by Owner all Confidential Information of Owner that Contractor receives in connection with the performance of this Agreement. Notwithstanding the foregoing, Contractor may use and disclose any information to the extent required by an order of any court or governmental authority, but only after it has notified Owner and Owner has had an opportunity to obtain reasonable protection for such information in connection with such disclosure. For purposes of this Agreement, "Confidential Information" means:
- a. The name or address of any affiliate, customer or contractor of Owner or any information concerning the transactions of any such person with Owner;
 - b. Any contracts, agreements, business plans, budgets or other financial information, renderings, photographs, and materials provided by Owner, relating to the Work or any improvement on the Project Site to the extent such has not been made available to the public by the Owner;
 - c. Any other information that is marked or noted as confidential at the time of its disclosure.
28. **No Commercial Use of Transaction or Relationship.** Without the prior written consent of Owner, which Owner may grant or withhold in its sole discretion, neither Contractor nor Contractor's affiliates, officers, directors, agents, representatives, shareholders, members, Subcontractors, or employees shall make any private commercial use of their relationship to Owner or the Project, including, without limitation:
- a. By referring to the Owner or Project verbally or in any sales, marketing or other literature, letters, client lists, press releases, brochures or other written materials except as may be necessary for Contractor to perform Contractor's obligations under the terms of this Agreement;
 - b. By using or allowing the use of any photographs of the Work or Project or any part thereof, or of any service marks, trademarks or trade names or other intellectual property now or which may hereafter be associated with, owned by or licensed by Owner, in connection with any work, service or product; or
 - c. By contracting with or receiving money or anything of value from any person or commercial entity to facilitate such person or entity obtaining any type of commercial identification, advertising or visibility in connection with the Owner or Project.
- Notwithstanding the foregoing, Contractor may include a reference to Owner or the Project in a professional résumé or other similar listing of Contractor's references without seeking Owner's written consent in each instance, provided that such reference to Owner or the Project is included with at least several other similar references to projects of different owners and is given no more prominence than such other references.
29. **Entire Agreement.** This Agreement contains the entire and integrated agreement between the parties hereto and supersedes all prior negotiations, representations, or agreements, either written or oral, relating to the Project. This Agreement may be amended only by a writing signed by both parties. This Agreement will not be construed to create a contractual relationship of any kind between any persons or entities other than Owner and Contractor.
30. **Assignment.** Contractor will not assign any right or obligation hereunder without the prior written consent of

the Owner, which consent may be granted or withheld in Owner's absolute discretion.

31. **Governing Law.** The parties acknowledge that the Contract Documents have substantial connections to the State of Utah. The Contract Documents will be deemed to have been made, executed, and delivered in Salt Lake City, Utah. To the maximum extent permitted by law, (i) the Contract Documents and all matters related to their creation and performance will be governed by and enforced in accordance with the laws of the State of Utah, excluding conflicts of law rules, and (ii) all disputes arising from or related to the Contract Documents will be decided only in a state or federal court located in Salt Lake City, Utah and not in any other court or state. Toward that end, the parties hereby consent to the jurisdiction of the state and federal courts located in Salt Lake City, Utah and waive any other *venue* to which they might be entitled by virtue of domicile, habitual residence, place of business, or otherwise.

32. **Effective Date.** The effective date of this Agreement is the date indicated by Owner's signature.

OWNER:	CONTRACTOR:
The Church of Jesus Christ of Latter-day Saints, a Utah corporation sole	
Signature:	Signature:
Print Name:	Print Name:
Title:	Title:
Address:	Address:
Telephone No:	Telephone No:
Facsimile No:	Facsimile No:
Email:	Email:
Effective Date:	Fed. I.D. or SSN:
	License No:
Reviewed By:	Date Signed:

SUPPLEMENTARY CONDITIONS

FOR SMALL PROJECT AGREEMENT BETWEEN OWNER AND CONTRACTOR (U.S.)

ITEM 1 - GENERAL

1. Conditions of the Small Project Agreement Between Owner and Contractor (U.S.) apply to each Division of the Specifications.
2. Provisions contained in Division 01 apply to all Divisions of the Specifications.

ITEM 2 - LIQUIDATED DAMAGES PAYABLE TO OWNER

This section may be included as a separate additional paragraph to the Small Project Agreement Between Owner and Contractor (U.S.), at Owner's discretion:

Delay in Completion of the Work. For each day after the expiration of the designated Time of Completion that Contractor has not completed the Work, Contractor will pay Owner the amount of one hundred and fifty dollars (\$100.00) per day as liquidated damages for Owner's loss of use and the added administrative expense to Owner to administer the Project during the period of delay. In addition, Contractor will reimburse Owner for any additional Architect's fees, attorneys' fees, expert fees, consultant fees, copy costs, and other expenses incurred by Owner as a result of the delay. Owner may deduct any liquidated damages or reimbursable expenses from any money due or to become due to Contractor. If the amount of liquidated damages and reimbursable expenses exceeds any amounts due to Contractor, Contractor will pay the difference to Owner within ten (10) days after receipt of a written request from Owner for payment.

ITEM 3 - STATE SPECIFIC SUPPLEMENTARY CONDITIONS

Washington

WASHINGTON STATE CONTRACTOR DISCLOSURE NOTICE:

Add the following to the Small Project Agreement Between Owner and Contractor (U.S.):

1. For Projects in state of Washington, the Contractor will provide a 'job site' disclosure notice in accordance with Statute 60.04.230. Contractor will post this notice at the job site. This notice will detail the following:
 - a. Legal description and street address of the construction site.
 - b. Property Owner's name address, and phone number as shown in the Contract Documents.
 - c. Contractor's registration number and identification.
 - d. Contractor's business name, address, and telephone number.

END OF DOCUMENT

DIVISION 01: GENERAL REQUIREMENTS**01 1000 SUMMARY**

- 01 1100 SUMMARY OF WORK & BID ALTERNATES
- 01 1400 WORK RESTRICTIONS

01 2000 PRICE AND PAYMENT PROCEDURES

- 01 2900 PAYMENT PROCEDURES

01 3000 ADMINISTRATIVE REQUIREMENTS

- 01 3100 PROJECT MANAGEMENT AND COORDINATION
- 01 3300 SUBMITTAL PROCEDURES

01 4000 QUALITY REQUIREMENTS

- 01 4100 REGULATORY REQUIREMENTS
- 01 4301 QUALITY ASSURANCE - QUALIFICATIONS

01 6000 PRODUCT REQUIREMENTS

- 01 6100 COMMON PRODUCT REQUIREMENTS
- 01 6200 PRODUCT OPTIONS
- 01 6600 PRODUCT DELIVERY, STORAGE, AND HANDLING REQUIREMENTS

01 7000 EXECUTION AND CLOSEOUT REQUIREMENTS

- 01 7300 EXECUTION
- 01 7400 CLEANING AND WASTE MANAGEMENT
- 01 7700 CLOSEOUT PROCEDURES
- 01 7800 CLOSEOUT SUBMITTALS

END OF TABLE OF CONTENTS

SECTION 01 1100**SUMMARY OF WORK & BID ALTERNATES****PART 1 - GENERAL****1.1 SUMMARY**

- A. Section Includes But is Not Limited To:
 - 1. Administrative and procedural requirements Summary of Work requirements.

1.2 WORK COVERED BY CONTRACT DOCUMENTS

- A. Provisions contained in Division 01 apply to Sections of Divisions 02 through 26 of Specifications. Instructions contained in Specifications are directed to Contractor. Unless specifically provided otherwise, obligations set forth in Contract Documents are obligations of Contractor.
- B. Contractor shall furnish total labor, materials, equipment, and services necessary to perform The Work in accordance with Contract Document..

1.3 SCOPE

- A. Bidder hereby proposes to furnish all materials, labor, equipment, tools, transportations, services, licenses, fees, permits, etc., required by said documents to complete the Work described by the Contract Documents to replace HVAC systems to rooms as shown and all related work.
 - 1. This project is to replace (5) vandalized Condensing units, and upgrade (5) Gas fired furnaces from 80% to 95% efficient units, and associates piping and Electrical work.

PART 2 - PRODUCTS Not Used**PART 3 - EXECUTION Not Used****END OF SECTION**

SECTION 01 1400**WORK RESTRICTIONS****PART 1 - GENERAL****1.1 SUMMARY**

- A. Section Includes But is Not Limited To:
1. Administrative and procedural requirements for Work Restrictions.

1.2 PROJECT CONDITIONS

- A. During construction period, Contractor will have use of premises for construction operations. Contractor will ensure that Contractor, its employees, subcontractors, and their employees comply with following requirements:
1. Confine operations to areas within Contract limits shown on Drawings. Do not disturb portions of site beyond Contract limits.
 2. Do not allow alcoholic beverages, illegal drugs, or persons under their influence on Project site.
 3. Do not allow use of tobacco in any form on Project Site.
 4. Do not allow pornographic or other indecent materials on site.
 5. Do not allow work on Project site on Sundays except for emergency work.
 6. Refrain from using profanity or being discourteous or uncivil to others on Project Site or while performing The Work.
 7. Wear shirts with sleeves, wear shoes, and refrain from wearing immodest, offensive, or obnoxious clothing, while on Project Site.
 8. Do not allow playing of obnoxious and loud music on Project Site. Do not allow playing of any music within existing facilities.
 9. Do not build fires on Project Site.
 10. Do not allow weapons on Project Site, except those carried by law enforcement officers or other uniformed security personnel who have been retained by Owner or Contractor to provide security services.
- B. Do not load or permit any part of the structure to be loaded with a weight that will endanger its safety. Questions of structural loading as part of construction means and methods shall be addressed by a licensed structural engineer engaged by Contractor, subject to the review by Architect.

PART 2 - PRODUCTS Not Used**PART 3 - EXECUTION Not Used****END OF SECTION**

SECTION 01 2900**PAYMENT PROCEDURES****PART 1 - GENERAL****1.1 SUMMARY**

- A. Section Includes But is Not Limited To:
 - 1. Administrative and procedural requirements to prepare and process Applications for Payments.

1.2 PAYMENT REQUESTS

- A. Use Payment Request forms provided by Owner.
- B. Each Payment Request will be consistent with previous requests and payments certified by Architect and paid for by Owner.
- C. Request Preparation:
 - 1. Complete every entry on Payment Request form.
 - 2. Entries will match data on approved schedule of values and Contractor's Construction Schedule. Use updated schedules if revisions have been made.
 - 3. Submit signed Payment Request to Architect with current Construction Schedule.
- D. Provide following submittals before or with submittal of Initial Payment Request:
 - 1. List of Subcontractors.
 - 2. Initial progress report.
 - 3. Contractor's Construction Schedule.
 - 4. Submittal Schedule.
- E. Provide Affidavit of Contractor and Consent of Surety with Payment Request following Substantial Completion.

1.3 SCHEDULE OF VALUES

- A. Submit schedule of values on Owner's standard form to Architect 20 days minimum before submission of Initial Payment Request as a necessary condition before payment will be processed. Coordinate preparation of schedule of values with preparation of Contractor's Construction Schedule. Correlate line items in Schedule of Values with other required administrative schedules and forms, including:
 - 1. Contractor's Construction Schedule.
 - 2. Payment Request form.
 - 3. Schedule of Allowances.
 - 4. Schedule of Alternates.
- B. Provide a breakdown of the Contract Sum in enough detail to facilitate continued evaluation of Applications for Payment and progress reports. Coordinate with the Project Manual table of contents. Provide multiple line items for principal subcontract amounts in excess of five percent of Contract Sum.
 - 1. Include separate line items under Contractor and principal subcontracts for Sustainable (LEED) documentation and other project closeout requirements in an amount totaling five percent of the Contract Sum and subcontract amount.

PART 2 - PRODUCTS Not Used**PART 3 - EXECUTION Not Used****END OF SECTION**

SECTION 01 3100**PROJECT MANAGEMENT AND COORDINATION****PART 1 - GENERAL****1.1 SUMMARY**

- A. Section Includes But is Not Limited To:
 - 1. Administrative and procedural requirements for Project Management and Coordination on Projects.

1.2 PROJECT COORDINATION

- A. This Project designation will be included on documents generated for Project by Contractor and Subcontractors, or be present on a cover letter accompanying such documents.

1.3 MULTIPLE CONTRACT COORDINATION

- A. Contractor shall be responsible for accurately maintaining and reporting schedule of The Work from Notice to Proceed to date of Substantial Completion.
- B. Contractor shall be responsible for providing Temporary Facilities And Controls for those who perform work on Project from Notice to Proceed to date of Substantial Completion.
- C. Contractor shall be responsible for providing Construction Waste Management And Disposal services for those who perform work on Project from Notice to Proceed to date of Substantial Completion.
- D. Contractor shall be responsible for Final Cleaning for entire Project.

1.4 PROJECT MEETINGS AND CONFERENCES

- A. Preconstruction Conference:
 - 1. Attend preconstruction conference and organizational meeting scheduled by Architect at Project site or other convenient location.
 - 2. Be prepared to discuss items of significance that could affect progress, including such topics as:
 - a. Construction schedule.
 - b. Critical Work sequencing.
 - c. Current problems.
 - d. Designation of responsible personnel.
 - e. Distribution of Contract Documents.
 - f. Equipment deliveries and priorities.
 - g. General schedule of inspections by Architect and its consultants.
 - h. General inspection of tests.
 - i. Office, work, and storage areas.
 - j. Preparation of record documents and O & M manuals.
 - k. Procedures for processing interpretations and Modifications.
 - l. Procedures for processing Payment Requests.
 - m. Project cleanup.
 - n. Security.
 - o. Status of permits.

- p. Submittal of Product Data, Shop Drawings, Samples, Quality Assurance / Control submittals.
 - q. Sustainable (LEED) Requirements.
 - r. Use of the premises.
 - s. Work restrictions.
 - t. Working hours.
3. Architect will record minutes of meetings and distribute copies to Owner and Contractor within three (3) working days.
- B. Progress Meetings:
1. Attend progress meetings at Project site at regularly scheduled intervals determined by Architect, at least once a month.
 2. Progress meetings will be open to Owner, Architect, Subcontractors, and anyone invited by Owner, Architect, and Contractor.
 3. Be prepared to discuss items of significance that could affect progress, including following:
 - a. Progress since last meeting.
 - b. Whether Contractor is on schedule.
 - c. Activities required to complete Project within Contract Time.
 - d. Labor and materials provided under separate contracts.
 - e. Off-site fabrication problems.
 - f. Access.
 - g. Site use.
 - h. Temporary facilities and services.
 - i. Hours of work.
 - j. Hazards and risks.
 - k. Project cleanup.
 - l. Quality and Work standards.
 - m. Status of pending modifications.
 - n. Documentation of information for Payment Requests.
 - o. Maintenance of Project records.
 4. Architect will prepare minutes of progress meetings and distribute copies of minutes to Owner and Contractor within three (3) working days.
- C. Pre-Installation Conferences:
1. Attend pre-installation conferences specified in Contract Document.
 - a. If possible, schedule these conferences on same day as regularly scheduled Progress Meetings. If this is not possible, coordinate scheduling with Architect.
 - b. Request input from attendees in preparing agenda.
 2. Be prepared to discuss following items:
 - a. Requirements of Contract Documents.
 - b. Completed work necessary for installation of items or systems.
 - c. Conditions not in compliance with installation requirements.
 - d. Installation and inspection schedule.
 - e. Coordination between trades.
 - f. Space and access limitations.
 - g. Testing.
 3. Architect will prepare meeting minutes and distribute minutes to Owner and Contractor within three (3) working days.

PART 2 - PRODUCTS Not Used**PART 3 - EXECUTION Not Used****END OF SECTION**

SECTION 01 3300**SUBMITTAL PROCEDURES****PART 1 - GENERAL****1.1 SUMMARY**

- A. Section Includes But is Not Limited To:
1. Administrative and procedural requirements for Submittal Procedures.

1.2 SUBMITTAL SCHEDULE

- A. Furnish submittal schedule within 20 days after receipt of Notice to Proceed, listing items specified to be furnished for review to Architect including product data, shop drawings, samples, and Informational submittals.
1. Coordinate submittal schedule with Contractor's construction schedule.
 2. Enclose the following information for each item:
 - a. Scheduled date for first submittal.
 - b. Related Section number.
 - c. Submittal category.
 - d. Name of Subcontractor.
 - e. Description of part of the Work covered.
 - f. Scheduled date for resubmittal.
 - g. Scheduled date for Architect's final release or approval.
- B. Print and distribute copies to Architect and Owner and post copy in field office. When revisions are made, distribute to same parties and post in same location.
- C. Revise schedule monthly. Send copy of revised schedule to Owner and Architect and post copy in field office.

1.3 SUBMITTAL PROCEDURES

- A. Coordination:
1. Coordinate preparation and processing of submittals with performance of construction activities. Transmit each submittal sufficiently before performance of related construction activities to avoid delay.
 - a. Coordinate each submittal with fabrication, purchasing, testing, delivery, other submittals, and related activities that require sequential activity.
 - b. Coordinate transmittal of different types of submittals required for related elements of The Work so processing will not be delayed by need to review submittals concurrently for coordination. Architect reserves right to withhold action on a submittal requiring coordination with other submittals until related submittals are received.
 2. Processing Time:
 - a. Allow sufficient review time so installation will not be delayed by time required to process submittals, including time for resubmittals.
 - 1) Allow 21 days for initial review. Allow additional time if processing must be delayed to allow coordination with subsequent submittals. Architect will promptly advise Contractor when submittal being processed must be delayed for coordination.
 - 2) If an intermediate submittal is necessary, process same as initial submittal.
 - 3) Allow 10 days for reprocessing each submittal.

- 4) No extension of Contract Time will be authorized because of failure to transmit submittals to Architect in sufficient time before work is to be performed to allow processing.
3. Identification:
 - a. Place permanent label or title block on each submittal for identification. Include name of entity that prepared each submittal on label or title block.
 - 1) Provide space approximately 4 by 5 inches on label or beside title block on Shop Drawings to record Contractor's review and approval markings and action taken.
 - 2) Include following information on label for processing and recording action taken:
 - a) Project name.
 - b) Date.
 - c) Name and address of Architect.
 - d) Name and address of Contractor.
 - e) Name and address of Subcontractor.
 - f) Name and address of supplier.
 - g) Name of manufacturer.
 - h) Number and title of appropriate Specification Section.
 - i) Drawing number and detail references, as appropriate.
4. Transmittal:
 - a. Package each submittal appropriately for transmittal and handling. Transmit each submittal from Contractor to Architect using transmittal letter. On transmittal, record relevant information and requests for data. Include Contractor's certification that information complies with Contract Document requirements, or, on form or separate sheet, record deviations from Contract Document requirements, including minor variations and limitations.
 - b. Submittals received from sources other than Contractor or not marked with Contractor's approval will be returned without action.

1.4 ACTION SUBMITTALS

- A. Product Data:
 1. Submit Product Data, as required by individual Sections of Specifications.
 2. Mark each copy of each set of submittals to show choices and options used on Project. Where printed Product Data includes information on products that are not required for Project, mark copies to indicate information relating to Project.
 3. Certify that proposed product complies with requirements of Contract Documents. List any deviations from those requirements on form or separate sheet.
 4. Submit five copies of each required submittal unless otherwise required. Architect will return three copies marked with action taken and with corrections or modifications required.
 5. Submit electronic files PDF: Architect will return a PDF copy marked with action taken and with corrections or modifications required.
- B. Shop Drawings:
 1. Submit newly prepared graphic data to accurate scale. Except for templates, patterns, and similar full-size Drawings, submit Shop Drawings on sheets at least **8-1/2 by 11 inches (215 by 280 mm)** but no larger than **36 by 48 inches (915 by 1 200 mm)**. Highlight, encircle, or otherwise show deviations from Contract Documents. Include following information as a minimum:
 - a. Dimensions.
 - b. Identification of products and materials included.
 - c. Compliance with specified standards.
 - d. Notation of coordination requirements.
 - e. Notation of dimensions established by field measurement.
 2. Do not reproduce Contract Documents or copy standard information as basis of Shop Drawings. Standard printed information prepared without specific reference to Project is not acceptable as Shop Drawings.

3. Review and designate (stamp) approval of shop drawings. Unless otherwise specified, submit to Architect six copies of shop drawings required by Contract Documents. Shop drawings not required by Contract Documents, but requested by Contractor or supplied by Subcontractor, need not be submitted to Architect for review.
- C. Samples:
1. Submit full-size, fully fabricated Samples cured and finished as specified and physically identical with material or product proposed. Samples include partial sections of manufactured or fabricated components, cuts or containers of materials, color range sets, and swatches showing color, texture, and pattern.
 - a. Mount, display, or package Samples so as to ease review of qualities specified. Prepare Samples to match samples provided by Architect, if applicable. Include following:
 - 1) Generic description of Sample.
 - 2) Sample source.
 - 3) Product name or name of manufacturer.
 - 4) Compliance with recognized standards.
 - 5) Availability and delivery time.
 2. Submit Samples for review of kind, color, pattern, and texture, for final check of these characteristics with other elements, and for a comparison of these characteristics between final submittal and actual component as delivered and installed.
 - a. Where variations in color, pattern, texture or other characteristics are inherent in material or product represented, submit set of three samples minimum that show approximate limits of variations.
 - b. Refer to other specification Sections for requirements for Samples that illustrate workmanship, fabrication techniques, details of assembly, connections, operation and similar construction characteristics.
 - c. Refer to other Sections for Samples to be returned to Contractor for incorporation into The Work. Such Samples shall be undamaged at time of use. On transmittal, indicate special requests regarding disposition of Sample submittals.
 3. Where Samples are for selection of color, pattern, texture, or similar characteristics from a range of standard choices, submit full set of choices for material or product. Preliminary submittals will be reviewed and returned with Architect's mark indicating selection and other action.
 4. Except for Samples illustrating assembly details, workmanship, fabrication techniques, connections, operation, and similar characteristics, submit three sets. One will be returned marked with action taken.
 5. Samples, as accepted and returned by Architect, will be used for quality comparisons throughout course of construction.
 - a. Unless noncompliance with Contract Documents is observed, submittal may serve as final submittal.
 - b. Sample sets may be used to obtain final acceptance of construction associated with each set.

1.5 INFORMATIONAL SUBMITTALS

- A. Informational submittals are design data, test reports, certificates, manufacturer's instructions, manufacturer's field reports, and other documentary data affirming quality of products and installations. Submit five copies of each required submittal unless otherwise required. Architect will return three copies marked with action taken and with corrections or modifications required. [or] Submit electronic files: PDF. Architect will return a PDF copy marked with action taken and with corrections or modifications required.
1. Certificates: Describe certificates intended to document affirmations by Contractor or others that the work is in accordance with the Contract Documents, but do not repeat provisions of Parts 2 or 3.
 2. Delegated Design Submittals / Design Data: Describe submittals intended to demonstrate design work prepared by Contractor's licensed professionals.

