



ST. TAMMANY PARISH SCHOOL BOARD

BOYET JUNIOR HIGH SCHOOL, GYMNASIUM HVAC REPLACEMENT SLIDELL, LOUISIANA

STPSB PROJECT NO. PO428



DAMMON ENGINEERING, INC.
554 OLD SPANISH TRAIL
SLIDELL, LOUISIANA 70458

December 29 2023

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ADVERTISEMENT FOR BIDS

Separate sealed bids will be received by the St. Tammany Parish School Board at the St. Tammany Parish School Board C.J. Schoen Administrative Complex, Reception Desk, 321 N. Theard St., Covington, LA 70433 for **Boyet Junior High School, Replacement of Gymnasium HVAC Units, STPSB Project No. P0428** on the **23rd** day of **February, 2024** at **2:00 p.m.** (Time shall be established by the PBX clock at the above referenced address), at which time and place bids will be publicly opened and read aloud.

Complete Bidding Documents provided by the Engineer, **Dammon Engineering, Inc., 554 Old Spanish Trail Slidell, LA 70458, 985-649-5832**, may be obtained through City Blueprint & Supply Co. located at 1200 West Causeway Approach, Suite 24, Mandeville, LA 70471, upon payment of a deposit of \$80.00 for each set of documents. Deposits are refundable as provided for by law. Complete Bidding Documents are also available in electronic form. Electronic documents can be downloaded at **no cost** (\$0.00) from City Blue Print at www.cityblueprint.com and are also available at www.centralbidding.com. Printing costs from electronic download of documents are the responsibility of the prospective bidder. **Bid documents should be obtained through City Blueprint or at www.centralbidding.com. Prospective Bidders are cautioned that the failure to obtain Bid Documents from the Engineer as set forth above or notify the Engineer of an intention to Bid could prevent the Prospective Bidder from receiving additional information, updates or addenda that may be issued concerning bidding on this Project.**

All bids must be accompanied by bid security equal to five percent (5%) of the sum of the base bid and all alternates, and must be in the form of a certified check, cashier's check or bid bond, as outlined in the Instructions to Bidders.

The Successful Bidder will be required to furnish a performance and payment bond, each in an amount equal to 100% of the contract amount.

No bid may be withdrawn except as provided for by law.

Bidders must meet the requirements of the State of Louisiana Contractor's Licensing Law, La. R.S. 37:2150.1 through 2164, as amended.

Preference may be given to materials, supplies and provisions produced, manufactured or grown in Louisiana in accordance with law.

The Owner reserves the right, in accordance with law, to reject any and all bids.

A pre-bid conference will be held on the **31st** day of **January, 2024** at **9:30 a.m.** at the project site, **Boyet Junior High School, 59295 Rebel Drive, Slidell, LA 70461**. Bidders are strongly urged to attend and participate in the conference.

Bidders have the option to submit bids electronically in accordance with Louisiana Revised Statute 38:2212 A(1)(f)(i). Please find bid related materials and place electronic bids at www.centralbidding.com.

Visitors on St. Tammany Parish Public School campuses are required to check in at the front office of the school. If there are any questions regarding this project, please contact the St. Tammany Parish Public School System Construction Department at 985-898-3287.

Print Dates: Wednesday, January 17, 2024
 Wednesday, January 24, 2024
 Wednesday, January 31, 2024

SECTION IB - INSTRUCTIONS TO BIDDERS

COMPLETION TIME:

The Bidder shall agree to fully complete the contract within the amount of time shown in the Summary of Work under “Work Sequence”, subject to such extensions as may be granted in accordance with the Contract Documents and acknowledges that this construction time will start on or before the date specified in the written “Notice to Proceed” from the Owner.

LIQUIDATED DAMAGES:

The Bidder shall agree to pay as Liquidated Damages the amount of **Five Hundred Dollars (\$500.00)** for each consecutive calendar day for which the work is not complete, beginning with the first day beyond the completion date stated on the “Notice to Proceed”. Said sum shall in no event be construed to be a penalty; but only as damages fixed and agreed upon in advance.

CONSTRUCTION CLASSIFICATION:

Bids will be accepted from Contractors who are properly licensed for the classification of Mechanical Construction (see La. R.S. 37:2156.2 for classifications).

ST. TAMMANY PARISH SCHOOL BOARD

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SECTION 1

DEFINITIONS

- 1.1 “Alternate Bid” (or Alternate) is an amount stated in the Bid to be added to or deducted from the amount of the Base Bid if the corresponding change in project scope or materials or methods of construction described in the Bidding Documents is accepted by the Owner.
- 1.2 “Base Bid” is the sum stated in the Bid for which the Bidder offers to perform the Work described as the base, to which work may be added or deducted for sums stated in any Alternate Bid.
- 1.3 “Bid” is a complete and properly signed Uniform Public Work Bid Form to do the Work or designated portion thereof for the sums stipulated therein supported by data called for by the Bidding Documents and subject to the requirements of the Contract Documents.
- 1.4 “Bidder” is one who submits a Bid for a prime contract with the Owner for the Work described in the proposed Contract Documents.

SECTION IB - INSTRUCTIONS TO BIDDERS

- 1.5 “Bidding Documents” include but are not limited to:
- 1.5.1 All definitions set forth in the General Conditions of the Contract.
 - 1.5.2 “Addendum” or “Addenda” are written or graphic instruments issued by the Architect prior to the opening of bids which modify or interpret the Bidding Documents by additions, deletions, approvals, clarifications or corrections.
 - 1.5.3 “Contract Documents” include all documents identified in the Agreement between the Successful Bidder and the Owner.
- 1.6 “Owner” is the St. Tammany Parish School Board.
- 1.7 “Sub-bidder” is one who submits a bid to a Bidder for a portion of the Work.
- 1.8 “Successful Bidder” means the lowest qualified responsible and responsive Bidder submitting a Bid and to whom the Owner makes an award.
- 1.9 “Unit Price” is an amount stated in the Bid as a price per unit of measurement for materials or services as described in the Contract Documents.
- 1.10 “Work” consists of the duties and obligations undertaken by the Bidder in accordance with the Contract Documents to complete the Project identified in the Contract Documents.

SECTION 2

BIDDER'S REPRESENTATION

- 2.1 Each Bidder by submitting a completed and signed Bid represents that:
- 2.1.1 He has read and understands the Bidding Documents and his Bid is made in accordance therewith.
 - 2.1.2 He has examined and personally visited the site and the location of the proposed Work and has familiarized himself with the local conditions under which the Work is to be performed to include correlation of his personal observations with the requirements of the Contract Documents.
 - 2.1.3 His Bid is based upon the materials, systems, equipment or other items and conditions described in the Bidding Documents without exception.
 - 2.1.4 He is satisfied as to (1) the conditions to be encountered, (2) the character, quality, and scope of the proposed Work, (3) the quality and quantity of the materials to be furnished, and (4) the requirements of the Bid, the plans and specifications, and other Contract Documents.
 - 2.1.5 He is fully qualified and licensed in accordance with La. R.S. 37:2150.1 through 37:2164 as