3. Test And Evaluation Reports: Describe submittal of test reports or evaluation service reports intended to document required tests.
4. Manufacturer Instructions: Describe submittals intended to document manufacturer instructions.
5. Source Quality Control Submittals: Describe submittal of source quality control documentation.
6. Field Quality Control Submittals: Describe submittal of field quality control documentation.
7. Manufacturer Reports: Describe submittal of Manufacturer reports as documentation of manufacturer activities.
8. Special Procedure Submittals: Describe submittals intended to document special procedures. An example would be construction staging or phasing for remodeling an existing facility while keeping it in operation. While the Contractor would normally be responsible for managing this, submittal of his plan as documentation could be specified.
9. Qualification Statements: Describe submittals intended to document qualifications of entities employed by Contractor.

1.6 CLOSEOUT SUBMITTALS

- A. This title groups submittals that occur during project closeout. Coordinate with section 01 7800 Closeout Submittals.
 1. Maintenance Contracts: Describe submittal of the maintenance contract.
 2. Operations & Maintenance Data: Describe submittal of operation and maintenance data necessary for products of the Section.
 3. Warranty Documentation: Describe submittal of final executed warranty document.
 4. Record Documentation: Describe submittal of record documentation specific to this Section.
 5. Software: Describe submittal of extra copy operating system and other utility software necessary to operate and maintain software during life of product.

1.7 MAINTENANCE MATERIAL SUBMITTALS

- A. This title groups maintenance material submittals required by Section.
 1. Spare Parts: Describe spare parts necessary for Owner's use in facility operation and maintenance. 'Parts' are generally understood to be items such as filters, motor drive belts, lamps, and other similar manufactured items that require only simple replacement.
 2. Extra Stock Materials: Describe extra stock materials to be provided for Owner's use in facility operation and maintenance.
 3. Tools and Software:
 - a. Describe tools to be provided for Owner's use in facility operation and maintenance. Tools are generally understood to be wrenches, gauges, circuit setters, etc, required for proper operation or maintenance of a system.
 - b. If necessary, describe submittal of an extra copy of operating system and other utility software necessary to operate and maintain the software during expected life of product.

PART 2 - PRODUCTS Not Used

PART 3 - EXECUTION Not Used

END OF SECTION

SECTION 01 4100
REGULATORY REQUIREMENTS

PART 1 - GENERAL

1.1 SUMMARY

- A. Section Includes But is Not Limited To:
 - 1. Administrative and procedural requirements for Regulatory Requirements.

1.2 ASBESTOS

- A. Contract Documents for this Project have been prepared in accordance with generally accepted professional architectural and engineering practices. Accordingly, no asbestos or products containing asbestos have been knowingly specified for this Project. Notify Architect immediately for instructions if materials containing asbestos are brought to site for inclusion in the Work.
- B. At Architect's direction and with Owner's approval, a certified asbestos inspector will collect samples and an independent testing laboratory will perform testing procedures on suspect materials.
- C. Certify that based upon best knowledge, information, inspection, and belief no building materials containing asbestos were used in construction of Project. Submit certification on form provided by Owner.

PART 2 - PRODUCTS Not Used

PART 3 - EXECUTION Not Used

END OF SECTION

SECTION 01 6600**PRODUCT DELIVERY, STORAGE, AND HANDLING REQUIREMENTS****PART 1 - GENERAL****1.1 SUMMARY**

- A. Section Includes But is Not Limited To:
 - 1. Administrative and procedural requirements for Product Delivery, Storage, and Handling Requirements.

1.2 GENERAL

- A. Deliver, store, and handle products according to manufacturer's recommendations, using means and methods that will prevent damage, deterioration, and loss, including theft.

1.3 DELIVERY AND ACCEPTANCE REQUIREMENTS

- A. Schedule delivery to reduce long-term storage at site and to prevent overcrowding of construction spaces.
- B. Coordinate delivery with installation time to ensure minimum holding time for items that are flammable, hazardous, easily damaged, or sensitive to deterioration, theft, and other losses.
- C. Deliver products to site in manufacturer's original sealed container or other packaging system, complete with labels and instructions for handling, storing, unpacking, protecting, and installing.
- D. Inspect products upon delivery to ensure compliance with Contract Documents, and to ensure that products are undamaged and properly protected.

1.4 STORAGE AND HANDLING REQUIREMENTS

- A. Store products at site in manner that will simplify inspection and measurement of quantity or counting of units.
- B. Store heavy materials away from Project structure so supporting construction will not be endangered.
- C. Store products subject to damage by elements above ground, under cover in weathertight enclosure, with ventilation adequate to prevent condensation. Maintain temperature and humidity within range required by manufacturer's instructions.

PART 2 - PRODUCTS Not Used**PART 3 - EXECUTION Not Used****END OF SECTION**

SECTION 01 7300**EXECUTION****PART 1 - GENERAL****1.1 SUMMARY**

- A. Section Includes But is Not Limited To:
 - 1. Administrative and procedural requirements for governing Execution of the Work.

1.2 COMMON INSTALLATION PROVISIONS

- A. Manufacturer's Instructions: Comply with Manufacturer's installation instructions and recommendations to extent that those instructions and recommendations are more explicit or stringent than requirements contained in Contract Documents. Notify Architect of conflicts between Manufacturer's installation instructions and Contract Document requirements.
- B. Provide attachment and connection devices and methods necessary for securing Work. Secure work true to line and level. Anchor each product securely in place, accurately located, and aligned with other Work. Allow for expansion and building movement.
- C. Visual Effects: Provide uniform joint widths in exposed work. Arrange joints in exposed work to obtain best visual effect. Refer questionable choices to Architect for final decision.
- D. Install each component during weather conditions and Project status that will ensure best possible results. Isolate each part of completed construction from incompatible material as necessary to prevent deterioration.
- E. Coordinate temporary enclosures with required inspections and tests, to reduce necessity of uncovering completed construction for that purpose.
- F. Mounting Heights: Where mounting heights are not shown, install individual components at standard mounting heights recognized within the industry or local codes for that application. Refer questionable mounting height decisions to Architect for final decision.

PART 2 - PRODUCTS Not Used**PART 3 - EXECUTION Not Used****END OF SECTION**

SECTION 01 7400**CLEANING AND WASTE MANAGEMENT****PART 1 – GENERAL****1.1 SUMMARY**

- A. Includes But Not Limited To:
 - 1. Administrative and procedural requirements for Cleaning and Waste Management as described in Contract Documents.
 - 2. Administrative and procedural requirements for Cleaning, Salvaging, Recycling and Disposing of Construction Waste as described in Contract Documents.

- B. Related Requirements:
 - 1. Section 01 1200: Coordination of responsibilities for waste management.
 - 2. Section 01 6400: Waste removal of Owner furnished products.
 - 3. In addition to standards described in this section, comply with all requirements for cleaning-up as described in various other Sections of these Specifications.

1.2 REFERENCES

- A. Definitions:
 - 1. Asphalt Pavement, Brick, and Concrete (ABC) Rubble: Rubble that contains only weathered (cured) asphalt pavement, clay bricks and attached mortar normally used in construction, or concrete that may contain rebar. The rubble shall not be mixed with, or contaminated by, another waster or debris.
 - 2. Construction Waste: Building and site improvement materials and other solid waste resulting from construction, remodeling, renovation, or repair operations. Construction waste includes packaging.
 - 3. Demolition Waste: Building and site improvement materials resulting from demolition or selective demolition operations.
 - 4. Disposal: Removal off-site of demolition and construction waste and subsequent sale, recycling, reuse, or deposit in landfill or incinerator acceptable to authorities having jurisdiction.
 - 5. Recycle: Recovery of demolition or construction waste for subsequent processing in preparation for reuse.
 - 6. Salvage: Recovery of demolition or construction waste and subsequent sale or reuse in another facility.
 - 7. Salvage and Reuse: Recovery of demolition or construction waste and subsequent incorporation into the Work.

- B. Reference Standards:
 - 1. ASTM International:
 - a. ASTM E1609-01, 'Standard Guide for Development and Implementation of a Pollution Prevention Program.'

1.3 ADMINISTRATIVE REQUIREMENTS

- A. Pre-Installation Conference:
 - 1. Waste Management Conference:
 - a. Schedule conference before start of construction activities on Project.
 - b. In addition to agenda items specified in Section 01 3100, review following:

- c. Review methods and procedures related to waste management including, but not limited to, the following:
 - 1) Review and discuss waste management plan including responsibilities of waste management coordinator.
 - 2) Review requirements for documenting quantities of each type of waste and its disposition.
 - 3) Review and finalize procedures for materials separation and verify availability of containers and bins needed to avoid delays.
 - 4) Review procedures for periodic waste collection and transportation to recycling and disposal facilities.
 - 5) Review waste management requirements for each trade.

1.4 PERFORMANCE REQUIREMENTS

- A. General:
 1. Achieve end-of-Project rates for salvage/recycling of 75 percent by weight of total nonhazardous solid waste generated by the Work.
 2. Practice efficient waste management in the use of materials in the course of the Work.
 3. Use all reasonable means to divert construction and demolition waste from landfills and incinerators.
 4. Facilitate recycling and salvage of materials, including the following:
 - a. Construction Waste:
 - 1) Carpet and pad.
 - 2) Electrical conduit.
 - 3) Gypsum board.
 - 4) Insulation.
 - 5) Lumber.
 - 6) Masonry and CMU.
 - 7) Metals.
 - 8) Packaging: Regardless of salvage/recycle goal indicated in paragraph above, salvage or recycle 100 percent of the following uncontaminated packaging materials:
 - a) Boxes.
 - b) Cardboard.
 - c) Paper.
 - d) Plastic pails.
 - e) Plastic sheet and film.
 - f) Polystyrene packaging.
 - g) Wood crates.
 - 9) Piping.
 - 10) Roofing.
 - 11) Site-clearing waste.
 - 12) Wood sheet materials.
 - 13) Wood trim.

1.5 SUBMITTALS

- A. Action Submittals:
 1. Waste Reduction Progress Reports:
 - a. Submit plan within 10 days of date established for the Notice to Proceed.
- B. Informational Submittals:
 1. Waste Management Progress Reports:
 - a. Waste Reduction Progress Reports: Concurrent with each Application for Payment, submit report. Include the following information:
 - 1) Material category.

- 2) Generation point of waste.
 - 3) Total quantity of waste in **tons (tonnes)**.
 - 4) Quantity of waste salvaged, both estimated and actual in **tons (tonnes)**.
 - 5) Quantity of waste recycled, both estimated and actual in **tons (tonnes)**.
 - 6) Total quantity of waste recovered (salvaged plus recycled) in **tons (tonnes)**.
 - 7) Total quantity of waste recovered (salvaged plus recycled) as a percentage of total waste.
- b. Waste Reduction Calculations: Before request for Substantial Completion, submit calculated end-of-Project rates for salvage, recycling, and disposal as a percentage of total waste generated by the Work.
 - c. Records of Donations:
 - 1) Indicate receipt and acceptance of salvageable waste donated to individuals and organizations.
 - 2) Indicate whether organization is tax exempt.
 - d. Records of Sales:
 - 1) Indicate receipt and acceptance of salvageable waste sold to individuals and organizations.
 - 2) Indicate whether organization is tax exempt.
 - e. Recycling and Processing Facility Records: Indicate receipt and acceptance of recyclable waste by recycling and processing facilities licensed to accept them. Include manifests, weight tickets, receipts, and invoices.
 - f. Landfill and Incinerator Disposal Records: Indicate receipt and acceptance of waste by landfills and incinerator facilities licensed to accept them. Include manifests, weight tickets, receipts, and invoices.
2. Sustainable Design Submittals:
 - a. Sustainable (LEED) letter template for Credit MR 2.1 and 2.2, signed by Contractor, tabulating total waste material, quantities diverted and means by which it is diverted, and statement that requirements for the credit have been met.
 3. Qualification Statements: Waste management coordinator qualification documentation.

1.6 QUALITY ASSURANCE

- A. Regulatory Agency Sustainability Approvals:
 1. Comply with hauling and disposal regulations of authorities having jurisdiction (AHJ).
- B. Qualifications:
 1. Waste Management Coordinator Qualifications:
 - a. Experienced firm, with a record of successful sustainable waste management coordination of Projects with similar requirements.

1.7 WASTE MANAGEMENT PLAN

- A. General:
 1. Develop a waste management plan according to ASTM E1609 and requirements of this Section.
 2. Plan shall consist of waste identification, waste reduction work plan, and cost/revenue analysis.
 3. Indicate quantities by weight or volume, but use same units of measure throughout waste management plan.
- B. Waste Identification:
 1. Indicate anticipated types and quantities of demolition site-clearing and construction waste generated by the Work.
 2. Include estimated quantities and assumptions for estimates.
- C. Waste Reduction Work Plan:

1. List each type of waste and whether it will be salvaged, recycled, or disposed of in landfill or incinerator. Include points of waste generation, total quantity of each type of waste, quantity for each means of recovery, and handling and transportation procedures.
 - a. Disposed Materials:
 - 1) Indicate how and where materials will be disposed of. Include name, address, and telephone number of each landfill and incinerator facility.
 - b. Handling and Transportation Procedures:
 - 1) Include method that will be used for separating recyclable waste including sizes of containers, container labeling, and designated location on Project site where materials separation will be located.
 - c. Recycled Materials:
 - 1) Include list of local receivers and processors and type of recycled materials each will accept. Include names, addresses, and telephone numbers.
 - d. Salvaged Materials for Donation:
 - 1) For materials that will be donated to individuals and organizations, include list of their names, addresses, and telephone numbers.
 - e. Salvaged Materials for Reuse:
 - 1) For materials that will be salvaged and reused in this Project, describe methods for preparing salvaged materials before incorporation into the Work.
 - f. Salvaged Materials for Sale:
 - 1) For materials that will be sold to individuals and organizations, include list of their names, addresses, and telephone numbers.
2. Cost/Revenue Analysis: Indicate total cost of waste disposal as if there was no waste management plan and net additional cost or net savings resulting from implementing waste management plan. Include the following:
 - a. Estimated cost of disposal (cost per unit). Include hauling and tipping fees and cost of collection containers for each type of waste.
 - b. Handling and transportation costs. Include cost of collection containers for each type of waste.
 - c. Net additional cost or net savings from waste management plan.
 - d. Revenue from salvaged materials.
 - e. Revenue from recycled materials.
 - f. Savings in hauling and tipping fees by donating materials.
 - g. Savings in hauling and tipping fees that are avoided.
 - h. Total cost of disposal (with no waste management).
 - i. Total quantity of waste.

PART 2 - PRODUCTS Not Used

PART 3 - EXECUTION

3.1 PLAN IMPLEMENTATION:

- A. General:
 1. Implement approved waste management plan. Provide handling, containers, storage, signage, transportation, and other items as required to implement waste management plan during the entire duration of the Contract:
 - a. Comply with Division 01 Section "Temporary Facilities and Controls" for operation, termination, and removal requirements.
- B. Training:
 1. Train workers, subcontractors, and suppliers on proper waste management procedures, as appropriate for the Work occurring at Project site:

- a. Distribute waste management plan to everyone concerned within five (5) days of submittal return.
 - b. Distribute waste management plan to entities when they first begin work on-site. Review plan procedures and locations established for salvage, recycling, and disposal.
- C. Site Access and Temporary Controls:
- 1. Conduct waste management operations to ensure minimum interference with roads, streets, walks, walkways, and other adjacent occupied and used facilities:
 - a. Designate and label specific areas on Project site necessary for separating materials that are to be salvaged, recycled, reused, donated, and sold.
 - b. Comply with Division 01 Section "Temporary Facilities and Controls" for controlling dust and dirt, environmental protection, and noise control.

3.2 RECYCLING CONSTRUCTION WASTE

- A. General:
- 1. Recycle paper and beverage containers used by on-site workers.
 - 2. Recycling Receivers and Processors: Contractor to determine suitability and merit based on project requirements.
 - 3. Recycling Incentives: Revenues, savings, rebates, tax credits, and other incentives received for recycling waste materials shall accrue to Contractor.
 - 4. Preparation of Waste: Prepare and maintain recyclable waste materials according to recycling or reuse facility requirements. Maintain materials free of dirt, adhesives, solvents, petroleum contamination, and other substances deleterious to the recycling process.
 - 5. Procedures:
 - a. Contractor in coordination with the Architect to determine the option that best suits the project:
 - 1) Option 1 - Source Separated:
 - a) Separate recyclable waste from other waste materials, trash, and debris. Separate recyclable waste by type at Project site to the maximum extent practical according to approved construction waste management plan.
 - b) Provide appropriately marked containers or bins for controlling recyclable waste until they are removed from Project site. Include list of acceptable and unacceptable materials at each container and bin.
 - c) Inspect containers and bins for contamination and remove contaminated materials if found.
 - d) Stockpile processed materials on-site without intermixing with other materials. Place, grade, and shape stockpiles to drain surface water. Cover to prevent windblown dust.
 - e) Stockpile materials away from construction area. Do not store within drip line of remaining trees.
 - f) Store components off the ground and protect from the weather.
 - g) Remove recyclable waste off Owner's property and transport to recycling receiver or processor.
 - 2) Option 2 – Co-mingled:
 - a) All recyclable waste shall be placed in a container un-separated and then separated later at the recycling facility.
- B. Packaging:
- 1. Cardboard and Boxes:
 - a. Break down packaging into flat sheets.
 - b. Bundle and store in a dry location.
 - 2. Polystyrene Packaging: Separate and bag materials.
 - 3. Pallets: As much as possible, require deliveries using pallets to remove pallets from Project site.
 - a. For pallets that remain on-site, break down pallets into component wood pieces and comply with requirements for recycling wood.

4. Crates: Break down crates into component wood pieces and comply with requirements for recycling wood.
- C. Site-Clearing Wastes:
 1. Chip brush, branches, and trees at landfill facility.
- D. Gypsum Board:
 1. Stack large clean pieces on wood pallets or in container and store in a dry location.

3.3 DISPOSAL OF WASTE

- A. General:
 1. Except for items or materials to be salvaged, recycled, or otherwise reused, remove waste materials from Project site and legally dispose of them in a landfill or incinerator acceptable to authorities having jurisdiction.
 - a. Except as otherwise specified, do not allow waste materials that are to be disposed of accumulate on-site.
 - b. Remove and transport debris in a manner that will prevent spillage on adjacent surfaces and areas.
- B. Burning:
 1. Do not burn waste materials.
- C. Disposal:
 1. Transport waste materials off Owner's property and legally dispose of them.
- D. Landfill Receipts:
 1. Submit copy of receipts issued by a landfill facility, licensed to accept hazardous materials, for hazardous waste disposal.

3.4 PROGRESS CLEANING

- A. Comply with regulations of authorities having jurisdiction and safety standards for cleaning.
- B. Keep premises broom clean during progress of the Work.
- C. Keep site and adjoining streets reasonably clean. If necessary, sprinkle rubbish and debris with water to suppress dust.
- D. During handling and installation, protect construction in progress and adjoining materials in place. Apply protective covering where required to ensure protection from soiling, damage, or deterioration until Substantial Completion.
- E. Clean and maintain completed construction as frequently as necessary throughout construction period. Adjust and lubricate operable components to ensure ability to operate without damaging effects.
- F. Supervise construction activities to ensure that no part of construction completed or in progress, is subject to harmful, dangerous, damaging, or otherwise deleterious exposure during construction period.
- G. Before and during application of painting materials, clear area where such work is in progress of debris, rubbish, and building materials that may cause dust. Sweep floors and vacuum as required and take all possible steps to keep area dust free.
- H. Clean exposed surfaces and protect as necessary to avoid damage and deterioration.

- I. Place extra materials of value remaining after completion of associated work have become Owner's property as directed by Owner or Architect.
- J. Construction Waste Management And Disposal:
 - 1. Remove waste materials and rubbish caused by employees, Subcontractors, and contractors under separate contract with Owner and dispose of legally. Remove unsuitable or damaged materials and debris from building and from property.
 - a. Provide adequate waste receptacles and dispose of materials when full.
 - b. Properly store volatile waste and remove daily.
 - c. Do not deposit waste into storm drains, sanitary sewers, streams, or waterways. Do not discharge volatile, harmful, or dangerous materials into drainage systems.
 - 2. Do not burn waste materials or build fires on site. Do not bury debris or excess materials on Owner's property.

3.5 FINAL CLEANING

- A. Immediately before Substantial Completion, thoroughly clean building and area where The Work was performed. Remove all rubbish from under and about building, landscaped areas and parking lot and leave building and Project Site ready for occupancy by Owner.
- B. Comply with individual manufacturer's cleaning instructions.
- C. Clean each surface or unit to condition expected in normal, commercial building cleaning and maintenance program, including but not limited to:
 - 1. Interior Cleaning:
 - a. Clean inside glazing, exercising care not to scratch glass.
 - b. Remove marks, stains, fingerprints and dirt.
 - c. Clean and polish woodwork and finish hardware.
 - d. Remove labels that are not permanent labels.
 - e. Clean plumbing fixtures and tile work. Remove spots, soil or paint.
 - f. Clean surfaces of mechanical and electrical equipment. Remove excess lubrication and other substances. Clean light fixtures and lamps.
 - g. Clean other fixtures and equipment and remove stains, paint, dirt, and dust.
 - h. Remove temporary floor protection and clean floors.
 - 2. Exterior Cleaning:
 - a. Clean outside glazing, exercising care not to scratch glass.
 - b. Remove marks, stains, and dirt from exterior surfaces.
 - c. Clean and polish finish hardware.
 - d. Remove temporary protection systems.
 - e. Clean dirt, mud, and other foreign material from paving, sidewalks, and gutters.
 - f. Clean drop inlets, through-curb drains, and other drainage structures.
 - g. Remove trash, debris, and foreign material from landscaped areas.

END OF SECTION

SECTION 01 7700
CLOSEOUT PROCEDURES

PART 1 - GENERAL

1.1 SUMMARY

- A. Section Includes But is Not Limited To:
 - 1. Administrative and procedural requirements for Closeout Procedures.

1.2 GENERAL

- A. Closeout process consists of three specific project closeout inspections. Contractor shall plan sufficient time in construction schedule to allow for required inspections before expiration of Contract Time.
- B. Contractor shall conduct his own inspections of The Work and shall not request closeout inspections until The Work of the contract is reasonably complete and correction of obvious defects or omissions are complete or imminent.
- C. Date of Substantial Completion shall not occur until completion of construction work, unless agreed to by Architect and included on Certificate of Substantial Completion.

1.3 PRELIMINARY CLOSEOUT REVIEW

- A. When Architect, Owner and Contractor agree that project is ready for closeout, Pre-Substantial Inspection shall be scheduled. Preparation of floor substrate to receive carpeting and any work which could conceivably damage or stain carpet must be completed, as carpet installation will be scheduled immediately following this inspection.
- B. Prior to this inspection, completed test and evaluation reports for HVAC system and font, where one occurs, are to be provided to Project Manager, Architect, and applicable consultants.
- C. Architect and his appropriate consultants, together with Contractor and mechanical, plumbing, fire protection, and electrical sub-contractors shall conduct a space by space and exterior inspection to review materials and workmanship and to demonstrate that systems and equipment are operational.
 - 1. Punch list of items requiring completion and correction will be created.
 - 2. Time frame for completion of punch list items will be established, and date for Substantial Completion Inspection shall be set.

1.4 SUBSTANTIAL COMPLETION INSPECTION

- A. When Architect, Owner and Contractor agree that project is ready for Substantial Completion, an inspection is held. Punch list created at Pre-Substantial Inspection is to be substantially complete.
- B. Prior to this inspection, Contractor shall discontinue or change over and remove temporary facilities from the site, along with construction tools, mock-ups and similar elements.

- C. Architect, Owner and Contractor review completion of punch list items. When Owner and Architect confirm that Contractor has achieved Substantial Completion of The Work, Owner, Architect and Contractor will execute Certificate of Substantial Completion that contains:
1. Date of Substantial Completion.
 2. Punch List Work not yet completed, including seasonal and long lead items.
 3. Amount to be withheld for completion of Punch List Work.
 4. Time period for completion of Punch List Work.
 5. Amount of liquidated damages set forth in Supplementary Conditions to be assessed if Contractor fails to complete Punch List Work within time set forth in Certificate.
- D. Contractor shall present Closeout Submittals to Architect and place tools, spare parts, extra stock, and similar items required by Contract Documents in locations as directed by Facilities Manager.

1.5 FINAL ACCEPTANCE MEETING

- A. When punch list items except for any seasonal items or long lead items which will not prohibit occupancy are completed, Final Acceptance Meeting is held.
- B. Owner, Architect and Contractor execute Owner's Project Closeout - Final Acceptance form, and verify:
1. All seasonal and long lead items not prohibiting occupancy, if any, are identified, with committed to completion date and amount to be withheld until completion.
 2. Owner's maintenance personnel have been instructed on all system operation and maintenance as required by the Contract Documents.
 3. Final cleaning requirements have been completed.
- C. If applicable, once any seasonal and long lead items are completed, Closeout Inspection is held where Owner and Architect verify that The Work has been satisfactorily completed, and Owner, Architect and Contractor execute Closeout portion of the Project Closeout - Final Acceptance form.
- D. When Owner and Architect confirm that The Work is satisfactorily completed, Architect will authorize final payment.

PART 2 - PRODUCTS Not Used

PART 3 - EXECUTION Not Used

END OF SECTION

SECTION 01 7800
CLOSEOUT SUBMITTALS

PART 1 - GENERAL

1.1 SUMMARY

- A. Section Includes But is Not Limited To:
 - 1. Administrative and procedural requirements for Closeout Submittals.

1.2 GENERAL

- A. Workmanship bonds, final certifications, equipment check-out sheets, and similar documents.
- B. Releases enabling Owner unrestricted use of The Work and access to services and utilities. Include occupancy permits, operating certificates, and similar releases.
- C. Project photographs, damage or settlement survey, and similar record information required by Contract Documents.

1.3 OPERATIONS AND MAINTENANCE DATA

- A. Operations And Maintenance Manual(s) that include:
 - 1. Certifications required by Contract Documents.
 - 2. Copies of warranties required by Contract Documents.
 - 3. Copy of complete Project Manual including Addenda, Modifications as defined in General Conditions, and other interpretations issued during construction.
 - a. Mark these documents to show variations in actual Work performed in comparison with text of specifications and Modifications. Show substitutions, selection of options, and similar information, particularly on elements that are concealed or cannot otherwise be readily discerned later by direct observation.
 - b. Note related record drawing information and Product Data.
 - 4. Testing and Inspection Reports required by Contract Documents.

1.4 WARRANTIES

- A. When written guarantees beyond one (1) year after substantial completion are required by Contract Documents, secure such guarantees and warranties properly addressed and signed in favor of Owner. Include these documents in Operations & Maintenance Manual(s) specified above.
- B. Delivery of guarantees and warranties will not relieve Contractor from obligations assumed under other provisions of Contract Documents.

1.5 PROJECT RECORD DOCUMENTS

- A. Do not use record documents for construction purposes. Protect from deterioration and loss in secure, fire-resistive location. Provide access to record documents for Architect's reference during normal working hours.

- B. Maintain clean, undamaged set of Drawings. Mark set to show actual installation where installation varies from the Work as originally shown. Give particular attention to concealed elements that would be difficult to measure and record at a later date.
 - 1. Mark record sets with red erasable pencil. Use other colors to distinguish between variations in separate categories of the Work.
 - 2. Mark new information that is important to Owner, but was not shown on Drawings.
 - 3. Note related Change Order numbers where applicable.

1.6 SPARE PARTS

- A. Provide items that are indicated in individual Sections.

1.7 EXTRA STOCK MATERIALS

- A. Provide items that are indicated in individual Sections.

PART 2 - PRODUCTS Not Used

PART 3 - EXECUTION Not Used

END OF SECTION

END OF DIVISION

**DIVISION 23: HEATING, VENTILATING, AND
AIR-CONDITIONING**

23 0000 HEATING, VENTILATING, AND AIR-CONDITIONING

- 23 0501 COMMON HVAC REQUIREMENTS
- 23 0502 DEMOLITION AND REPAIR
- 23 0553 IDENTIFICATION FOR HVAC PIPING AND EQUIPMENT
- 23 0593 DUCT TESTING, ADJUSTING, & BALANCING
- 23 0713 DUCT INSULATION
- 23 0719 HVAC PIPING INSULATION

23 2000 HVAC PIPING AND PUMPS

- 23 1123 FACILITY NATURAL GAS PIPING

23 2000 HVAC PIPING AND PUMPS

- 23 2300 REFRIGERANT PIPING
- 23 2350 REFRIGERANT PIPE COVER
- 23 2600 CONDENSATE DRAIN PIPING

23 3000 HVAC AIR DISTRIBUTION

- 23 3114 LOW-PRESSURE METAL DUCTWORK
- 23 3300 AIR DUCT ACCESSORIES

23 5000 CENTRAL HEATING EQUIPMENT

- 23 4100 AIR FILTERS
- 23 5417 GAS-FIRED FURNACES
- 23 5135 AIR PIPING

23 6000 CENTRAL COOLING EQUIPMENT

- 23 6213 AIR-COOLED REFRIGERANT CONDENSERS

END OF TABLE OF CONTENTS

SECTION 23 0501**COMMON HVAC REQUIREMENTS****PART 1 - GENERAL****1.1 SUMMARY**

- A. Includes But Not Limited To:
 - 1. Common requirements and procedures for HVAC systems.
 - 2. Responsibility for proper operation of electrically powered equipment furnished under this Division.
 - 3. Interface with Testing And Balancing Agency.
- B. Related Requirements:
 - 1. Division 26: Raceway and conduit, unless specified otherwise, line voltage wiring, outlets, and disconnect switches.
 - 2. Slots and openings through floors, walls, ceilings, and roofs provided under other Divisions in their respective materials.

1.2 SUBMITTALS

- A. Action Submittals:
 - 1. Product Data:
 - a. Manufacturer's catalog data for each manufactured item.
 - 1) Provide section in submittal for each type of item of equipment. Include Manufacturer's catalog data of each manufactured item and enough information to show compliance with Contract Document requirements. Literature shall show capacities and size of equipment used and be marked indicating each specific item with applicable data underlined.
 - 2) Include name, address, and phone number of each supplier.
 - 2. Shop Drawings:
 - a. Schematic control diagrams for each separate fan system, heating system, control panel, etc. Each diagram shall show locations of all control and operational components and devices. Mark correct operating settings for each control device on these diagrams.
 - b. Diagram for electrical control system showing wiring of related electrical control items such as firestats, fuses, interlocks, electrical switches, and relays. Include drawings showing electrical power requirements and connection locations.
 - c. Drawing of each temperature control panel identifying components in panels and their function.
 - d. Other shop drawings required by Division 23 trade Sections.
- B. Informational Submittals:
 - 1. Sustainable Design Submittals:
 - a. See Section 01 8113 for Sustainable Design Requirements for this Project. See individual Specification Sections in Division 23 for Submittals required.
- C. Closeout Submittals:
 - 1. Include following in Operations And Maintenance Manual specified in Section 01 7800:
 - a. Operations and Maintenance Data (Modify and add to requirements of Section 01 7800):

- 1) At beginning of HVAC section of Operations And Maintenance Manual, provide master index showing items included.
 - a) Provide name, address, and phone number of Architect, Architect's Mechanical Engineer, General Contractor, and HVAC, Sheet Metal, Refrigeration, and Temperature Control subcontractors.
 - b) Identify maintenance instructions by using same equipment identification used in Contract Drawings. Maintenance instructions shall include:
 - (1) List of HVAC equipment used indicating name, model, serial number, and nameplate data of each item together with number and name associated with each system item.
 - (2) Manufacturer's maintenance instructions for each piece of HVAC equipment installed in Project. Instructions shall include name of vendor, installation instructions, parts numbers and lists, operation instructions of equipment, and maintenance and lubrication instructions.
 - (3) Summary list of mechanical equipment requiring lubrication showing name of equipment, location, and type and frequency of lubrication.
 - (4) Manual for Honeywell LCBS thermostat published by Honeywell.
 - c) Provide operating instructions to include:
 - (1) General description of each HVAC system.
 - (2) Step by step procedure to follow in putting each piece of HVAC equipment into operation.
 - (3) Provide diagrams for electrical control system showing wiring of items such as smoke detectors, fuses, interlocks, electrical switches, and relays.
- b. Warranty Documentation:
 - 1) Include copies of warranties required in individual Sections of Division 23.
- c. Record Documentation:
 - 1) Manufacturers documentation:
 - a) Copies of approved shop drawings.

1.3 QUALITY ASSURANCE

- A. Regulatory Agency Sustainability Approvals:
 1. Perform work in accordance with applicable provisions of Gas Ordinances applicable to Project. Provide materials and labor necessary to comply with rules, regulations, and ordinances.
 2. In case of differences between building codes, laws, local ordinances, utility company regulations, and Contract Documents, the most stringent shall govern. Notify Architect in writing of such differences before performing work affected by such differences.
 3. Sustainable Design Compliance:
 - a. Submit all Sustainable Design Requirements to comply with Section 01 8113 for information needed by the Design Professional to demonstrate that particular credits have been achieved. In particular, credits that depend on knowing the cost and quantity of certain types of products cannot be achieved without obtaining that information from the Contractor. These include renewable content, locally sourced new products, and reused products. In addition, a form is provided for each installer to certify that they have not used adhesives, sealants, and for suppliers and installers to certify they have not used composite wood with prohibited VOC content.
- B. Identification:
 1. Motor and equipment name plates as well as applicable UL / ULC and AGA / CGA labels shall be in place when Project is turned over to Owner.

1.4 DELIVERY, STORAGE, AND HANDLING

- A. Delivery And Acceptance Requirements:

1. Accept valves on site in shipping containers with labeling in place.
- B. Storage And Handling Requirements:
 1. In addition to requirements specified in Division 01:
 - a. Stored material shall be readily accessible for inspection by Architect until installed.
 - b. Store items subject to moisture damage, such as controls, in dry, heated spaces.
 - c. Provide temporary protective coating on cast iron and steel valves.
 - d. Provide temporary end caps and closures on piping and fittings. Maintain in place until installation.
 2. Protect bearings during installation. Thoroughly grease steel shafts to prevent corrosion.

1.5 WARRANTY

- A. Manufacturer Warranty:
 1. Provide certificates of warranty for each piece of equipment made out in favor of Owner. Clearly record 'start-up' date of each piece of equipment on certificate.
- B. Special Warranty:
 1. Guarantee HVAC systems to be free from noise in operation that may develop from failure to construct system in accordance with Contract Documents.
 2. If HVAC sub-contractor with offices located more than 150 miles (240 km) from Project site is used, provide service / warranty work agreement for warranty period with local HVAC sub-contractor approved by Architect. Include copy of service / warranty agreement in warranty section of Operation And Maintenance Manual.

PART 2 - PRODUCTS

2.1 COMPONENTS

- A. Components shall bear Manufacturer's name and trade name. Equipment and materials of same general type shall be of same make throughout work to provide uniform appearance, operation, and maintenance.
- B. Pipe And Pipe Fittings:
 1. Use domestic made pipe and pipe fittings on Project.
 2. Weld-O-Let and Screw-O-Let fittings are acceptable.
- C. Sleeves:
 1. In Framing: Standard weight galvanized iron pipe, Schedule 40 PVC, or 14 ga (2 mm) galvanized sheet metal two sizes larger than bare pipe or insulation on insulated pipe.
 2. In Concrete And Masonry: Sleeves through outside walls, interior shear walls, and footings shall be schedule 80 black steel pipe with welded plate.
- D. Valves:
 1. Valves of same type shall be of same manufacturer.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Drawings:

1. HVAC Drawings show general arrangement of piping, ductwork, equipment, etc. Follow as closely as actual building construction and work of other trades will permit.
 2. Consider Architectural and Structural Drawings part of this work insofar as these drawings furnish information relating to design and construction of building. These drawings take precedence over HVAC Drawings.
 3. Because of small scale of Drawings, it is not possible to indicate all offsets, fittings, and accessories that may be required. Investigate structural and finish conditions affecting this work and arrange work accordingly, providing such fittings, valves, and accessories required to meet conditions.
- B. Verification Of Conditions:
1. Examine premises to understand conditions that may affect performance of work of this Division before submitting proposals for this work. Examine adjoining work on which mechanical work is dependent for efficiency and report work that requires correction.
 2. No subsequent allowance for time or money will be considered for any consequence related to failure to examine site conditions.
 3. Ensure that items to be furnished fit space available. Make necessary field measurements to ascertain space requirements including those for connections and furnish and install equipment of size and shape so final installation shall suit true intent and meaning of Contract Documents. If approval is received by Addendum or Change Order to use other than originally specified items, be responsible for specified capacities and for ensuring that items to be furnished will fit space available.
 4. Check that slots and openings provided under other Divisions through floors, walls, ceilings, and roofs are properly located. Perform cutting and patching caused by neglecting to coordinate with Divisions providing slots and openings at no additional cost to Owner.

3.2 PREPARATION

- A. Changes Due To Equipment Selection:
1. Where equipment specified or otherwise approved requires different arrangement or connections from that shown in Contract Documents, submit drawings, if requested by Architect, showing proposed installations.
 2. If proposed changes are approved, install equipment to operate properly and in harmony with intent of Contract Documents. Make incidental changes in piping, ductwork, supports, installation, wiring, heaters, panelboards, and as otherwise necessary.
 3. Provide any additional motors, valves, controllers, fittings, and other additional equipment required for proper operation of system resulting from selection of equipment.
 4. Be responsible for the proper location of roughing-in and connections provided under other Divisions.

3.3 INSTALLATION

- A. Interface With Other Work:
1. Furnish sleeves, inserts, supports, and equipment that are to be installed by others in sufficient time to be incorporated into construction as work proceeds. Locate these items and see they are properly installed.
 2. Electrical: Furnish exact location of electrical connections and complete information on motor controls to installer of electrical system.
 3. Testing And Balancing:
 - a. Put HVAC systems into full operation and continue their operation during each working day of testing and balancing.
 - b. Make changes in pulleys, belts, fan speeds, and dampers or add dampers as required for correct balance as recommended by Testing And Balancing Agency and at no additional cost to Owner.

- B. Cut carefully to minimize necessity for repairs to previously installed or existing work. Do not cut beams, columns, or trusses.
- C. Locating Equipment:
1. Arrange pipes, ducts, and equipment to permit ready access to valves, cocks, unions, traps, filters, starters, motors, control components, and to clear openings of doors and access panels.
 2. Adjust locations of pipes, ducts, switches, panels, and equipment to accommodate work to interferences anticipated and encountered.
 3. Install HVAC work to permit removal of equipment and parts of equipment requiring periodic replacement or maintenance without damage to or interference with other parts of equipment or structure.
 4. Determine exact route and location of each pipe and duct before fabrication.
 - a. Right-Of-Way:
 - 1) Lines that pitch shall have right-of-way over those that do not pitch. For example, steam, steam condensate, and drains shall normally have right-of-way.
 - 2) Lines whose elevations cannot be changed shall have right-of-way over lines whose elevations can be changed.
 - b. Offsets, Transitions, and Changes in Direction:
 - 1) Make offsets, transitions, and changes in direction in pipes and ducts as required to maintain proper head room and pitch of sloping lines whether or not indicated on Drawings.
 - 2) Furnish and install all traps, air vents, sanitary vents, and devices as required to effect these offsets, transitions, and changes in direction.
- D. Piping:
1. Furnish and install complete system of piping, valved as indicated or as necessary to completely control entire apparatus.
 - a. Pipe drawings are diagrammatic and indicate general location and connections. Piping may have to be offset, lowered, or raised as required or directed at site. This does not relieve this Division from responsibility for proper erection of systems of piping in every respect.
 - b. Arrange piping to not interfere with removal of other equipment, ducts, or devices, or block access to doors, windows, or access openings.
 - 1) Arrange so as to facilitate removal of tube bundles.
 - 2) Provide accessible flanges or ground joint unions, as applicable for type of piping specified, at connections to equipment and on bypasses.
 - a) Make connections of dissimilar metals with di-electric unions.
 - b) Install valves and unions ahead of traps and strainers. Provide unions on both sides of traps.
 - 3) Do not use reducing bushings, street elbows, bull head tees, close nipples, or running couplings.
 - 4) Install piping systems so they may be easily drained. Provide drain valves at low points and manual air vents at high points in hot water heating and cooling water piping.
 - 5) Install piping to insure noiseless circulation.
 - 6) Place valves and specialties to permit easy operation and access. Valves shall be regulated, packed, and glands adjusted at completion of work before final acceptance.
 - c. Do not install piping in shear walls.
 2. Properly make adequate provisions for expansion, contraction, slope, and anchorage.
 - a. Cut piping accurately for fabrication to measurements established at site. Remove burr and cutting slag from pipes.
 - b. Work piping into place without springing or forcing. Make piping connections to pumps and other equipment without strain at piping connection. Remove bolts in flanged connections or disconnect piping to demonstrate that piping has been so connected, if requested.
 - c. Make changes in direction with proper fittings.
 - d. Expansion of Thermoplastic Pipe:
 - 1) Provide for expansion in every **30 feet (9 meters)** of straight run.
 - 2) Provide **12 inch (300 mm)** offset below roof line in each vent line penetrating roof.

3. Provide sleeves around pipes passing through concrete or masonry floors, walls, partitions, or structural members. Do not place sleeves around soil, waste, vent, or roof drain lines passing through concrete floors on grade. Seal sleeves with specified sealants.
 - a. Sleeves through floors shall extend **1/4 inch (6 mm)** above floor finish in mechanical equipment rooms above basement floor. In other rooms, sleeves shall be flush with floor.
 - b. Sleeves through floors and foundation walls shall be watertight.
 4. Provide spring clamp plates (escutcheons) where pipes run through walls, floors, or ceilings and are exposed in finished locations of building. Plates shall be chrome plated heavy brass of plain pattern and shall be set tight on pipe and to building surface.
 5. Remove dirt, grease, and other foreign matter from each length of piping before installation.
 - a. After each section of piping used for movement of water or steam is installed, flush with clean water, except where specified otherwise.
 - b. Arrange temporary flushing connections for each section of piping and arrange for flushing total piping system.
 - c. Provide temporary cross connections and water supply for flushing and drainage and remove after completion of work.
- E. Penetration Firestops: Install Penetration Firestop System appropriate for penetration at HVAC system penetrations through walls, ceilings, roofs, and top plates of walls.
- F. Sealants:
1. Seal openings through building exterior caused by penetrations of elements of HVAC systems.
 2. Furnish and install acoustical sealant to seal penetrations through acoustically insulated walls and ceilings.

3.4 REPAIR / RESTORATION

- A. Each Section of this Division shall bear expense of cutting, patching, repairing, and replacing of work of other Sections required because of its fault, error, tardiness, or because of damage done by it.
1. Patch and repair walls, floors, ceilings, and roofs with materials of same quality and appearance as adjacent surfaces unless otherwise shown.
 2. Surface finishes shall exactly match existing finishes of same materials.

3.5 FIELD QUALITY CONTROL

- A. Field Tests:
1. Perform tests on HVAC piping systems. Furnish devices required for testing purposes.
- B. Non-Conforming Work:
1. Replace material or workmanship proven defective with sound material at no additional cost to Owner.
 2. Repeat tests on new material, if requested.

3.6 SYSTEM START-UP

- A. Off-Season Start-up:
1. If Substantial Completion inspection occurs during heating season, schedule spring start-up of cooling systems. If inspection occurs during cooling season, schedule autumn start-up for heating systems.
 2. Notify Owner seven days minimum before scheduled start-up.
 3. Time will be allowed to completely service, test, check, and off-season start systems. During allowed time, train Owner's representatives in operation and maintenance of system.

4. At end of off-season start-up, furnish Owner with letter confirming that above work has been satisfactorily completed.
- B. Preparations that are to be completed before start up and operation include, but are not limited to, following:
1. Dry out electric motors and other equipment to develop and properly maintain constant insulation resistance.
 2. Make adjustments to insure that:
 - a. Equipment alignments and clearances are adjusted to allowable tolerances.
 - b. Nuts and bolts and other types of anchors and fasteners are properly and securely fastened.
 - c. Packed, gasketed, and other types of joints are properly made up and are tight and free from leakage.
 - d. Miscellaneous alignments, tightenings, and adjustments are completed so systems are tight and free from leakage and equipment performs as intended.
 3. Motors and accessories are completely operable.
 4. Inspect and test electrical circuitry, connections, and voltages to be properly connected and free from shorts.
 5. Adjust drives for proper alignment and tension.
 6. Make certain filters in equipment for moving air are new and of specified type.
 7. Properly lubricate and run-in bearings in accordance with Manufacturer's directions and recommendations.

3.7 CLEANING

- A. Clean exposed piping, ductwork, and equipment.
- B. No more than one week before Final Inspection, flush out bearings and clean other lubricated surfaces with flushing oil. Provide best quality and grade of lubricant specified by Equipment Manufacturer.
- C. Replace filters in equipment for moving air with new filters of specified type no more than one week before Final Inspection.

3.8 CLOSEOUT ACTIVITIES

- A. Instruction Of Owner:
 1. Instruct building maintenance personnel and Stake Physical Facilities Representative in operation and maintenance of mechanical systems utilizing Operation And Maintenance Manual when so doing.
 - a. Minimum Instruction Periods:
 - 1) HVAC: Four hour.
 - 2) Temperature Control: Two hour.
 - 3) Refrigeration: Two hour.
 - b. Conduct instruction periods after Substantial Completion inspection when systems are properly working and before final payment is made. None of these instructional periods shall overlap another.

3.9 PROTECTION

- A. Protect piping systems from entry of foreign materials by temporary covers, completing sections of the work, and isolating parts of completed system. Cap or plug open ends of pipes and equipment to keep dirt and other foreign materials out of system. Do not use plugs of rags, wool, cotton waste, or similar materials.
- B. Do not operate pieces of equipment used for moving supply air without proper air filters installed properly in system.

- C. After start-up, continue necessary lubrication and be responsible for damage to bearings while equipment is being operated up to Substantial Completion.

END OF SECTION

SECTION 23 0502**DEMOLITION AND REPAIR****PART 1 - GENERAL****1.1 RELATED DOCUMENTS**

- A. Drawings, General Provisions of Contract, including General and Supplementary Conditions and other Division 1 Specification Sections, and Section 23 0501 apply to this Section.

1.2 SUMMARY

- A. Under this section remove obsolete piping and mechanical equipment and relocate, reconnect or replace existing piping affected by demolition or new construction. Remove concealed piping abandoned due to demolition or new construction, or cap piping flush with existing surfaces.

1.3 DRAWINGS AND EXISTING CONDITIONS

- A. All relocations, reconnections and removals are not necessarily indicated on the drawings. As such, the Contractor shall make adequate allowance in his proposal for this work as no extra charges will be allowed for these items.

PART 2 - PRODUCTS – Not Used**PART 3 - EXECUTION****3.1 TEMPORARY CONNECTIONS**

- A. Where existing piping must remain in service to supply occupied areas during construction, provide temporary piping, connections, and equipment to maintain service to such areas. All shall be performed in a neat and safe manner to prevent injury to the building or its occupants.

3.2 DRILLING, CUTTING, PATCHING

- A. All Required drilling, cutting, block-outs and demolition work required for the removal and/or installation of the mechanical system is the responsibility of this Contractor.
- B. No joists, beams, girders, trusses or columns shall be cut by any Contractor without written permission from the Architect.
- C. The patching, repair, and finishing to existing or new surfaces is the responsibility of this Contractor, unless specifically called for under sections of specifications covering these materials.
- D. Disconnect all equipment that is to be removed or relocated. Relocate any existing equipment that obstructs new construction.

3.3 EXISTING PIPING TO REMAIN IN USE

- A. Where affected by demolition or new construction, relocate, replace, extend, or repair piping and equipment to allow continued use of same. Use methods and materials as specified for new construction.

3.4 MATERIALS AND EQUIPMENT REMOVED

- A. All obsolete materials, piping, and equipment shall become the property of the Contractor and be removed from the site promptly.

END OF SECTION

SECTION 23 0553

IDENTIFICATION FOR HVAC PIPING AND EQUIPMENT

PART 1 - GENERAL

1.1 SUMMARY

- A. Includes But Not Limited To:
 - 1. Furnish and install identification of HVAC equipment and piping as described in Contract Documents.

1.2 SUBMITTALS

- A. Informational Submittals:
 - 1. Sustainable Design Submittals:
 - a. Product Data for Credit EQ 4.1:
 - 1) For adhesives, including printed statement of VOC content.

PART 2 - PRODUCTS

2.1 SYSTEMS

- A. General:
 - 1. VOC Content of Field-Applied Interior Paints and Coatings:
 - a. Provide products that comply with the limits for VOC content and the limits for chemical components specified under heading Sections 09 9000 portions of the specifications.
- B. Materials:
 - 1. Labels:
 - a. Equipment Identification:
 - 1) Black formica, with white reveal when engraved.
 - 2) Lettering to be 3/16 inch (5 mm) high minimum.

PART 3 - EXECUTION

3.1 APPLICATION

- A. Labels:
 - 1. Identify following items with specified labels fastened to equipment with screws (unless noted otherwise):
 - a. A/C Condensing units.
 - b. Furnaces

END OF SECTION

SECTION 23 0593**DUCT TESTING, ADJUSTING, AND BALANCING****PART 1 - GENERAL****1.1 SUMMARY**

- A. Includes But Not Limited To:
 - 1. Test, balance, and adjust air duct systems as described in Contract Documents.
- B. Related Sections:
 - 1. Other Sections of Division 23:
 - a. Completing installation and start-up of mechanical systems, and changing sheaves, belts, and dampers as required for correct balance.
 - b. Assisting Balancing Agency in testing and balancing of mechanical system.

1.2 SYSTEM DESCRIPTION

- A. Performance Requirements:
 - 1. Perform testing and balancing in complete accordance with Associated Air Balance Council Standards for Field Measurement & Instructions, Form P1266, Volume I. Record test data on AABC standard forms or facsimile.
 - 2. Noise level shall not exceed PNC 35 in Chapel or Cultural Center when all mechanical equipment is operating.

1.3 SUBMITTALS

- A. Quality Assurance / Control:
 - 1. Four copies of complete test data for evaluation and approval.
 - 2. Test And Balance Report:
 - a. Complete with logs, data, and records as required herein. Print logs, data, and records on white bond paper bound together in report form.
 - b. Certified accurate and complete by Balancing Agency's certified test and balance engineer.
 - c. Contain following general data in format selected by Balancing Agency.
 - 1) Project Number.
 - 2) Project Title.
 - 3) Project Location.
 - 4) Project Architect and Mechanical Engineer.
 - 5) Test and Balance Agency and Certified Engineer.
 - 6) Contractor and mechanical sub-contractor.
 - 7) Dates tests were performed.
 - 8) Certification Document.
 - 9) Report Forms similar to AABC Standard format.
 - d. Report shall include following:
 - 1) Preface suggesting abnormalities and problems encountered.
 - 2) Instrumentation List including type, model, manufacturer, serial number, and calibration dates.
 - 3) System Identification reporting location of zones, supply, return, and exhaust openings.
 - 4) Record following for each piece of air handling equipment:

- a) Manufacturer, model number, and serial number.
 - b) Design and manufacturer rated data.
 - c) Actual CFM.
 - d) Suction and discharge static pressure of each fan.
 - e) Outside-air and return-air total CFM.
 - f) Actual operating current, voltage, and brake horsepower of each fan motor.
 - g) Final RPM of each motor.
 - h) Fan and motor sheave manufacturer, model, size, number of grooves and center distance.
 - i) Belt size and quantity.
 - j) Static-pressure controls final operating set points.
3. Bind approved copy of report in Operations And Maintenance Manual for Division 23.

1.4 QUALITY ASSURANCE

- A. Qualifications:
 1. Work of this Section shall be performed by independent Air Testing And Balance Agency specializing in testing and balancing of heating, ventilating, and cooling systems to balance, adjust, and test air moving equipment, air distribution, and exhaust systems.
 2. Agency shall provide proof of having successfully completed at least five years of specialized experience in air and hydronic system balancing. Work by this Agency shall be done under direct supervision of qualified heating and ventilating engineer employed by Agency.
 3. Agency shall be approved in writing by Architect.
 4. Neither Architect's engineering consultant or anyone performing work on this Project under other Sections of Division 23 shall be permitted to do this work.

1.5 SCHEDULING

- B. Award test and balance subcontract to Agency upon receipt of Notice To Proceed to allow Agency to schedule this work in cooperation with other Sections involved and to comply with completion date.
- C. During construction, Agency shall inspect installation of pipe systems, sheet metal work, temperature controls, and other component parts of mechanical systems. Perform inspections as follows.
 1. One inspection when 60 percent of ductwork is installed.
 2. One inspection when 90 percent of equipment is installed.
- D. Do not begin air testing and balancing until:
 1. After completion of air cooling, heating, and exhaust systems including installation of specialties, devices, and new filters.
 2. Proper function of control system components including electrical interlocks, damper sequences, air and water reset, and fire and freeze stats has been verified.
 3. Automatic temperature controls have been calibrated and set for design operating conditions.
 4. Verification of proper thermostat calibration and setting of control components such as static pressure controllers and other devices that may need set points changed during process of balancing system.

PART 2 - PRODUCTS: Not Used**PART 3 - EXECUTION****3.1 PREPARATION**

- A. Heating, ventilating, and cooling systems and equipment shall be in full operation and continue in operation during each working day of testing and balancing.

3.2 FIELD QUALITY CONTROL

- A. Site Tests:
1. If requested, conduct tests in presence of Architect.
 2. Instruments used by Agency shall be accurately calibrated and maintained in good working order.
 3. Air Testing And Balancing Procedure:
 - a. Perform tests at high and low speeds of multi-speed systems and single speed systems. Perform following testing and balancing functions in accordance with Associated Air Balance Council National Standards:
 - 1) Fan Speeds: Furnaces And Fan Coil Units (with direct drive motors): Set fan speed to lowest possible setting that will achieve design CFM requirements. Adjust down from Contractor setting, if necessary.
 - 2) Current And Voltage: Measure and record motor current and voltage.
 - 3) Pitot-Tube Traverse: Perform pitot-tube traverse of main supply and return ducts to obtain total CFM.
 - 4) Outside Air: Test and adjust system minimum outside air by pitot-tube traverse.
 - 5) Static Pressure: Test and record system static pressures, including suction and discharge static pressure of each fan.
 - 6) Air Temperature: Take wet and dry bulb air temperatures on entering and leaving side of each cooling coil. Dry bulb temperatures shall be taken on entering and leaving side of each heating unit.
 - 7) Main Ducts: Adjust main ducts to within design CFM requirements and traverse for total CFM quantities.
 - 8) Branch Ducts: Adjust branch ducts to within design CFM requirements. Multi-diffuser branch ducts shall have at least one outlet or inlet volume damper completely open.
 - 9) Tolerances: Test and balance each diffuser, grille, and register to within 10 percent of design requirements.
 - 10) Identification: Identify the location and area of each grille, diffuser, and register. Record on air outlet data sheets.
 - 11) Description: Record size, type, and manufacturer of each diffuser, grille, and register on air outlet data sheets.
 - 12) Drafts: Adjust diffusers, grilles, and registers to minimize drafts.
 - b. Permanently mark all outside air, supply air, and return air damper positions after balancing has been completed.
- B. Final Inspection And Adjustments:
1. System shall be balanced and reports submitted to Architect before final inspection.
 2. Balancing Agency shall be represented at final inspection meeting by qualified testing personnel with balancing equipment and two copies of air balancing test report.
 - a. Architect will choose and direct spot balancing of one zone. Differences between the spot balance and test report will be justification for requiring repeat of testing and balancing for entire building. If recheck testing demonstrates measured flow deviation of 10 percent or

- more from recorded information on report, report will be rejected and new inspection and report will be made and resubmitted.
- b. Perform re-balancing in presence of Architect and subject to its approval.
 - c. If re-balancing is required, submit revised air test and balance reports to Architect before Substantial Completion.
 - d. Spot balance and rebalance shall be performed at no additional cost to Owner.
3. Where furnace supplied to job site provides over 5 percent more air than schedule requirements, rooms supplied by that furnace shall have their supply air quantities increased by ratio of actual total air quantity supplied to minimum air quantity required by furnace schedule.

END OF SECTION

SECTION 23 0713**DUCT INSULATION****PART 1 - GENERAL****1.1 SUMMARY**

A. Includes But Not Limited To:

1. Furnish and install thermal wrap duct insulation as described in Contract Documents.

B. Related Requirements:

1. Section 23 3114: 'Low-Pressure Metal Ducts'.
2. Section 23 3300: 'Acoustic Duct Accessories' for duct liner.

PART 2 - PRODUCTS**2.1 MANUFACTURERS**

A. Manufacturer Contact List:

1. Certainteed St Gobain, Valley Forge, PA www.certainteed.com.
2. Johns-Manville, Denver, CO www.jm.com.
3. Knauf Fiber Glass, Shelbyville, IN www.knauffiberglass.com or Toronto, ON (416) 593-4322.
4. Manson Insulation Inc, Brossard, QB www.isolationmanson.com.
5. Owens-Corning, Toledo, OH or Owens-Corning Canada Inc, Willowdale, ON www.owenscorning.com.

2.2 MATERIALS

A. Thermal Wrap Duct Insulation:

1. 1-1/2 inch (38 mm) or 3 inch (76 mm) thick fiberglass with factory-laminated, reinforced aluminum foil scrim kraft facing and density of 0.75 lb / per cu ft (12 kg / per cu m).
2. Thermal Conductivity: 0.27 BTU in/HR SF deg F at 75 deg F (24 deg C) maximum.
3. Type One Acceptable Products:
 - a. Type 75 standard duct insulation by Certainteed St Gobain.
 - b. Microlite FSK by Johns-Manville.
 - c. Duct Wrap FSK by Knauf Fiber Glass.
 - d. Alley Wrap FSK by Manson Insulation Inc.
 - e. FRK by Owens-Corning.
 - f. Equal as approved by Architect before bidding. See Section 01 6200.

PART 3 - EXECUTION**3.1 INSTALLATION**

A. Thermal Wrap Duct Insulation:

1. Install insulation as follows:

- a. Within Building Insulation Envelope:
 - 1) 1-1/2 inches (38 mm) thick on rectangular outside air ducts and combustion air ducts.
 - 2) 1-1/2 inches (38 mm) thick on all round ducts.
 - b. Outside Building Insulation Envelope:
 - 1) 3 inch (76 mm) thick on round supply and return air ducts.
 - 2) 1-1/2 inch (38 mm) thick on rectangular, acoustically lined, supply and return air ducts.
2. Wrap insulation tightly on ductwork with circumferential joints butted and longitudinal joints overlapped minimum 2 inches (50 mm).
- a. Do not compress insulation except in areas of structural interference. Minimum thickness at corners shall be one inch (25 mm) thick.
 - b. Remove insulation from lap before stapling.
 - c. Staple seams at approximately 16 inches (400 mm) on center with outward clenching staples.
 - d. Seal seams with foil vapor barrier tape or vapor barrier mastic. Seal penetrations of facing to provide vapor tight system.
- B. Insulate outside of ceiling diffusers, diffuser drops, and duct silencers same as ductwork.

END OF SECTION

SECTION 23 0719

HVAC PIPING INSULATION

PART 1 - GENERAL

1.1 SUMMARY

- A. Includes But Not Limited To:
 - 1. Furnish and install insulation on above ground refrigerant piping and fittings as described in Contract Documents.
- B. Related Requirements:
 - 1. Section 23 0501: General Mechanical Requirements.

1.2 DELIVERY, STORAGE, AND HANDLING

- A. Storage And Handling Requirements:
 - 1. Keep materials and work dry and free from damage.
 - 2. Replace wet or damaged materials at no additional cost to Owner.

PART 2 - PRODUCTS

2.1 ASSEMBLIES

- A. Manufacturers:
 - 1. Manufacturer Contact List:
 - a. Armacell, Mebane, NC www.armacell.com.
 - b. Childers Products Co, Eastlake, OH www.fosterproducts.com.
 - c. Foster Products Corp, Oakdale, MN www.fosterproducts.com.
 - d. Johns-Manville, Denver, CO www.jm.com.
 - e. Knauf, Shelbyville, IN www.knauffiberglass.com.
 - f. Manson, Brossard, BC, Canada www.isolationmanson.com.
 - g. Nitron Industries, Thousand Oaks, CA www.nitronindustries.com.
 - h. Owens-Corning, Toledo, OH www.owenscorning.com or Owens-Corning Canada Inc, Willowdale, ON (416) 733-1600.
 - i. Ramco, Lawrenceville, NJ www.ramco.com.
 - j. Nomac, Zebulon, NC www.nomaco.com.
 - k. Speedline Corp, Solon, OH www.speedlinepvc.com.
- B. Materials:
 - 1. Refrigeration Piping System:
 - a. Thickness:

Pipe Size, Outside Diameter	Insulation Thickness
One inch and smaller	1/2 inch
1-1/8 inch to 2 inch	3/4

- 1) One inch sheet for fittings as recommended by Manufacturer.

- 2) Category Four Approved Products. See Section 01 6200 for definitions of Categories.
 - a) AP Armaflex 25/50 by Armacell.
 - b) Nitrolite by Nitron Industries. White only for exterior.
 - c) Nomaco K-Flex.
- b. Joint Sealer:
 - 1) Category Four Approved Products. See Section 01 6200 for definitions of Categories.
 - a) Armacell 520 by Armacell.
 - b) Namaco K-Flex R-373.
- c. Insulation Tape:
 - 1) Category Four Approved Products. See Section 01 6200 for definitions of Categories.
 - a) Armaflex AP Insul Tape by Armacell.
 - b) FT182 Tape by Nitron Industries.
 - c) Elastomeric Foamtape by Nomac K-Flex.
- d. Exterior Finish:
 - 1) For application to non-white, exterior insulation.
 - 2) Category Four Approved Products. See Section 01 6200 for definitions of Categories.
 - a) WB Armaflex Finish by Armacell.
 - b) R-374 Protective Coating by Nomaco K-Flex.

PART 3 - EXECUTION

3.1 PREPARATION

- A. Before application of insulating materials, brush clean surfaces to be insulated and make free from rust, scale, grease, dirt, moisture, and any other deleterious materials.
- B. Use drop cloths over equipment and structure to prevent adhesives and other materials spotting the work.

3.2 INSTALLATION

- A. Refrigeration System Piping System:
 1. General:
 - a. Install insulation in snug contact with pipe.
 - 1) Insulate flexible pipe connectors.
 - 2) Insulate thermal expansion valves with insulating tape.
 - 3) Insulate fittings with sheet insulation and as recommended by Manufacturer.
 - b. Slip insulation on tubing before tubing sections and fittings are assembled keeping slitting of insulation to a minimum.
 - c. Do not install insulation on lines through clamp assembly of pipe support. Butt insulation up against sides of clamp assembly.
 - d. Stagger joints on layered insulation. Seal joints in insulation.
 - e. Install insulation exposed outside building so 'slit' joint seams are placed on bottom of pipe.
 - f. Paint exterior exposed, non-white insulation with two coats of specified exterior finish.
 2. System Requirements:
 - a. Condensing Units: Install insulation on above ground refrigerant suction piping and fittings, including thermal bulb, from thermal expansion valve..

3.3 FIELD QUALITY CONTROL

- A. Non-Conforming Work:
 1. Method of installing insulation shall be subject to approval of Architect. Sloppy or unworkmanlike installations are not acceptable.

3.4 CLEANING

- A. Leave premises thoroughly clean and free from insulating debris.

3.5 PROTECTION

- A. Protect insulation wherever leak from valve stem or other source might drip on insulated surface, with aluminum cover or shield rolled up at edges and sufficiently large in area and of shape that dripping will not splash on surrounding insulation.

END OF SECTION

SECTION 23 1123**FACILITY NATURAL-GAS PIPING****PART 1 - GENERAL****1.1 SUMMARY**

A. Includes But Not Limited To:

1. Furnish and install gas piping and fittings within building as described in Contract Documents.

B. Related Requirements:

1. Section 23 0501: 'Common HVAC Requirements'.
2. Section 23 0553: 'Identification for HVAC Piping and Equipment'.

1.2 REFERENCES

A. Reference Standards:

1. American National Standards Institute / CSA Group:
 - a. ANSI LC 4-2012 (2017) / CSA 6.32-2012 (R2016), 'Press-Connect Metallic Fittings for Use in Fuel Gas Distribution Systems'.
2. ASTM International:
 - a. ASTM A53/A53M-12, 'Standard Specification for Pipe, Steel, Black and Hot-Dipped, Zinc-Coated, Welded and Seamless'.
 - b. ASTM A234/A234M-16, 'Standard Specification for Piping Fittings of Wrought Carbon Steel and Alloy Steel for Moderate and High Temperature Service'.
 - c. ASTM D2513-16a, 'Standard Specification for Polyethylene (PE) Gas Pressure Pipe, Tubing, and Fittings'.
3. International Code Council (ICC):
 - a. ICC IFGC-2015: 'International Fuel Gas Code'.

1.3 QUALITY ASSURANCE

A. Regulatory Agency Sustainability Approvals:

1. Conform to requirements of requirements of IFGC International Fuel Gas Code.
2. Viega MegaPressG fittings:
 - a. Conform to requirements of Canadian Standards Association CSA B149.1 and to requirements of IFGC International Fuel Gas Code.

B. Qualifications:

1. Welders:
 - a. Welders shall be certified and bear evidence of certification thirty (30) days before commencing work on project.
 - b. If there is doubt as to proficiency of welder, Owner's Representative may require welder to take another test. This shall be done at no cost to Owner. Certification shall be by Pittsburgh Testing Laboratories or other approved authority.
2. Pipe Installers:
 - a. Polyethylene pipe installers shall be properly trained and certified in procedure for joining polyethylene pipe.

1.4 DELIVERY, STORAGE, AND HANDLING

A. Storage And Handling Requirements:

1. Do not store polyethylene pipe so it is exposed to sunlight.

PART 2 - PRODUCTS

2.1 SYSTEM

A. Manufacturers:

1. Manufacturer Contact List:
 - a. BrassCraft, Novi, MI www.brasscraft.com.
 - b. Cimberio Valve Co Inc, Malvern, PA www.cimberio.com.
 - c. ConBraCo Industries, Inc, Matthews, NC www.conbraco.com or ConBraCo / Honeywell Ltd, Scarborough, ON (416) 293-8111.
 - d. Dormont Manufacturing Company, Export, PA www.dormont.com.
 - e. Jenkins-NH-Canada, Brantford, ON www.jenkins-nh-canada.com.
 - f. Jomar International, Madison Heights, MI www.jomar.com.
 - g. California Valves (formally KOSO) by Pacific Seismic Products Inc, Lancaster, CA, Distributed by Strand Earthquake Consultants www.strandearthquake.net.
 - h. Viega LLC, Broomfield, CO www.viega.com.
 - i. Watts Regulator Co, North Andover, MA www.wattsreg.com or Watts Industries (Canada) Inc, Burlington, ON (888) 208-8927.

B. Materials:

1. Above-Ground Pipe:
 - a. Black carbon steel, butt welded, Schedule 40 pipe meeting requirements of A53/A53M.
2. Above-Ground Pipe Fittings:
 - a. Welded forged steel fittings meeting requirements of ASTM A234/A234M.
 - b. Standard weight malleable iron screwed.
 - c. Viega MegaPressG fittings.
3. Valves:
 - a. 125 psi (862 kPa) bronze body ball valve, UL listed.
 - b. Category Four Approved Products. See Section 01 6200 for definitions of Categories:
 - 1) CIM 102.1 by Cimbrio Valve.
 - 2) Apollo Series 80-100 by ConBraCo.
 - 3) 'Red Cap' R602 by Jenkins NH Canada.
 - 4) Model T-204 by Jomar International.
 - 5) Model B-6000-UL by Watts Regulator.
4. Cocks:
 - a. Gauge Cocks: Conbraco Series 50-56 bronze gauge cock.
5. Flexible Connector:
 - a. Type 304 stainless steel corrugated tube coated for corrosion protection.
 - b. Category Four Approved Products. See Section 01 6200 for definitions of Categories:
 - 1) Dormont Supr-Safe.
 - 2) BrassCraft Procoat.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Steel pipe installed through air plenums, in walls:

1. Pipes 2-1/2 inches (64 mm) and larger shall have welded fittings and joints.

2. Other steel pipe may have screwed or welded fittings.
 3. Viega MegaPressG:
 - a. Install MegaPressG fittings according to Manufacture's recommendations and with Manufacture's recommended tools.
- B. On lines serving gas-fired equipment, install gas cocks adjacent to equipment outside of equipment cabinet and easily accessible.
- C. Install **6 inch (150 mm)** long minimum dirt leg, with pipe cap, on vertical gas drop serving each gas-fired equipment unit.
- D. Use fittings for changes of direction in pipe and for branch runouts.
- E. Visible gas piping inside building shall be painted yellow and labeled.

3.2 FIELD QUALITY CONTROL

- A. Field tests:
1. Subject all portions of gas piping system, in sections or in entirety, to air pressure of **75 psig (0.52 MPa)** and prove airtight for four (4) hours.
 2. Disconnect equipment not suitable for **75 psig (0.52 MPa)** pressure from piping system during test period.

END OF SECTION

SECTION 23 2300
REFRIGERANT PIPING

PART 1 - GENERAL**1.1 SUMMARY**

- A. Includes But Not Limited To:
 - 1. Furnish and install piping and specialties for refrigeration systems as described in Contract Documents.

- B. Related Requirements:
 - 1. Section 23 0501: Common HVAC Requirements.
 - 2. Section 23 0719: Refrigerant Piping Insulation.
 - 3. Section 23 6213: Air-Cooled Refrigerant Condensers.

1.2 REFERENCES

- A. Reference Standards:
 - 1. ASTM International:
 - a. ASTM A36-08, 'Standard Specification for Carbon Structural Steel.'
 - b. ASTM B280-08, 'Standard Specification for Seamless Copper Tube for Air Conditioning and Refrigeration Field Service.'
 - 2. American Welding Society / American National Standards Institute:
 - a. AWS / ANSI A5.8-2004, 'Specification for Brazing and Braze Welding.'

1.3 SUBMITTALS

- A. Action Submittals:
 - 1. Shop Drawings: Show each individual equipment and piping support.

- B. Informational Submittals:
 - 1. Qualification Statements: Technician certificate for use of CFC and HCFC refrigerants.

1.4 QUALITY ASSURANCE

- A. Qualifications:
 - 1. Installer: Refrigerant piping shall be installed by a refrigeration subcontractor licensed by State and by technicians certified in use of CFC and HCFC refrigerants.

PART 2 - PRODUCTS**2.1 COMPONENTS**

- A. Manufacturers:
 - 1. Manufacturer Contact List:
 - a. Airtec, Fall River, MA, www.noventcaps.com.

- b. Cush-A-Clamp by ZSI Manufacturing, Canton, MI www.cushaclamp.com.
- c. Elkhart Products Corp, Elkhart, IN www.elkhartproducts.com.
- d. Emerson Climate Technologies, St Louis, MO www.emersonflowcontrols.com.
- e. Handy & Harman Products Division, Fairfield, CT www.handy-1.com.
- f. Harris Products Group, Cincinnati, OH www.harrisproductsgroup.com.
- g. Henry Valve Co, Melrose Park, IL www.henrytech.com.
- h. Hilti Inc, Tulsa, OK www.hilti.com.
- i. Hydra-Zorb Co, Auburn Hills, MI www.hydra-zorb.com.
- j. Mueller Steam Specialty, St Pauls, NC www.muellersteam.com.
- k. Nibco Inc, Elkhart, IN www.nibco.com.
- l. Packless Industries, Waco, TX www.packless.com.
- m. Parker Corp, Cleveland, OH www.parker.com.
- n. Sporlan Valve Co, Washington, MO www.sporlan.com.
- o. Sherwood Valves, Washington, PA www.sherwoodvalve.com.
- p. Thomas & Betts, Memphis, TN www.superstrut.com.
- q. Unistrut Corp, Wayne, MI www.unistrut.com.
- r. Universal Metal Hose, Chicago, IL www.universalmetalhose.com.
- s. Vibration Mountings & Controls, Bloomingdale, NJ www.vmc-kdc.com.
- t. Virginia KMP Corp, Dallas, TX www.virginiakmp.com.

B. Materials:

1. Refrigerant Piping:
 - a. Meet requirements of ASTM B280, hard drawn straight lengths. Soft copper tubing not permitted.
 - b. Do not use pre-charged refrigerant lines.
2. Refrigerant Fittings:
 - a. Wrought copper with long radius elbows.
 - b. Category Four Approved Manufacturers. See Section 01 6200 for definitions of Categories:
 - 1) Mueller Streamline.
 - 2) Nibco Inc.
 - 3) Elkhart.
3. Connection Material:
 - a. Brazing Rods in accordance with ANSI / AWS A5.8:
 - 1) Copper to Copper Connections:
 - a) Classification BCuP-4 Copper Phosphorus (6 percent silver).
 - b) Classification BCuP-5 Copper Phosphorus (15 percent silver).
 - 2) Copper to Brass or Copper to Steel Connections: Classification BAg-5 Silver (45 percent silver).
 - 3) Do not use rods containing Cadmium.
 - b. Flux:
 - 1) Type Two Acceptable Products:
 - a) Stay-Silv White Brazing Flux by Harris Products Group.
 - b) High quality silver solder flux by Handy & Harmon.
 - c) Equal as approved by Architect before use. See Section 01 6200.
4. Valves:
 - a. Expansion Valves:
 - 1) For pressure type distributors, externally equalized with stainless steel diaphragm, and same refrigerant in thermostatic elements as in system.
 - 2) Size valves to provide full rated capacity of cooling coil served. Coordinate selection with evaporator coil and condensing unit.
 - 3) Category Four Approved Manufacturers. See Section 01 6200 for definitions of Categories:
 - a) Emerson Climate Technologies.
 - b) Henry.
 - c) Mueller.
 - d) Parker.

- e) Sporlan.
- b. Manual Refrigerant Shut-Off Valves:
 - 1) Ball valves designed for refrigeration service and full line size.
 - 2) Valve shall have cap seals.
 - 3) Valves with hand wheels are not acceptable.
 - 4) Provide service valve on each liquid and suction line at compressor.
 - 5) If service valves come as integral part of condensing unit, additional service valves shall not be required.
 - 6) Category Four Approved Manufacturers. See Section 01 6200 for definitions of Categories:
 - a) Henry.
 - b) Mueller.
 - c) Sherwood.
 - d) Virginia.
- 5. Filter-Drier:
 - a. On lines **3/4 inch** (19 mm) outside diameter and larger, filter-drier shall be replaceable core type with Schraeder type valve.
 - b. On lines smaller than **3/4 inch** (19 mm) outside diameter, filter-drier shall be sealed type with brazed end connections.
 - c. Size shall be full line size.
 - d. Category Four Approved Manufacturers. See Section 01 6200 for definitions of Categories:
 - 1) Emerson Climate Technologies.
 - 2) Mueller.
 - 3) Parker.
 - 4) Sporlan.
 - 5) Virginia.
- 6. Sight Glass:
 - a. Combination moisture and liquid indicator with protection cap.
 - b. Sight glass shall be full line size.
 - c. Sight glass connections and sight glass body shall be solid copper or brass, no copper-coated steel sight glasses allowed.
 - d. Category Four Approved Product. See Section 01 6200 for definitions of Categories:
 - 1) HMI by Emerson Climate Technologies.
- 7. Refrigerant Piping Supports:
 - a. Base, Angles, And Uprights: Steel meeting requirements of ASTM A 36.
 - b. Securing Channels:
 - 1) At Free-Standing Pipe Support:
 - a) Class One Quality Standard: P-1000 channels by Unistrut.
 - b) Acceptable Manufacturers: Hilti, Thomas & Betts.
 - c) Equal as approved by Architect before installation. See Section 01 6200.
 - 2) At Wall Support:
 - a) Class One Quality Standard: P-3300 channels by Unistrut.
 - b) Acceptable Manufacturers: Hilti, Thomas & Betts.
 - c) Equal as approved by Architect before installation. See Section 01 6200.
 - 3) At Suspended Support:
 - a) Class One Quality Standard: P-1001 channels by Unistrut.
 - b) Acceptable Manufacturers: Hilti, Thomas & Betts.
 - c) Equal as approved by Architect before installation. See Section 01 6200.
 - 4) Angle Fittings:
 - a) Class One Quality Standard: P-2626 90 degree angle by Unistrut.
 - b) Acceptable Manufacturers: Hilti, Thomas & Betts.
 - c) Equal as approved by Architect before installation. See Section 01 6200.
 - c. Pipe Clamps:
 - 1) Type Two Acceptable Manufacturers:
 - a) Hydra-Zorb.
 - b) ZSI Cush-A-Clamp.

- c) Hilti Cush-A-Clamp.
 - d) Equal as approved by Architect before installation. See Section 01 6200.
8. Locking Refrigerant Cap:
- a. Provide and install on charging valves:
 - 1) Class One
 - 2) Class One Quality Standard: 'No Vent' locking refrigerant cap.
 - 3) Acceptable Manufacturers: Airtec.
 - 4) Equal as approved by Architect before installation. See Section 01 6200.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Refrigerant Lines:
 - 1. Install as high in upper mechanical areas as possible. Do not install underground or in tunnels.
 - 2. Slope suction lines down toward compressor **one inch/10 feet** (25 mm in 3 meters). Locate traps at vertical rises against flow in suction lines.
- B. Connections:
 - 1. Refrigeration system connections shall be copper-to-copper, copper-to-brass, or copper-to-steel type properly cleaned and brazed with specified rods. Use flux only where necessary. No soft solder (tin, lead, antimony) connections will be allowed in system.
 - 2. Braze manual refrigerant shut-off valve, sight glass, and flexible connections.
 - 3. Circulate dry nitrogen through tubes being brazed to eliminate formation of copper oxide during brazing operation.
- C. Specialties:
 - 1. Install valves and specialties in accessible locations. Install refrigeration distributors and suction outlet at same end of coil.
 - 2. Install thermostatic bulb as close to cooling coil as possible. Do not install on vertical lines.
 - 3. Install equalizing line in straight section of suction line, downstream of and reasonably close to thermostatic bulb. Do not install on vertical lines.
- D. Refrigerant Supports:
 - 1. Support Spacing:
 - a. Piping **1-1/4 inch** (32 mm) And Larger: **8 feet** (2.450 m) on center maximum.
 - b. Piping **1-1/8 inch** (28.5 mm) And Smaller: **6 feet** (1.80 m) on center maximum.
 - c. Support each elbow.
 - 2. Isolate pipe from supports and clamps with Hydrozorb or Cush-A-Clamp systems.
 - 3. Run protective cover continuous from condensing units to risers or penetrations at building wall.

3.2 FIELD QUALITY CONTROL

- A. Field Tests:
 - 1. Make evacuation and leak tests in presence of Architect's Engineer after completing refrigeration piping systems. Positive pressure test will not suffice for procedure outlined below.
 - a. Draw vacuum on each entire system with two stage vacuum pump. Draw vacuum to 300 microns using micron vacuum gauge capable of reading from atmosphere to 10 microns. Do not use cooling compressor to evacuate system nor operate it while system is under high vacuum.
 - b. Break vacuum with nitrogen and re-establish vacuum test. Vacuum shall hold for 30 minutes at 300 microns without vacuum pump running.

- c. Conduct tests at **70 deg F** (21 deg C) ambient temperature minimum.
 - d. Do not run systems until above tests have been made and systems started up as specified. Inform Owner's Representative of status of systems at time of final inspection and schedule start-up and testing if prevented by outdoor conditions before this time.
 - e. After testing, fully charge system with refrigerant and conduct test with Halide Leak Detector.
 - f. Recover all refrigerant in accordance with applicable codes. Do not allow any refrigerant to escape to atmosphere.
2. If it is observed that refrigerant lines are being or have been brazed without proper circulation of nitrogen through lines, all refrigerant lines installed up to that point in time shall be removed and replaced at no additional cost to Owner.

END OF SECTION

SECTION 23 2350**REFRIGERANT PIPE COVER****PART 1 - GENERAL****1.1 RELATED DOCUMENTS**

- A. Drawings, General Provisions of Contract, including General and Supplementary Conditions and other Division 1 Specification Sections, and Section 23 0100 apply to this Section.

PART 2 - PRODUCTS**2.1 BASIC COVER**

- A. Basic refrigerant line cover shall be 18 gauge steel, hot-dipped galvanized steel meeting the requirements of ASTM<A361-85.
- B. Pop rivet attachments will not be allowed.
- C. All fastening devices shall be plated screws. Arrange covers so they may be taken apart for service.

2.2 MANUFACTURED OUTER COVER

- A. Refrigerant line covers at exterior walls shall be 24 ga steel, hot-dipped galvanized meeting requirements of ASTM<A361-85, "Specification for Steel Sheet, Zinc-Coated (Galvanized) by Hot-Dip Process for Roofing and Siding", 1.25 oz/sq ft and complete with accessories recommended by Manufacturer for proper installation.
 - 1. Approved Manufacturers –
 - a. AEP / Span, Dallas, TX or San Diego, CA
 - b. Idose Aluminum Products, Allentown, PA
 - c. Berridge Manufacturing Co., Houston, TX
 - d. Copper Sales Inc., Minneapolis, MN
 - e. Engineered Components Inc., Stafford (Houston), TX
 - f. Fashion Inc., Lenaxa, KS
 - g. Alumax Building Specialties, Mesquite, TX
 - h. MM Systems Corp., Tucker, GA
 - i. Merchant & Evans Industries Inc., Burlington, NJ
 - j. Reynolds Metals Company, Richmond VA
- B. Finish:
 - 1. Fluoropolymer Resin-base finish for coil coating components. Thermo cured two coat system consisting of primer and top coat factory applied over properly pretreated metal.
 - 2. Color as selected by Engineer from Manufacturer's standard colors.
 - 3. Approved Manufacturers –
 - a. Equal to Duranar 200 by PPG or Fluropon by Desoto containing 70% minimum Kynar 500 by Pennwalt Corp.

PART 3 - INSTALLATION

- 3.1 Do not use pop rivets. All fastening devices shall be plated screws and arranged so covers may be taken off for service.
- 3.2 Provide access opening for viewing the sight glass on the refrigerant line.

END OF SECTION

SECTION 23 2600
CONDENSATE DRAIN PIPING

PART 1 - GENERAL

1.1 SUMMARY

A. Includes But Not Limited To:

1. Coordinate installation of condensate drain piping with Section 22 0501 as described in Contract Documents.

B. Related Requirements:

1. Section 22 0501: 'Common Plumbing Requirements'.
2. Section 23 0501: 'Common HVAC Requirements'.

1.2 REFERENCES

A. Reference Standards:

1. ASTM International:

PART 2 - PRODUCTS

2.1 SYSTEMS

A. Materials:

1. Condensate Drains:
 - a. Schedule 40 PVC for condensate drains from furnace combustion chambers and furnace cooling coils.
2. Solvent Cement and Adhesive Primer:
 - a. Use PVC solvent cement that has a VOC content of 510 g/L or less if required by local AHJ if required.
 - b. Use adhesive primer that has a VOC content of 550 g/L or less if required by local AHJ if required.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Condensate Drains:

1. Support piping and protect from damage.
2. Do not combine PVC condensate drain piping from furnace combustion chamber with copper condensate drain piping from cooling coil.
3. Condensate piping shall be Schedule 40 PVC.

END OF SECTION

SECTION 23 3114**LOW-PRESSURE METAL DUCTS****PART 1 - GENERAL****1.1 SUMMARY**

A. Includes But Not Limited To:

1. Furnish and install above-grade low-pressure steel ducts and related items as described in Contract Documents.

B. Related Requirements:

1. Section 23 0593: 'Duct Testing, Adjusting, And Balancing' for duct test, balance, and adjust air duct systems services provided by Owner.
2. Section 23 0713: 'Duct Insulation' for thermal Insulation for ducts, plenum chambers, and casings.
3. Section 23 3001: 'Common Duct Requirements'.

1.2 REFERENCES

A. Association Publications:

1. Sheet Metal And Air Conditioning Contractors' National Association / American National Standards Institute:
2. SMACNA, 'HVAC Duct Construction Standards - Metal and Flexible' (4th edition).

B. Reference Standards:

1. ASTM International:
 - a. ASTM A653/A653M-18, 'Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process'.
 - b. ASTM E84-18b, 'Standard Test Method for Surface Burning Characteristics of Building Materials'.
2. Underwriters Laboratories, Inc.:
 - a. UL 723: 'Standard for Safety Test for Surface Burning Characteristics of Building Materials'; (11th Edition - 2018).

1.3 QUALITY ASSURANCE

A. Regulatory Agency Sustainability Approvals:

1. Duct Sealer:
 - a. Meet Class A flame spread rating in accordance with ASTM E84 or UL 723.

1.4 DELIVERY, STORAGE, AND HANDLING

A. Storage and Handling Requirements:

1. Duct Sealer:
 - a. Handle, store, and apply materials in compliance with applicable regulations and material safety data sheets (MSDS).
 - b. Handle to prevent inclusion of foreign matter, damage by water, or breakage.

- c. Store in a cool dry location, but never under **35 deg F (1.7 deg C)** or subjected to sustained temperatures exceeding **110 deg F (43 deg C)** or as per Manufacturer's written recommendations.
- d. Do use sealants that have exceeded shelf life of product.

1.5 FIELD CONDITIONS

A. Ambient Conditions:

1. Duct Sealer:
 - a. Do not apply under **35 deg F (1.7 deg C)** or subjected to sustained temperatures exceeding **110 deg F (43 deg C)** or as per Manufacturer's written recommendations.
 - b. Do not apply when rain or freezing temperatures will occur within seventy two (72) hours.

PART 2 - PRODUCTS

2.1 SYSTEM

A. Materials:

1. Sheet Metal:
 - a. Fabricate ducts, plenum chambers and casings of zinc-coated, lock-forming quality steel sheets meeting requirements A653/A653M, with G 60 coating.
2. Duct Sealer For Interior Ducts:
 - a. Category Four Approved Products. See Section 01 6200 for definitions of Categories:
 - 1) Duct Butter or ButterTak by Cain Manufacturing Co Inc, Pelham, AL
www.cainmfg.com.
 - 2) DP 1010, DP 1030 or DP 1015 by Design Polymeric, Fountain Valley, CA
www.designpoly.com.
 - 3) PROseal, FIBERseal, EVERseal, or EZ-seal by Ductmate Industries, Inc., Charleroi, PA
www.ductmate.com.
 - 4) SAS by Duro Dyne, Bay Shore, NY or Duro Dyne Canada, Lachine, QB
www.durodyne.com.
 - 5) Iron Grip 601 by Hardcast Inc, Wylie, TX www.hardcast.com.
 - 6) MTS100 or MTS 200 by Hercules Mighty Tough, Denver CO,
www.herculesindustries.com.
 - 7) 15-325 by Miracle / Kingco, Div ITW TACC, Rockland, MA www.taccint.com.
 - 8) 44-39 by Mon-Eco Industries Inc, East Brunswick, NJ www.mon-ecoindustries.com.
 - 9) Airseal Zero by Polymer Adhesive Sealant Systems Inc, Weatherford, TX
www.polymeradhesives.com.
 - 10) Airseal #22 Water Base Duct Sealer by Polymer Adhesive Sealant Systems Inc,
Weatherford, TX www.polymeradhesives.com.
3. Duct Sealer For Exterior Ducts:
 - a. Category Four Approved Products. See Section 01 6200 for definitions of Categories:
 - 1) Two Part II Sealing System including RTA-50 liquid adhesive and DT-5300 for **3 inch (76 mm)** and DT 5400 for **4 inch (100 mm)** tape by Hardcast Inc, Wylie, TX
www.carlislehvac.com.

B. Fabrication:

1. General:
 - a. Straight and smooth on inside with joints neatly finished.
 - b. Duct drops to diffusers shall be round, square, or rectangular to accommodate diffuser neck. Drops shall be same gauge as branch duct. Seal joints air tight.
2. Standard Ducts:

- a. General:
 - 1) Ducts shall be large enough to accommodate inside acoustic duct liner. Dimensions shown on Drawings are net clear inside dimensions after duct liner has been installed.

PART 3 - EXECUTION

3.1 PREPARATION

- A. Metal duct surface must be clean and free of moisture, contamination and foreign matter before applying duct sealer for interior and exterior ducts.

3.2 INSTALLATION

- A. Install internal ends of slip joints in direction of flow. Seal transverse and longitudinal joints air tight using specified duct sealer as per Manufacturer's written instructions. Cover horizontal and longitudinal joints on exterior ducts with two layers of specified tape installed with specified adhesive.
- B. Securely anchor ducts and plenums to building structure with specified duct hangers attached with screws. Do not hang more than one duct from a duct hanger. Brace and install ducts so they shall be free of vibration under all conditions of operation.
- C. Ducts shall not bear on top of structural members.
- D. Paint ductwork visible through registers, grilles, and diffusers flat black.
- E. Properly flash where ducts protrude above roof.
- F. Under no conditions will pipes, rods, or wires be allowed to penetrate ducts.

3.3 FIELD QUALITY CONTROL

- A. Field Tests:
 - 1. Air Test and Balance Testing as specified in Section 23 0593: 'Duct Testing, Adjusting, and Balancing'.
- B. Non-Conforming Work:
 - 1. Reseal transverse joint duct leaks and seal longitudinal duct joint leaks discovered during air test and balance procedures at no additional cost to Owner.

END OF SECTION

SECTION 23 3300**AIR DUCT ACCESSORIES****PART 1 - GENERAL****1.1 SUMMARY**

A. Includes But Not Limited To:

1. Furnish and install duct accessories in specified ductwork as described in Contract Documents.
2. Section 23 3001: 'Common Duct Requirements'.

1.2 REFERENCES

A. Reference Standards:

1. ASTM International:
 - a. ASTM A653/A653M-18, 'Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process'.
 - b. ASTM C1071-16, 'Standard Specification for Fibrous Glass Duct Lining Insulation (Thermal and Sound Absorbing Material)'.
 - c. ASTM C1338-14, 'Standard Test Method for Determining Fungi Resistance of Insulation Materials and Facings'.

PART 2 - PRODUCTS**2.1 ACCESSORIES**

A. Manufacturers:

1. Manufacturer Contact List:
 - a. AGM Industries, Brockton, MA www.agmind.com.
 - b. Air Balance Inc, Holland, OH www.airbalance.com.
 - c. Air Filters Inc, Baltimore, MD www.afinc.com.
 - d. Air-Rite Manufacturing, Bountiful, UT (801) 295-2529.
 - e. American Warming & Ventilating, Holland, OH www.american-warming.com.
 - f. Arrow United Industries, Wyalusing, PA www.arrowunited.com.
 - g. Cain Manufacturing Company Inc, Pelham, AL www.cainmfg.com.
 - h. C & S Air Products, Fort Worth, TX www.csairproducts.com.
 - i. CertainTeed Corp, Valley Forge, PA www.certainteed.com.
 - j. Cesco Products, Florence, KY www.cescoproducts.com.
 - k. Daniel Manufacturing, Ogden, UT (801) 622-5924.
 - l. Design Polymerics, Fountain Valley, CA www.designpoly.com.
 - m. Ductmate Industries Inc, East Charleroi, PA www.ductmate.com.
 - n. Duro Dyne, Bay Shore, NY www.durodyne.com.
 - o. Dyn Air Inc. Lachine, QB www.dynair.ca
 - p. Elgen Manufacturing Company, Inc. East Rutherford, NJ www.elgenmfg.com
 - q. Flexmaster USA Inc, Houston, TX www.flexmasterusa.com.
 - r. Greenheck Corp, Schofield, WI www.greenheck.com.
 - s. Gripnail Corp, East Providence, RI www.gripnail.com.
 - t. Hardcast Inc, Wylie, TX www.hardcast.com.

- u. Hercules Industries, Denver, CO, www.herculesindustries.com.
- v. Honeywell Inc, Minneapolis, MN www.honeywell.com.
- w. Industrial Acoustics Co, Bronx, NY www.industrialacoustics.com.
- x. Johns-Manville, Denver, CO www.jm.com.
- y. Kees Inc, Elkhart Lake, WI www.kees.com.
- z. Knauf Fiber Glass, Shelbyville, IN www.knauffiberglass.com.
- aa. Manson Insulation Inc, Brossard, QB www.isolationmanson.com.
- bb. Metco Inc, Salt Lake City, UT (801) 467-1572 www.metcospiral.com.
- cc. Miracle / Kingco, Rockland, MA www.taccint.com.
- dd. Mon-Eco Industries Inc, East Brunswick, NJ www.mon-ecoindustries.com.
- ee. Nailor Industries Inc, Houston, TX www.nailor.com.
- ff. Owens Corning, Toledo, OH www.owenscorning.com.
- gg. Polymer Adhesive Sealant Systems Inc, Irving, TX www.polymeradhesives.com.
- hh. Pottorff Company, Fort Worth, TX www.pottorff.com.
- ii. Ruskin Manufacturing, Kansas City, MO www.ruskin.com.
- jj. Sheet Metal Connectors Inc, Minneapolis, MN www.smconnectors.com.
- kk. Tamco, Stittsville, ON www.tamco.ca.
- ll. Techno Adhesive, Cincinnati, OH www.techoadhesives.com.
- mm. Titus, Richardson, TX (972) 699-1030. www.titus-hvac.com
- nn. McGill AirSeal, Columbus, OH www.mcgillairseal.com.
- oo. United Enertech Corp, Chattanooga, TN www.unitedenertech.com.
- pp. Utemp Inc, Salt Lake City, UT (801) 978-9265.
- qq. Ventfabrics Inc, Chicago, IL www.ventfabrics.com.
- rr. Ward Industries, Grand Rapids MI www.wardind.com.
- ss. Young Regulator Co, Cleveland, OH www.youngregulator.com.

B. Materials:

1. Acoustical Liner System:

a. Duct Liner:

- 1) **One inch (25 mm)** thick, **1-1/2 lb (0.68 kg)** density fiberglass conforming to requirements of ASTM C1071. Liner will not support microbial growth when tested in accordance with ASTM C1338.
- 2) Category Four Approved Products. See Section 01 6200 for definitions of Categories:
 - a) ToughGard by CertainTeed.
 - b) Duct Liner E-M by Knauf Fiber Glass.
 - c) Akousti-Liner by Manson Insulation.
 - d) Quiet R by Owens Corning.
 - e) Linacoustic RC by Johns-Manville.

b. Adhesive:

- 1) Category Four Approved Water-Based Products. See Section 01 6200 for definitions of Categories:
 - a) Cain: Hydrotak.
 - b) Design Polymerics: DP2501 or DP2502 (CMCL-2501).
 - c) Duro Dyne: WSA.
 - d) Elgen: A-410-WB.
 - e) Hardcast: Coil-Tack.
 - f) Hercules: Mighty Tough Adhesives MTA500 or MTA600.
 - g) Miracle / Kingco: PF-101.
 - h) Mon-Eco: 22-67 or 22-76.
 - i) Polymer Adhesive: Glasstack #35.
 - j) Techno Adhesive: 133.
 - k) McGill AirSeal: Uni-tack.
- 2) Category Four Approved Solvent-Based (non-flammable) Products. See Section 01 6200 for definitions of Categories:
 - a) Cain: Safetak.
 - b) Duro Dyne: FPG.

- c) Hardcast: Glas-Grip 648-NFSE.
 - d) Miracle / Kingco: PF-91.
 - e) Mon-Eco: 22-24.
 - f) Polymer Adhesive: Q-Tack.
 - g) Techno Adhesive: 'Non-Flam' 106.
 - 3) Category Four Approved Solvent-Based (flammable) Products. See Section 01 6200 for definitions of Categories:
 - a) Cain: HV200.
 - b) Duro Dyne: MPG.
 - c) Hardcast: Glas-Grip 636-SE.
 - d) Miracle / Kingco: PF-96.
 - e) Mon-Eco: 22-22.
 - f) Polymer Adhesive: R-Tack.
 - g) Techno Adhesive: 'Flammable' 106.
- c. Fasteners:
 - 1) Adhesively secured fasteners not allowed.
 - 2) Category Four Approved Products. See Section 01 6200 for definitions of Categories:
 - a) AGM Industries: 'DynaPoint' Series RP-9 pin.
 - b) Cain.
 - c) Duro Dyne.
 - d) Gripnail: May be used if each nail is installed by 'Grip Nail Air Hammer' or by 'Automatic Fastener Equipment' in accordance with Manufacturer's recommendations.
- 2. Flexible Equipment Connections:
 - a. 30 oz closely woven UL approved glass fabric double coated with neoprene.
 - b. Fire retardant, waterproof, air-tight, resistant to acids and grease, and withstand constant temperatures of **200 deg F (93 deg C)**.
 - c. Category Four Approved Products. See Section 01 6200 for definitions of Categories:
 - 1) Cain: N-100.
 - 2) Duro Dyne: MFN.
 - 3) Dyn Air: CPN with G-90 galvanized off-set seam.
 - 4) Elgen: ZLN / SDN.
 - 5) Ventfabrics: Ventglas.
 - 6) Ductmate: ProFlex.
- 3. Duct Access Doors:
 - a. General:
 - 1) Factory built insulated access door with hinges and sash locks, as necessary. Construction shall be galvanized sheet metal, **24 ga (0.635 mm)** minimum.
 - 2) Fire and smoke damper access doors shall have minimum clear opening of **12 inches (300 mm)** square or larger as shown on Drawings.
 - b. Rectangular Ducts:
 - 1) Category Four Approved Products. See Section 01 6200 for definitions of Categories:
 - a) Air Balance: Fire/Seal FSA 100.
 - b) Air-Rite: Model HAD-2.
 - c) Cesco: HDD.
 - d) Elgen: TAB Type / Hinge and Cam.
 - e) Flexmaster: Spin Door.
 - f) Kees: ADH-D.
 - g) Nailor: 08SH.
 - h) Pottorff: 60-HAD.
 - i) Ruskin: ADH-24.
 - j) United Enertech: L-95.
 - c. Round Ducts:
 - 1) Category Four Approved Products. See Section 01 6200 for definitions of Categories:
 - a) Ductmate: 'Sandwich' Access Door.
 - b) Elgen: Sandwich Access Door.

- c) Kees: ADL-R.
 - d) Nailor: 0809.
 - e) Pottorff: RAD.
 - f) Ruskin: ADR.
 - g) Ward: DSA.
4. Dampers And Damper Accessories:
- a. Locking Quadrant Damper Regulators:
 - 1) Category Four Approved Products. See Section 01 6200 for definitions of Categories:
 - a) Duro Dyne: KS-385.
 - b) Dyn Air: QPS-385.
 - c) Elgen: EQR-4.
 - d) Ventfabrics: Ventline 555.
 - e) Young: No. 1.
 - b. Concealed Ceiling Damper Regulators:
 - 1) Category Four Approved Products. See Section 01 6200 for definitions of Categories:
 - a) Cain.
 - b) Duro Dyne.
 - c) Elgen.
 - d) Metco Inc.
 - e) Ventfabrics: 666 Ventlok.
 - f) Young: 301.
 - c. Volume Dampers:
 - 1) Rectangular Duct:
 - a) Factory-manufactured 16 ga (1.6 mm) galvanized steel, single blade and opposed blade type with 3/8 inch (9.5 mm) axles and end bearings. Blade width 8 inches (200 mm) maximum. Blades shall have 1/8 inch (3 mm) clearance all around.
 - b) Damper shall operate within acoustical duct liner.
 - c) Provide channel spacer equal to thickness of duct liner.
 - d) Dampers above removable ceiling and in Mechanical Rooms shall have locking quadrant on bottom or side of duct. Otherwise, furnish with concealed ceiling damper regulator and cover plate.
 - e) Category Four Approved Products. See Section 01 6200 for definitions of Categories:
 - (1) Air-Rite: Model CD-2.
 - (2) American Warming: VC-2-AA.
 - (3) Arrow: OBDAF-207.
 - (4) C & S: AC40.
 - (5) Cesco: AGO.
 - (6) Daniel: CD-OB.
 - (7) Greenheck: VCD-20.
 - (8) Nailor: 1810 or 1820.
 - (9) Pottorff: CD-42.
 - (10) Ruskin: MD-35.
 - (11) United Enertech: MD-115.
 - (12) Utemp: CD-OB.
 - 2) Round Duct:
 - a) Factory-manufactured 20 ga (1.0 mm) galvanized steel, single blade with 3/8 inch (9.5 mm) axles and end bearings.
 - b) For use in outside air ducts.
 - c) Category Four Approved Products. See Section 01 6200 for definitions of Categories:
 - (1) Air Balance: Model AC-22.
 - (2) Air-Rite: Model CD-8.
 - (3) American Warming: V-22.
 - (4) Arrow: Type-70.
 - (5) C & S: AC21R.

- (6) Cesco: MGG.
 - (7) Nailor: 1890.
 - (8) Pottorff: CD-21R.
 - (9) Ruskin: MDRS-25.
 - (10) United Enertech: RD.
- d. Motorized Outside Air Dampers:
- 1) General:
 - a) Low leakage type. AMCA certified.
 - b) Make provision for damper actuators and actuator linkages to be mounted external of air flow.
 - 2) Rectangular Ducts:
 - a) Damper Blades:
 - (1) Steel or aluminum airfoil type with mechanically locked blade seals, 8 inch (200 mm) blade width maximum measured perpendicular to axis of damper.
 - (2) Jamb seals shall be flexible metal compression type.
 - (3) Opposed or single blade type.
 - b) Category Four Approved Products. See Section 01 6200 for definitions of Categories:
 - (1) Air Balance: AC 526.
 - (2) American Warming: AC526.
 - (3) Arrow: AFD-20.
 - (4) C & S: AC50.
 - (5) Cesco: AGO3.
 - (6) Nailor: 2020.
 - (7) Pottorff: CD-52.
 - (8) Ruskin: CD-60.
 - (9) Tamco: Series 1000.
 - (10) United Enertech: CD-150 or CD-160.
 - 3) Round Ducts:
 - a) Damper Blades:
 - (1) Steel with mechanically locked blade seals.
 - (2) Blade seals shall be neoprene or polyethylene.
 - (3) Single blade type.
 - b) Category Four Approved Products. See Section 01 6200 for definitions of Categories:
 - (1) Air Balance: AC 25.
 - (2) American Warming: VC25.
 - (3) Arrow: Type 70 or 75.
 - (4) C & S: AC25R.
 - (5) Cesco: AGG.
 - (6) Nailor: 1090.
 - (7) Pottorff: CD-25R.
 - (8) Ruskin: CD25.
 - (9) Tamco: Square-to-Round Series 1000.
 - (10) United Enertech: RI.
5. Air Turns:
- a. Single thickness vanes. Double thickness vanes not acceptable.
 - b. 4-1/2 inch (115 mm) wide vane rail. Junior vane rail not acceptable.
6. Branch Tap for Flexible Ductwork:
- a. Factory-manufactured rectangular-to-round 45 degree leading tap fabricated of 24 ga (0.635 mm) zinc-coated lock-forming quality steel sheets meeting requirements of ASTM A653, with G-90 coating.
 - b. One inch wide mounting flange with die formed corner clips, pre-punched mounting holes, and adhesive coated gasket.
 - c. Manual Volume Damper:
 - 1) Single blade, 22 ga (0.79 mm) minimum

- 2) **3/8 inch (9.5 mm)** minimum square rod with brass damper bearings at each end.
- 3) Heavy-duty locking quadrant on **1-1/2 inch (38 mm)** high stand-off mounting bracket attached to side of round duct.
- d. Category Four Approved Products. See Section 01 6200 for definitions of Categories:
 - 1) ST-1HD by Air-Rite:
 - a) Nylon damper bearings approved for Air-Rite.
 - 2) STO by Flexmaster.
 - 3) HET by Sheet Metal Connectors.

C. Fabrication:

1. Duct Liner:
 - a. Install mat finish surface on airstream side. Secure insulation to cleaned sheet metal duct with continuous 100 percent coat of adhesive and with **3/4 inch (19 mm)** long mechanical fasteners **12 inches (300 mm)** on center maximum unless detailed otherwise on Drawings. Pin all duct liner.
 - b. Accurately cut liner and thoroughly coat ends with adhesive. Butt joints tightly. Top and bottom sections of insulation shall overlap sides. If liner is all one piece, folded corners shall be tight against metal. Ends shall butt tightly together.
 - c. Coat longitudinal and transverse edges of liner with adhesive.
2. Air Turns:
 - a. Permanently install vanes arranged to permit air to make abrupt turn without appreciable turbulence, in 90 degree elbows of above ground supply and return ductwork.
 - b. Quiet and free from vibration when system is in operation.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Duct Liner:

1. Furnish and install acoustic lining in following types of rectangular ducts unless noted otherwise on Contract Documents:
 - a. Supply air.
 - b. Return air.
 - c. Mixed air.
 - d. Transfer air.
 - e. Relief air.
 - f. Elbows, fittings, and diffuser drops greater than **12 inches (300 mm)** in length.
2. Do not install acoustic lining in round ducts.

B. Flexible Connections: Install flexible inlet and outlet duct connections to each furnace.

C. Access Doors In Ducts:

1. Install at each manual outside air damper and at each motorized damper. Locate doors within **6 inches (150 mm)** of installed dampers.
2. Install within **6 inches (150 mm)** of fire dampers and in Mechanical Room if possible. Install on side of duct that allows easiest access to damper.

D. Dampers And Damper Accessories:

1. Install concealed ceiling damper regulators.
 - a. Paint cover plates to match ceiling tile.
 - b. Do not install damper regulators for dampers located directly above removable ceilings or in Mechanical Rooms.
2. Provide each take-off with an adjustable volume damper to balance that branch.

- a. Anchor dampers securely to duct.
 - b. Install dampers in main ducts within insulation.
 - c. Dampers in branch ducts shall fit against sheet metal walls, bottom and top of duct, and be securely fastened. Cut duct liner to allow damper to fit against sheet metal.
 - d. Where concealed ceiling damper regulators are installed, provide cover plate.
3. Install motorized dampers.

END OF SECTION

SECTION 23 4100**AIR FILTERS****PART 1 - GENERAL****1.1 SUMMARY**

A. Includes But Not Limited To:

1. Furnish and install filters used in mechanical equipment.

B. Related Requirements:

1. Section 23 3001: 'Common Duct Requirements'.
2. Section 23 5417: 'Gas Fired Furnaces'.

PART 2 - PRODUCTS**2.1 MANUFACTURED UNITS**

A. Furnace Filters: **One inch (25 mm)** thick throw-away type as recommended by Furnace Manufacturer.

PART 3 - EXECUTION**3.1 INSTALLATION**

A. Provide ample access for filter removal.

3.2 FIELD QUALITY CONTROL

A. Inspection: At date of Substantial Completion, air filters shall be new, clean, and approved by Owner's representative.

END OF SECTION

SECTION 23 5417

GAS-FIRED FURNACES

PART 1 - GENERAL

1.1 SUMMARY

A. Includes But Not Limited To:

- 1. Furnish and install horizontal/vertical gas-fired condensing furnaces as described in Contract Documents.

B. Related Sections:

- 1. Section 23 0501: 'Common HVAC Requirements'.
- 2. Section 23 1123: 'Facility Natural Gas Piping'.
- 3. Section 23 2300: 'Refrigerant Piping'.
- 4. Section 23 4100: 'Air Filters'.
- 5. Section 23 5135: 'Air Piping'.
- 6. Section 23 6215: Air Cooled Refrigerant Condensers

1.2 SUBMITTALS

A. Informational Submittals:

- 1. Manufacturer Reports: Equipment check-out sheets.

B. Special Procedure Submittals:

- 1. Installer must register with Manufacturer before submitting Manufacturer Warranty:
 - a. Installer to contact Owner's Representative (FM Group or Project Manager) for following MANDATORY information to be given to Manufacturer before Manufacturer will issue Manufacturer's 'Special LDS Warranty' included with Closing Submittal:
 - 1) This must be given to Manufacturer:
 - a) Name of Owner (name of FM Group) _____
 - b) Mailing Address (FM office address) _____
 - c) Building Property ID (unique 7-digit identifier) _____
 - d) Project site address: _____
 - e) Model Number of each Unit _____
 - f) Serial Number of each Unit _____
 - g) Date of Installation / Startup _____
 - b. Product Data for Prerequisite EQ 1:
 - 1) Documentation indicating that units comply with ANSI/ASHRAE 62.1, Section 5 - 'Systems and Equipment'.
 - c. Product Data for Credit EQ 4.1:
 - 1) For solvent cements and adhesive primers, including printed statement of VOC content.

C. Closeout Submittals:

- 1. Include following in Operations And Maintenance Manual specified in Section 01 7800:
 - a. Warranty Documentation:
 - 1) Final, executed copy of Manufacturer's 'Special LDS Warranty' including required Owner / Manufacturer mandatory information.
 - b. Record Documentation:
 - 1) Manufacturers Documentation:

- a) Equipment checkout sheet: Complete and sign all items for each unit.

1.3 WARRANTY

A. Manufacturer's Warranty:

1. Provide Manufacturer's 'Special LDS Warranty' for the following:
 - a. Provide fifteen (15) year minimum limited warranty of heat exchanger.
 - b. Provide five (5) year limited warranty on parts.

PART 2 - PRODUCTS

2.1 ASSEMBLIES

A. Manufacturers:

1. Manufacturer Contact List:
 - a. Carrier Corporation:
 - 1) Carrier National: Bradley Brunner (270) 282-1241 Bradley.M.Brunner@Carrier.com.
 - 2) Carrier Utah: Bret Adams (Contractors Heating/Cooling Supply) (801) 224-1020 ext. 2527 bret.adams@mc.supply
 - b. Lennox Industries:
 - 1) For pricing and information contact: Lennox Mountain Commercial @ 1-800-972-3283.
 - 2) Lennox National Contact: Jeff Barrett (801) 556-6114 jeff.barrett@lennoxind.com
 - c. York (US Air Conditioning Distributors):
 - 1) Nick Filimoehala (801) 463-5323 n.filimoehala@us-ac.com.

B. Design Criteria:

1. Rated at 92 percent minimum AFUE (Annual Fuel Utilization Efficiency) calculated in accordance with DOE test procedures.

C. Manufactured Units:

1. Furnaces:
 - a. Factory assembled units certified by AGA complete with blower section, furnace section, steel casing, piped, and wired.
 - b. Blower section shall consist of cabinet, blower, and motor.
 - 1) Cabinet shall be of 22 ga (0.8 mm) minimum cold rolled steel and have finish coat of baked-on enamel.
 - 2) Blower shall be Class 1, full DIDW, statically and dynamically balanced.
 - c. Automatic controls shall consist of:
 - 1) Manual gas shut-off valve.
 - 2) Operating automatic gas valve.
 - 3) Solid-state type fan and thermal limit controls.
 - 4) 24-volt transformer.
 - 5) Hot surface ignition system.
 - d. Blower shall be driven by multi-speed direct driven motor.
 - e. Furnace section shall be enclosed in 22 ga (0.8 mm) minimum enameled steel casing lined with foil covered insulation.
 - f. Heat Exchanger: Aluminized steel.
 - g. Gas Burners: Aluminized steel.
 - h. PVC intake of outside air and PVC combustion product exhaust, with sealed combustion, direct vent system.
 - i. Concentric roof termination kit for roof mounting.

- j. Category Four Approved Products. See Section 01 6200 for definitions of Categories:
 - 1) Standard Furnaces:
 - a) Carrier
 - b) Lennox
 - c) York
 - d) Others to be prior approved by engineer prior to bidding
 - 2. Cooling Coil:
 - a. Cooling coil shall consist of heavy gauge steel cabinet with baked-on enamel finish to match furnace:
 - 1) Coil shall have aluminum fins bonded to seamless copper or aluminum tubing.
 - 2) Coil shall be ARI rated. Provide drain pans with connections at one end.
 - 3) Use thermal expansion valve.
 - b. Category Four Approved Products. See Section 01 6200 for definitions of Categories:
 - 1) Vertical:
 - a) Carrier
 - b) Lennox
 - c) York
 - d) Others to be prior approved by engineer prior to bidding

2.2 ACCESSORIES

A. Filter Frame:

- 1. Build filter frame external to furnace as detailed on Contract Drawings.

B. Vibration Isolators:

- 1. Horizontal Installation:
 - a. Neoprene hanger type with load of **75 lbs (34 kg)** maximum.
 - b. Category Four Approved Products. See Section 01 6200 for definitions of Categories:
 - 1) RH by Kinetics Noise Control, Dublin, OH www.kineticsnoise.com.
 - 2) Mason Industries, Hauppauge, NY www.mason-ind.com.
 - 3) RH by Vibration Mounting & Controls, Bloomingdale, NJ www.vmc-kdc.com.
- 2. Vertical Installation: **4 inches (100 mm)** square by **1/2 inch (13 mm)** thick minimum neoprene type vibration isolation pads.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Vibration Isolators:

- 1. Install vibration isolator on each hanger rod supporting horizontal furnace and under each corner of vertical furnace.

3.2 FIELD QUALITY CONTROL

A. Manufacturer Services:

- 1. Furnace installer shall:
 - a. Verify proper gas orifice size.
 - b. Clock gas meter for rated input.
 - c. Verify and set gas pressure at furnace.
 - d. Check and measure temperature rise.
 - e. Check safety controls for proper operation.

- f. Check combustion vent sizes and combustion air sizes.
2. In addition, furnace installer shall start up, check out, and adjust furnaces using equipment check-out sheet provided by Manufacturer. Complete and sign all items on sheet.

END OF SECTION

SECTION 23 5135**AIR PIPING****PART 1 - GENERAL****1.1 SUMMARY**

A. Includes But Not Limited To:

1. Furnish and install heating equipment exhaust piping and combustion air intake piping as described in Contract Documents.

B. Related Requirements:

1. Section 23 0501: 'Common HVAC Requirements'.
2. Section 23 5417: 'Gas-Fired Furnaces'.

1.2 REFERENCES

A. Reference Standards:

1. ASTM International:
 - a. ASTM D1785-12, 'Standard Specification for Poly(Vinyl Chloride) (PVC) Plastic Pipe, Schedules 40, 80, and 120'.
 - b. ASTM D2564-12, 'Standard Specification for Solvent Cements for Poly (Vinyl Chloride) (PVC) Plastic Piping Systems'.
 - c. ASTM D2661-11, 'Standard Specification for Acrylonitrile-Butadiene-Styrene (ABS) Schedule 40 Plastic Drain, Waste, and Vent Pipe and Fittings'.
 - d. ASTM D2665-14, 'Standard Specification for Poly (Vinyl Chloride) (PVC) Plastic Drain, Waste, and Vent Pipe and Fittings'.

PART 2 - PRODUCTS**2.1 ASSEMBLIES**

A. Manufacturers:

1. Manufacturer Contact List:
 - a. Armaflex by Armacell, Mebane, NC www.armaflex.com.
 - b. Nomaco, Youngsville, NC www.nomacokflex.com.

B. Materials:

1. Air Piping: Schedule 40 pipe and fittings meeting requirements of ASTM D1785, ASTM D2661, or ASTM D2665.
2. Solvent Cement and Adhesive Primer:
 - a. Use PVC solvent cement that has a VOC content of 510 g/L or less if required by local AHJ if required.
 - b. Use adhesive primer that has a VOC content of 550 g/L or less if required by local AHJ if required.
 - c. Meet requirements of ASTM F656 for cement primer and ASTM D2564 for pipe cement.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Installation For Condensing Furnaces:

1. Run individual vent and individual combustion intake piping from each furnace to concentric roof termination kit provided by Furnace Manufacturer. Slope lines downward toward furnace.
2. Slope combustion chamber drain downward to funnel drain. Anchor to wall with wall clamps, allowing free movement through clamp for expansion.
3. Use concentric roof termination kit provided by Furnace Manufacturer. Install vent and combustion air intake piping at clearance and distances required by Furnace Manufacturer.
4. Attach factory-supplied neoprene coupling to combustion-air inlet connection and secure with clamp.
5. Ensure that factory-supplied perforated metal disc is installed in flexible coupling, unless its removal is required.
6. York Furnaces: Install air piping on side of furnace in horizontal or vertical installation.

B. Support:

1. Support concentric roof termination kit at ceiling or roof line with 20 ga (0.912 mm) sheet metal straps as detailed on Drawings.
2. Support horizontal and sloping sections of pipe with 1 inch (25 mm) wide 20 ga (1.0058 mm) galvanized steel straps. Anchor securely to structure, not allowing pipe to sway.

END OF SECTION

SECTION 23 6213**AIR-COOLED REFRIGERANT CONDENSERS****PART 1 - GENERAL****1.1 SUMMARY**

- A. Includes But Not Limited To:
 - 1. Furnish and install condensing units as described in contract documents.
- B. Related Sections:
 - 1. Section 23 0501: Common HVAC Requirements.
 - 2. Section 23 2300: Refrigerant Piping System.

1.2 SUBMITTALS

- A. Informational Submittals:
 - 1. Tests and Evaluation Reports:
 - a. Manufacturer Reports: Equipment check-out sheets.
 - 2. Qualification Statements:
 - a. Technician certificate for use of CFC, HFC, and HCFC refrigerants.

1.3 QUALITY ASSURANCE

- A. Regulatory Agency Sustainability Approvals:
 - 1. Each unit shall be UL / ULC labeled.
- B. Qualifications. Section 01 4301 applies, but is not limited to the following:
 - 1. Installer: Refrigerant piping shall be installed by refrigeration contractor licensed by State and by technicians certified in use of CFC and HCFC refrigerants.

1.4 WARRANTY

- A. Manufacturer's Warranty:
 - 1. Provide 10 year limited warranty on compressor and 5 year limited warranty on parts from date of 'start-up'.
 - 2. Record 'start-up' date on warranty certificate for each unit.

PART 2 - PRODUCTS**2.1 ASSEMBLIES**

- A. Manufacturer:
 - 1. Manufacturer Contact List:
 - a. Carrier Corporation: Carrier National: Steven L. Ament 317-240-2938.
steve.l.ament@carrier.utc.com Carrier Utah: Matt Smith 801-224-1020
msmith@mtncom.net.

- b. Lennox Industries: For pricing and information call Lennox National Account @ 1-800-367-6285.
 - c. York International: David E. Carey 405-419-6536 david.e.carey@jci.com.
- B. Performance:
- 1. Capacities: SEER rating as defined by ARI shall be 13.0 or greater.
- C. Manufactured Units:
- 1. Condensing Units:
 - a. General:
 - 1) Units shall be operable down to 0 deg F (minus 18 deg C) outdoor temperature.
 - 2) Use R-410a refrigerant.
 - 3) Only one liquid line, one suction line, and one power connection shall be made to each compressor. Provide charging valves.
 - b. Condenser Coils:
 - 1) Aluminum plate fins mechanically bonded to seamless copper tubes or 'Spine Fin' trade mark system which has aluminum fins epoxy bonded to aluminum tubes or micro-channel.
 - 2) Provide stamped louver coil guard for unit.
 - c. Fans:
 - 1) Direct driven propeller type.
 - 2) Fan motor shall be single or two speed, thermostatically controlled, permanently lubricated, and designed with permanent protection.
 - 3) Motors shall be resiliently mounted.
 - 4) Each fan shall have a safety guard.
 - d. Compressor:
 - 1) Each condenser unit shall have only one compressor.
 - 2) Design with following features:
 - a) Externally mounted brass service valves with charging connections.
 - b) Crankcase heater.
 - c) Resilient rubber mounts.
 - d) Compressor motor-overload protection.
 - e) Single speed.
 - e. Controls:
 - 1) Factory wired and located in separate enclosure.
 - 2) Following three paragraphs may not be factory installed and will therefore have to be field installed.
 - 3) Safety devices:
 - a) High and low pressure cutout.
 - b) Condenser fan motor-overload devices.
 - 4) Anti-cycle timers to prevent units from starting up again for five minutes after any power interruption.
 - 5) Head pressure type low ambient kit.
 - f. Casing:
 - 1) Fully weatherproof for outdoor installation. Finish shall be weather resistant.
 - g. Openings shall be provided for power and refrigerant connections.
 - h. Panels shall be removable for servicing.
 - i. Approved Products:
 - 1) Standard:
 - a) Carrier
 - b) Lennox
 - c) York
 - d) Others to be prior approved by engineer prior to bid

2.2 ACCESSORIES

- A. Vibration Isolators:
 - 1. **4 inches** (100 mm) square by **3/4 inch** (19 mm) thick minimum neoprene type vibration isolation pads.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Set condensing units level on concrete slab on vibration isolation pads located at each corner of unit. This does not apply to condensing units that have a composite non-metal bottom.
- B. Do not use capillary tube and piston type refrigerant metering devices.

3.2 FIELD QUALITY CONTROL

- A. Manufacturer Services:
 - 1. Condensing units shall be started up, checked out, and adjusted by condensing unit installer.
 - 2. Use equipment checkout sheet provided by Manufacturer. Complete and sign all items on sheet.

END OF SECTION

END OF DIVISION 23

DIVISION 26: ELECTRICAL

26 0500 COMMON WORK RESULTS FOR ELECTRICAL

- 26 0501 COMMON ELECTRICAL REQUIREMENTS
- 26 0519 LINE-VOLTAGE ELECTRICAL POWER CONDUCTORS AND CABLES
- 26 0533 RACEWAY AND BOXES FOR ELECTRICAL SYSTEMS

26 2000 LOW-VOLTAGE ELECTRICAL TRANSMISSION

- 26 2417 CIRCUIT BREAKER PANELBOARDS
- 26 2726 WIRING DEVICES
- 26 2816 ENCLOSED SWITCHES AND CIRCUIT BREAKERS

END OF TABLE OF CONTENTS

SECTION 26 0501**COMMON ELECTRICAL REQUIREMENTS****PART 1 - GENERAL****1.1 SUMMARY**

- A. Includes But Not Limited To:
 - 1. General electrical system requirements and procedures.
 - 2. Perform excavating and backfilling work required by work of this Division as described in Contract Documents.
 - 3. Make electrical connections to equipment provided under other Sections.
 - 4. Furnish and install Penetration Firestop Systems at electrical system penetrations as described in Contract Documents.

- B. Products Furnished But Not Installed Under This Section:
 - 1. Anchor bolts and templates for exterior lighting equipment bases.

- C. Related Requirements:
 - 1. Section 07 8400: 'Firestopping' for quality of Penetration Firestop Systems to be used on Project and submittal requirements.

1.2 REFERENCES

- A. Reference Standards:
 - 1. National Fire Protection Association / American National Standards Institute:
 - a. NFPA 70, 'National Electrical Code (NEC)' (2017 or most recent edition adopted by AHJ).
 - 2. National Electrical Manufacturing Association Standards (NEMA):
 - a. NEMA 250-2018, 'Enclosure for Electrical Equipment (1000 Volts Maximum)'.

1.3 SUBMITTALS

- A. Action Submittals:
 - 1. Product Data:
 - a. Provide following information for each item of equipment:
 - 1) Catalog Sheets.
 - 2) Assembly details or dimension drawings.
 - 3) Installation instructions.
 - 4) Manufacturer's name and catalog number.
 - 5) Name of local supplier.
 - b. Furnish such information for following equipment:
 - 1) Section 26 2816: 'Enclosed Switches And Circuit Breakers'.
 - c. Do not purchase equipment before approval of product data.
 - 2. Shop Drawings:
 - a. Submit on Panelboards:
 - b. Indicate precise equipment to be used, including all options specified. Indicate wording and format of nameplates where applicable. Submit in three-ring binder with hard cover.

- B. Informational Submittals:
 - 1. Test And Evaluation Reports:
 - a. Report of site tests, before Substantial Completion.
 - 2. Qualification Statement:

- a. Electrical Subcontractor:
 - 1) Provide Qualification documentation if requested by Architect or Owner.
 - b. Installer:
 - 1) Provide Qualification documentation if requested by Architect or Owner.
- C. Closeout Submittals:
- 1. Include following in Operations And Maintenance Manual specified in Section 01 7800:
 - a. Operations and Maintenance Data:
 - 1) Provide operating and maintenance instructions for each item of equipment submitted under Product Data.
 - b. Record Documentation:
 - 1) Manufacturers documentation:
 - a) Manufacturer's literature.
 - b) Include copy of approved shop drawings.

1.4 QUALITY ASSURANCE

- A. Regulatory Agency Sustainability Approvals:
- 1. NEC and local ordinances and regulations shall govern unless more stringent requirements are specified.
 - 2. Material and equipment provided shall meet standards of NEMA or UL and bear their label wherever standards have been established and label service is available.
 - 3. Material and equipment provided shall meet standards of NEMA or UL, or ULC, CSA, or EEMAC and bear their label wherever standards have been established and label service is available.
- B. Qualifications: Requirements of Section 01 4301 applies, but not limited to following:
- 1. Electrical Subcontractor:
 - a. Company specializing in performing work of this section.
 - 1) Minimum five (5) years experience in electrical installations.
 - 2) Minimum five (5) satisfactorily completed installations in past three (3) years of projects similar in size, scope, and complexity required for this project before bidding.
 - b. Upon request, submit documentation.
 - 2. Installer:
 - a. Licensed for area of Project.
 - b. Designate one (1) individual as project foremen who shall be on site at all times during installation and experienced with installation procedures required for this project.
 - c. Upon request, submit documentation.

PART 2 - PRODUCTS

2.1 SYSTEMS

- A. Performance:
- 1. Design Criteria:
 - a. Materials and equipment provided under following Sections shall be by same Manufacturer:
 - 1) Section 26 2417: Panelboards.
 - 2) Section 26 2816: Enclosed Switches And Circuit Breakers.

PART 3 - EXECUTION

3.1 INSTALLERS

- A. Acceptable Installers:
- 1. Meet Quality Assurance Installer Qualifications as specified in Part 1 of this specification.

3.2 EXAMINATION

- A. Verification Of Conditions:
1. Confirm dimensions, ratings, and specifications of equipment to be installed and coordinate these with site dimensions and with other Sections.

3.3 INSTALLATION

- A. General:
1. Locations of electrical equipment shown on Drawings are approximate only. Field verify actual locations for proper installation.
 2. Coordinate electrical equipment locations and conduit runs with those providing equipment to be served before installation or rough in.
 - a. Notify Architect of conflicts before beginning work.
 - b. Coordinate locations of power and lighting outlets in mechanical rooms and other areas with mechanical equipment, piping, ductwork, cabinets, etc, so they will be readily accessible and functional.
 3. Work related to other trades which is required under this Division, such as cutting and patching, trenching, and backfilling, shall be performed according to standards specified in applicable Sections.
- B. Install Penetration Firestop System appropriate for penetration at electrical system penetrations through walls, ceilings, and top plates of walls.

3.4 FIELD QUALITY CONTROL

- A. Field Tests:
1. Test systems and demonstrate equipment as working and operating properly. Notify Architect before test. Rectify defects at no additional cost to Owner.
 2. Measure current for each phase of each motor under actual final load operation, i.e. after air balance is completed for fan units, etc. Record this information along with full-load nameplate current rating and size of thermal overload unit installed for each motor.

3.5 CLOSEOUT ACTIVITIES

- A. Training:
1. Provide competent instructor for three (3) days to train Owner's maintenance personnel in operation and maintenance of electrical equipment and systems. Factory representatives shall assist this instruction as necessary. Schedule instruction period at time of final inspection.

END OF SECTION

SECTION 26 0519**LINE-VOLTAGE ELECTRICAL POWER CONDUCTORS AND CABLES****PART 1 - GENERAL****1.1 SUMMARY**

- A. Includes But Not Limited To:
 - 1. Quality of conductors used on Project except as excluded below.
- B. Related Requirements:
 - 1. Section 23 0933: 'Electric and Electronic Control System for HVAC' for conductors and cables for temperature control system.
 - 2. Section 26 0501: 'Common Electrical Requirements'.

1.2 REFERENCES

- A. Definitions:
 - 1. Line Voltage: Over 70 Volts.
- B. Reference Standards:
 - 1. National Fire Protection Association:
 - a. NFPA 70, 'National Electric Code (NEC)' (2017 or most recent edition adopted by AHJ including all applicable amendments and supplements).
 - 1) Article 334, "Nonmetallic-Sheathed Cable, Types NM, NMC And NMS'.

PART 2 - PRODUCTS**2.1 SYSTEMS**

- A. Line Voltage Conductors:
 - 1. Copper with AWG sizes as shown:
 - a. Minimum size shall be No. 12 except where specified otherwise.
 - b. Conductor size No. 8 and larger shall be stranded.
 - 2. Insulation:
 - a. Standard Conductor Size No. 10 And Smaller: 600V type THWN or XHHW (75 deg F (24 deg C)).
 - b. Standard Conductor Size No. 8 And Larger: 600V Type THW, THWN, or XHHW (75 deg F (24 deg C)).
 - c. Higher temperature insulation as required by NFPA 70 or local codes.
 - 3. Colors:
 - a. 208Y / 120 V System:
 - 1) Black: Phase A.
 - 2) Red: Phase B.
 - 3) Blue: Phase C.
 - 4) Green: Ground.
 - 5) White: Neutral.
 - b. 480Y / 277 Volt System:
 - 1) Brown: Phase A.
 - 2) Orange: Phase B.
 - 3) Yellow: Phase C.
 - 4) Gray: Neutral.
 - 5) Green: Ground.

- c. Conductors size No. 10 and smaller shall be colored full length. Tagging or other methods for coding of conductors size No. 10 and smaller not allowed.
 - d. For feeder conductors larger than No. 10 at pull boxes, gutters, and panels, use painted or taped band or color tag color-coded as specified above.
- B. Line Voltage Cables:
1. Non-Metallic Sheathed Cable (NM) and Metal Clad Cable (MC) may be used as restricted below:
 - a. Copper conductors.
 - b. Sizes #12 through #8.
 - c. Use only in indoor dry locations where:
 - 1) Not subject to damage.
 - 2) Not in contact with earth.
 - d. Not in concrete.
 - e. Not where exposed or not concealed.
 - f. Not over suspended ceilings.
 - g. As restricted by NFPA 70 Article 334.
 2. Metal Clad Cable (MC) may be used as restricted below:
 - a. Copper conductors.
 - b. Sizes #12 through #8.
 - c. Use only in indoor dry locations where:
 - 1) Not subject to damage.
 - 2) Not in contact with earth.
 - 3) Not in concrete.
- C. Standard Connectors:
1. Conductors No. 8 And Smaller: Steel spring wire connectors.
 2. Conductors Larger Than No. 8: Pressure type terminal lugs.
 3. Connections Outside Building: Watertight steel spring wire connections with waterproof, non-hardening sealant.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. General:
1. Conductors and cables shall be continuous from outlet to outlet.
 2. Do not use direct burial cable.
- B. Line Voltage Conductors:
1. Install conductors in raceway where indicated on Contract Drawings. Run conductors of different voltage systems in separate conduits.
 2. Route circuits at own discretion, however, circuiting shall be as shown in Panel Schedules. Group circuit homeruns to panels as shown on Contract Drawings.
 3. Neutrals:
 - a. On three-phase, 4-wire systems, do not use common neutral for more than three circuits.
 - b. On single-phase, 3-wire systems, do not use common neutral for more than two circuits.
 - c. Run separate neutrals for each circuit where specifically noted on Contract Drawings.
 - d. Where common neutral is run for two or three home run circuits, connect phase conductors to breakers in panel which are attached to separate phase legs:
 - 1) Provide breaker tie so that all circuits that share common neutral are simultaneously disconnected.
 - 2) Neutral conductors shall be of same size as phase conductors unless specifically noted otherwise.
 4. Pulling Conductors:

- a. Do not pull conductors into conduit until raceway system is complete and cabinets and outlet boxes are free of foreign matter and moisture.
 - b. Do not use heavy mechanical means for pulling conductors.
 - c. Use only listed wire pulling lubricants.
- C. Line Voltage Cables:
1. Route circuits at own discretion, however, circuiting and numbering shall be as shown in Panel Schedules.
 2. Support cables using approved staples, cable ties, straps, hangers, or similar fittings, spaced as required.
 3. Where installing in framing, do not bore holes in joists or beams outside center 1/3 of member depth or within **24 inches (600 mm)** of bearing points. Do not bore holes in vertical framing members outside center 1/3 of member width. Holes shall be one inch diameter maximum.
 4. Conceal cables within ceilings and walls of finished areas. Cables may be exposed in unfinished areas but not run on floors of mechanical equipment spaces or in such a way that they obstruct access to, operation of, or servicing of equipment.
 5. Install exposed cables parallel to or at right angles to building structure lines.
 6. Keep cables **6 inches (150 mm)** minimum from hot water pipes.
 7. Do not support cables from mechanical ducts or duct supports without Architect's written approval.
 8. Prohibited procedures:
 - a. Boring holes for installation of cables in vertical truss members.
 - b. Notching of structural members for installation of cables.

END OF SECTION

SECTION 26 0533**RACEWAY AND BOXES FOR ELECTRICAL SYSTEMS****PART 1 - GENERAL****1.1 SUMMARY**

- A. Includes But Not Limited To:
1. Quality of material and installation procedures for raceway, boxes, and fittings used on Project but furnished under other Divisions.
 2. Furnish and install raceway, conduit, and boxes used on Project not specified to be installed under other Divisions.
- B. Related Requirements:
1. See Section 07 8400: 'Firestopping' for raceways penetrating fire rated walls, ceilings, and barriers'.
 2. Section 23 0933: 'Electric and Electronic Control System for HVAC' for concealed raceway and extensions for temperature control system.
 3. Section 26 0501: 'Common Electrical Requirements' for general electrical requirements'.

1.2 REFERENCES

- A. Reference Standards:
1. National Fire Protection Association:
 - a. NFPA 70, 'National Electric Code (NEC)' (2017 or most recent edition adopted by AHJ including all applicable amendments and supplements).

PART 2 - PRODUCTS**2.1 SYSTEM**

- A. Manufacturers:
1. Manufacturer Contact List:
 - a. Cooper B-Line, Highland, IL www.b-line.com.
 - b. Hubbell Incorporated, Milford, CT www.hubbell-wiring.com or Hubbell Canada Inc, Pickering, ON (905) 839-4332.
 - c. Square D, Palatine, IL www.squared.com.
 - d. Thomas & Betts, Memphis, TN www.tnb.com or Thomas & Betts Ltd, Iberville, PQ (450) 347-5318.
 - e. Walker Systems Inc, Williamstown, WV (800) 240-2601 or Walker Systems Inc / Wiremold Canada Inc, Fergus, ON (519) 843-4332.
 - f. Wiremold Co, West Hartford, CT www.wiremold.com.
- B. Materials:
1. Raceway And Conduit:
 - a. **Sizes:**
 - 1) **3/4 inch (19 mm)** for exterior use, unless indicated otherwise.
 - 2) **1/2 inch (13 mm)** for interior use, unless indicated otherwise.
 - b. Types: Usage of each type is restricted as specified below by product.
 - 1) Galvanized rigid steel or galvanized intermediate metal conduit (IMC) is allowed for use in all areas. Where in contact with earth or concrete, wrap buried galvanized rigid steel and galvanized IMC conduit and fittings completely with vinyl tape.

- 2) Galvanized Electrical Metallic Tubing (EMT), Flexible Steel Conduit, and Electrical Non-Metallic Tubing (ENT):
 - a) Allowed for use only in indoor dry locations where it is:
 - (1) Not subject to damage.
 - (2) Not in contact with earth.
 - (3) Not in concrete.
 - b) For metal conduit systems, flexible steel conduit is required for final connections to indoor mechanical equipment.
 - 3) Galvanized Electrical Metallic Tubing (EMT) and Flexible Steel Conduit:
 - a) Allowed for use only in indoor dry locations where it is:
 - (1) Not subject to damage.
 - (2) Not in contact with earth.
 - (3) Not in concrete.
 - b) For metal conduit systems, flexible steel conduit is required for final connections to indoor mechanical equipment.
 - 4) Schedule 40 Polyvinyl Chloride (PVC) Conduit:
 - a) Allowed for use only underground or below concrete with galvanized rigid steel or IMC elbows and risers.
 - 5) Listed, Liquid-Tight Flexible Metal Conduit:
 - a) Use in outdoor final connections to mechanical equipment, length not to exceed **36 inches (900 mm)**.
 - 6) Pre-wired **3/8 Inch (9.5 mm)** Flexible Fixture Whips: Allowed only for connection to recessed lighting fixtures, lengths not to exceed **72 inches (1 800 mm)**.
- c. Prohibited Raceway Materials:
- 1) Aluminum conduit.
 - 2) Armored cable type AC (BX) cable.
2. Raceway And Conduit:
- a. **Sizes:**
- 1) **3/4 inch (19 mm)** for exterior use, unless indicated otherwise.
 - 2) **1/2 inch (13 mm)** for interior use, unless indicated otherwise.
- b. **Types:** Usage of each type is restricted as specified below by product.
- 1) Galvanized rigid steel or galvanized intermediate metal conduit (IMC) is allowed for use in all areas. Where in contact with earth or concrete, wrap buried galvanized rigid steel and galvanized IMC conduit and fittings completely with vinyl tape.
 - 2) Galvanized Electrical Metallic Tubing (EMT), Flexible Steel Conduit, and Metal Clad Cable (MC):
 - a) Allowed for use only in indoor dry locations where it is:
 - (1) Not subject to damage.
 - (2) Not in contact with earth.
 - (3) Not in concrete.
 - b) For metal conduit systems, flexible steel conduit is required for final connections to indoor mechanical equipment.
 - 3) Schedule 40 Polyvinyl Chloride (PVC) Conduit:
 - a) Allowed for use only underground or below concrete with galvanized rigid steel or IMC elbows and risers.
 - 4) Listed, Liquid-Tight Flexible Metal Conduit:
 - a) Use in outdoor final connections to mechanical equipment, length not to exceed **36 inches (900 mm)**.
 - 5) Pre-wired **3/8 Inch (9.5 mm)** Flexible Fixture Whips: Allowed only for connection to recessed lighting fixtures, lengths not to exceed **72 inches (1 800 mm)**.
- c. Prohibited Raceway Materials:
- 1) Aluminum conduit.
 - 2) Armored cable type AC (BX) cable.
3. Raceway And Conduit Fittings:
- a. Rigid Steel Conduit And IMC: Threaded and designed for conduit use.
 - b. EMT:
 - 1) Compression type.

- 2) Steel set screw housing type.
- c. PVC Conduit:
 - 1) PVC type. Use PVC adapters at all boxes.
 - 2) PVC components, (conduit, fittings, cement) shall be from same Manufacturer.
- d. Flexible Steel Conduit: Screw-in type.
- e. Liquid-tight Flexible Metal Conduit: Sealtite type.
- f. Expansion fittings shall be equal to OZ Type AX sized to raceway and including bonding jumper.
- g. Prohibited Fitting Materials:
 - 1) Crimp-on, tap-on, indenter type fittings.
 - 2) Cast set-screw fittings for EMT.
 - 3) Spray (aerosol) PVC cement.
4. Outlet Boxes:
 - a. Galvanized steel of proper size and shape are acceptable for all systems. Where metal boxes are used, provide following:
 - 1) Provide metal supports and other accessories for installation of each box.
 - 2) Equip ceiling and bracket fixture boxes with fixture studs where required.
 - 3) Equip outlets in plastered, paneled, and furred finishes with plaster rings and extensions to bring box flush with finish surface.
 - b. Non-metallic boxes may be used only for control voltage wiring systems.
 - c. Telephone / data outlet boxes shall be single device outlet boxes.
 - d. HVAC Instrumentation And Control:
 - 1) Junction boxes in mechanical equipment areas shall be 4 inches (100 mm) square.
 - 2) Boxes for remote temperature sensor devices shall be recessed single device.
 - 3) Boxes for thermostats shall be 4 inches (100 mm) square with raised single device cover.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Verification Of Conditions:
 1. Confirm dimensions, ratings, and specifications of materials to be installed and coordinate these with site dimensions and with other Sections.

3.2 INSTALLATION

- A. Interface With Other Work:
 1. Coordinate with Divisions 22 and 23 for installation of raceway for control of plumbing and HVAC equipment.
 2. Coordinate with Division 27 for installation of raceway for sound system.
 3. Before rough-in, verify locations of boxes with work of other trades to insure that they are properly located for purpose intended.
 - a. Coordinate location of outlet for water coolers with Division 22.
 - b. Coordinate location of outlets adjacent to or in millwork with Division 06 before rough-in. Refer conflicts to Architect and locate outlets under his direction.
 4. Coordinate installation of floor boxes in carpeted areas with carpet installer to obtain carpet for box covers.
 5. Install pull wires in raceways installed under this Section where conductors or cables are to be installed under other Divisions.
- B. General:
 1. Sound system electrical components furnished by Division 27 and installed under this Section include following items:
 - a. Speaker mounting rings.
 - b. Speaker enclosures.

C. Conduit And Raceway:

1. Conceal raceways within ceilings, walls, and floors, except at Contractor's option, conduit may be exposed on walls or ceilings of mechanical equipment areas and above acoustical panel suspension ceiling systems. Install exposed raceway runs parallel to or at right angles to building structure lines.
2. Seal all raceways penetrating fire rated walls, ceilings and barriers. See Section 07 8400.
3. Keep raceway runs **6 inches (150 mm)** minimum from hot water pipes.
4. Make no more than four quarter bends, 360 degrees total, in any conduit run between outlet and outlet, fitting and fitting, or outlet and fitting.
 - a. Make bends and offsets so conduit is not injured and internal diameter of conduit is not effectively reduced.
 - b. Radius of curve shall be at least minimum indicated by NFPA 70.
5. Cut conduit smooth and square with run and ream to remove rough edges. Cap raceway ends during construction. Clean or replace raceway in which water or foreign matter have accumulated.
6. Install insulated bushings on each end of raceway **1-1/4 inches (32 mm)** in diameter and larger, and on all raceways where cables emerge. Install expansion fittings where raceways cross building expansion joints.
7. Run two spare conduits from each new panelboard to ceiling access area or other acceptable accessible area and cap for future use.
8. Bend PVC conduit by hot box bender and, for PVC **2 inches (50 mm)** in diameter and larger, expanding plugs. Apply PVC adhesive only by brush.
9. Installation In Framing:
 - a. Do not bore holes in joists or beams outside center 1/3 of member depth or within **24 inches (600 mm)** of bearing points. Do not bore holes in vertical framing members outside center 1/3 of member width.
 - b. Holes shall be **one inch (25 mm)** diameter maximum.
10. Underground Raceway And Conduit:
 - a. Bury underground raceway installed outside building **24 inches (600 mm)** deep minimum.
 - b. Bury underground conduit in planting areas **24 inches (600 mm)** deep minimum. It is permissible to install conduit **6 inch (150 mm)** below concrete sidewalks, however, conduit must be buried **24 inches (600 mm)** deep at point of exit from planting areas.
11. Conduit And Raceway Support:
 - a. Securely support raceway with approved straps, clamps, or hangers, spaced as required.
 - b. Do not support from mechanical ducts or duct supports without Architect's written approval. Securely mount raceway supports, boxes, and cabinets in an approved manner by:
 - 1) Expansion shields in concrete or solid masonry.
 - 2) Toggle bolts on hollow masonry units.
 - 3) Wood screws on wood.
 - 4) Metal screws on metal.
12. Prohibited Procedures:
 - a. Use of wooden plugs inserted in concrete or masonry units for mounting raceway, supports, boxes, cabinets, or other equipment.
 - b. Installation of raceway that has been crushed or deformed.
 - c. Use of torches for bending PVC.
 - d. Spray applied PVC cement.
 - e. Boring holes in truss members.
 - f. Notching of structural members.
 - g. Supporting raceway from ceiling system support wires.
 - h. Nail drive straps or tie wire for supporting raceway.

D. Boxes:

1. Boxes shall be accessible and installed with approved cover.
2. Do not locate device boxes that are on opposite sides of framed walls in the same stud space. In other wall construction, do not install boxes back to back.
3. Locate boxes so pipes, ducts, or other items do not obstruct outlets.

4. Install outlets flush with finished surface and level and plumb.
5. Support switch boxes larger than two-gang with side brackets and steel bar hangers in framed walls.
6. At time of substantial completion, install blank plates on uncovered outlet boxes that are for future use.
7. Location:
 - a. Install boxes at door locations on latch side of door, unless explicitly shown otherwise on Contract Drawings. Verify door swings shown on electrical drawings with architectural drawings, and report discrepancies to Architect before rough-in. Distance of box from jamb shall be 6 inches (150 mm) from door jamb.
 - b. Properly center boxes located in walls with respect to doors, panels, furring, trim and consistent with architectural details. Where two or more outlets occur, space them uniformly and in straight lines with each other, if possible.
 - c. Center ceramic tile boxes in tile.

END OF SECTION

SECTION 26 2417**CIRCUIT-BREAKER PANELBOARDS****PART 1 - GENERAL****1.1 SUMMARY**

- A. Includes But Not Limited To:
 - 1. Furnish and install circuit-breaker panelboards as described in Contract Documents.
- B. Related Requirements:
 - 1. Section 26 0501: 'Common Electrical Requirements'.

1.2 REFERENCES

- A. Reference Standards:
 - 1. National Fire Protection Association:
 - a. NFPA 70E: 'Standard for Electrical Safety in the Workplace' (2018 or most recent edition adopted by AHJ).

PART 2 - PRODUCTS**2.1 EQUIPMENT**

- A. Manufacturers:
 - 1. Manufacturer Contact List:
 - a. Cutler-Hammer Inc, Pittsburgh, PA www.eatonelectric.com.
 - b. General Electric Industrial Systems, Charlotte, NC www.geindustrial.com.
 - c. Siemens Energy & Automation, Alphrata, GA www.sea.siemens.com.
 - d. Square D Co, Palatine, IL www.us.squared.com.
- B. Performance:
 - 1. Capacities:
 - a. Panelboard:
 - 1) Minimum integrated equipment short circuit rating of 22,000 amperes for 120 / 208 Volts.
 - 2) Minimum integrated equipment short circuit rating of 50,000 amperes for 277 / 280 Volts.
 - 3) Rated for use as service entrance equipment.
 - b. Lighting And Appliance Panelboards:
 - 1) Minimum integrated equipment short circuit rating of 10,000 amperes for 120 / 208 Volts.
 - 2) Minimum integrated equipment short circuit rating of 14,000 amperes for 277 / 480 Volts.
 - c. Load Centers:
 - 1) 125 Amp main lugs, 120 / 208 Volt, three-phase.
 - 2) Minimum integrated equipment short circuit rating of 10,000 Amps.
- C. Material:
 - 1. Circuit-breaker type.
 - 2. Galvanized steel cabinets
 - 3. Bussing and lugs arranged as required.

4. Multi-pole circuit-breakers shall be common trip.
5. Circuit-breakers shall be molded case thermal magnetic type with inverse time characteristics.
6. Lighting And Appliance Panelboards:
 - a. Plug-on or bolt-on breakers. Multi-pole breakers shall be common trip.
 - b. Factory installed or provided circuit number identification for each breaker and space.
 - c. Cabinets shall be locking type with no exposed latches or screws when door is closed. Key panels alike and provide minimum of three keys.
 - d. Minimum dimensions of 20 inches (500 mm) wide by 5-3/4 inches (146 mm) deep.
 - e. Space designation on Drawings indicates bus hardware and panelboard capacity for future acceptance of one 20 Amp, single-pole circuit-breaker.
 - f. Breakers specified to be shunt trip and shall include shunt trip accessories to remotely trip breaker using separate 120 V power source. Trip coil shall include coil-clearing contact to break coil current when breaker opens.
 - g. Use equipment from same manufacturer as main panelboard.
 - h. Category Four Approved Products. See Section 01 6200 for definitions of Categories:
 - 1) Type PRL1a by Cutler-Hammer.
 - 2) Type AL or AQ by General Electric.
 - 3) Type P1 by Siemens.
 - 4) Type NQOD by Square D.
7. Load Centers:
 - a. Surface-mounted, outdoor NEMA Type 3R enclosure with padlocking provisions. 12-1/2 inches (318 mm) wide by 4-1/2 inch (115 mm) deep minimum.
 - b. HACR type circuit breakers.
 - c. Use equipment from same manufacturer as main panelboard.
 - d. Category Four Approved Products. See Section 01 6200 for definitions of Categories:
 - 1) Type CH by Eaton.
 - 2) Type PowerMark Plus by General Electric.
 - 3) Type PL by Siemens.
 - 4) Type QO by Square D.
8. Labels:
 - a. All Switchboards shall be labeled with Arc-Flash Hazard Information per NFPA 70E 130.5 including:
 - 1) Nominal system voltage.
 - 2) Arc flash boundary.
 - 3) Available incident energy.
 - 4) Working distance.
 - 5) Minimum arc rating of clothing.
 - 6) Level of PPE.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Verification Of Conditions:
 1. Examine wall framing and verify framing for proper spacing for installation of panelboard(s).
 - a. Notify Architect of improper spacing in writing.
- B. Contractor shall be responsible for performing required calculations to determine ARC Flash Hazards and providing all appropriate labeling per NFPA 70E.

3.2 INSTALLATION

- A. Label panelboards, load centers, and each breaker in main panelboard with 1/16 inch (1.6 mm) thick laminated plastic composition material with contrasting color core. Engraved letters shall be 1/4 inch (6 mm) high.

- B. Provide typewritten circuit schedules in lighting and distribution panelboards and load centers to identify panelboard and load served by each branch breaker.
- C. Arrange conductors neatly within panelboards and load centers.
- D. Secure to structure in accordance with requirements of Project seismic design category.

3.3 PROTECTION

- A. Protect panelboards, load centers, and interior components from paint, gypsum board compound, dirt, dust, and other foreign matter during construction.

END OF SECTION

SECTION 26 2726**WIRING DEVICES****PART 1 - GENERAL****1.1 SUMMARY**

- A. Includes But Not Limited To:
 - 1. Furnish and install wiring devices complete with plates as described in Contract Documents.
- B. Related Requirements:
 - 1. Section 26 0501: 'Common Electrical Requirements'.

PART 2 - PRODUCTS**2.1 COMPONENTS**

- A. Manufacturers:
 - 1. Manufacturer Contact List:
 - a. Cooper Wiring Devices, Peachtree City, GA www.cooperwiringdevices.com.
 - b. General Electric Industrial Systems, Charlotte, NC www.geindustrial.com.
 - c. Hubbell Building Automation, Austin, TX www.hubbell-automation.com.
 - d. Hubbell Inc, Milford, CT www.hubbell-wiring.com or Hubbell Canada Inc, Pickering, ON (800) 263-4622 or (905) 839-4332.
 - e. Hunt Control Systems Inc, Fort Collins, CO www.huntdimming.com.
 - f. Intermatic Inc, Spring Grove, IL www.intermatic.com.
 - g. IR-TEC America, Inc., Brea, CA www.irtec.com/en-ira/.
 - h. Leviton Manufacturing Co, Little Neck, NY www.leviton.com or Leviton Manufacturing of Canada Ltd, Pointe-Claire, QB (800) 461-2002 or (514) 954-1840.
 - i. Legrand, West Hartford, CT www.legrand.us.com or Vaughan, ON www.legrand.ca.com.
 - j. Lutron Electronics Co Inc, Coopersburg, PA www.lutron.com.
 - k. Ortronics, New London, CT www.ortronics.com.
 - l. Paragon Electric Co Inc, Carol Stream, IL www.icca.invensys.com/paragon or Paragon Electric, Mississauga, ON (800) 951-5526 or (905) 890-5956.
 - m. Pass & Seymour, Syracuse, NY www.passandseymour.com or Pass & Seymour Canada Inc, Concord, ON (905) 738-9195.
 - n. Philips Lighting Co, Somerset, NJ www.lighting.philips.com/nam or Philips Lighting Canada, Scarborough, ON (416) 292-3000.
 - o. Red Dot div of Thomas & Betts, Memphis, TN www.tnbcom.
 - p. Schneider Electric North America, Palatine, IL www.schneider-electric.com (847) 397-2600.
 - q. Sensorswitch, Wallingford, CT www.sensorswitch.com.
 - r. Siemon Company, Watertown, CT www.siemon.com.
 - s. Square D Co, Palatine, IL www.squared.com.
 - t. Suttle, Hector, MN www.suttleonline.com.
 - u. Tork Inc, Mount Vernon, NY www.tork.com.
 - v. Watt Stopper Inc, Santa Clara, CA www.wattstopper.com.
 - 2. Product Options:
 - a. Faces shall be nylon where available.
 - b. Devices of single type shall be from same Manufacturer.
 - c. Devices are listed as white. Use white devices on light colored walls, brown on dark colored walls, and black on black walls.

- B. Switches:
 - 1. Furnace Disconnect:
 - a. Category Four Approved Products. See Section 01 6200 for definitions of Categories:
 - 1) 20 AMP, single pole:
 - a) Cooper: 2221V.
 - b) Hubbell: HBL1221-I.
 - c) Pass & Seymour: 20AC1-I.
 - d) Leviton: 1221-2I.
- C. Receptacles:
 - 1. Standard Style:
 - a. 15 AMP, specification grade, back and side wired, self grounding, tamper resistant.
 - b. Verified by UL to meet Fed Spec WC-596F.
 - c. Category Four Approved Products. See Section 01 6200 for definitions of Categories:
 - 1) Cooper: TR5262.
 - 2) Hubbell: BR20.
 - 3) Leviton: TBR20.
 - 4) Pass & Seymour: TR20.
 - 2. Ground Fault Circuit Interrupter (GFCI):
 - a. 15 AMP, specification grade.
 - b. Category Four Approved Products. See Section 01 6200 for definitions of Categories:
 - 1) Cooper: GF15W.
 - 2) Hubbell: GF5252WA.
 - 3) Leviton: 8599-W.
 - 4) Pass & Seymour: 1594-W.
- D. Plates:
 - 1. Standard Cover Plates:
 - a. Office / Occupied Areas:
 - 1) Nylon or high impact resistant thermoplastic.
 - 2) Color shall match wiring device.
 - b. All Other: Steel.
 - c. Ganged switches shall have gang plates.
 - d. Category Four Approved Manufacturers. See Section 01 6200 for definitions of Categories:
 - 1) Cooper.
 - 2) Hubbell.
 - 3) Leviton.
 - 4) Pass & Seymour.
 - 2. Weatherproof In-Use Receptacle Covers:
 - a. NEMA 3R rated.
 - b. Cast aluminum.
 - c. Compatible with GFCI receptacles.
 - d. Complete with weather resistant gaskets and stainless steel screws.
 - e. Category Four Approved Products. See Section 01 6200 for definitions of Categories:
 - 1) Hubbell: WP26MH, horizontal; WP26M, vertical.
 - 2) Intermatic: WP1010HMC, horizontal; WP1010MC, vertical.
 - 3) Red Dot: CKMG, horizontal; CKMGV, vertical.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Install devices flush with walls, straight, and solid to box.

END OF SECTION

SECTION 26 2816**ENCLOSED SWITCHES AND CIRCUIT BREAKERS****PART 1 - GENERAL****1.1 SUMMARY**

- A. Includes But Not Limited To:
 - 1. Furnish and install disconnects as described in Contract Documents, except those provided integral with equipment.
- B. Related Requirements:
 - 1. Section 26 0501: 'Common Electrical Requirements'.

PART 2 - PRODUCTS**2.1 ASSEMBLIES**

- A. Manufacturers:
 - 1. Category Four Approved Manufacturers. See Section 01 6200 for definitions of Categories.
 - a. Disconnects: Same as Manufacturer of Project's main panelboard.
 - b. Fuses.
 - 1) Cooper Bussmann, Ellisville, IL www.cooperbussmann.com.
 - 2) Edison Fuse, Ellisville, IL (314) 391-3443.
 - 3) Ferraz Shawmut, Newburyport, MA www.ferrazshawmut.com.
 - 4) Littelfuse Inc, Des Plaines, IL www.littelfuse.com.
- B. Disconnects:
 - 1. Heavy-duty quick-make, quick-break type, non-fused unless indicated otherwise.
 - 2. Provide interlock to prevent opening of door when switch is in ON position.
 - 3. Provide means to lock switch in OFF position with padlock.
 - 4. Disconnects for motor circuits shall be horsepower rated.
 - 5. Disconnects For Furnace Units And Unit Heaters: Provide manual starter with thermal overload relay. Provide overload relay to match motor full load amps.
 - 6. Enclosures:
 - a. Interior: NEMA / CEMA Type 1.
 - b. Exterior: NEMA / CEMA Type 3R.
 - 7. Fuses:
 - a. Fuse fused disconnects with dual-element time delay fuses and equip with rejection type fuse holders.
 - b. Fuses on Project shall be from single manufacturer.

PART 3 - EXECUTION**3.1 INSTALLATION**

- A. Label disconnects to indicate equipment served, such as Condensing Unit CU-1. Use **1/16 inch (1.6 mm)** thick laminated plastic composition material with contrasting color core. Engraved letters shall be **1/4 inch (6 mm)** high. Attach labels with screws.
- B. Install furnace disconnects on furnace at location where it is accessible from front of unit and it does not interfere with unit's operation.

**END OF SECTION
END OF DIVISION**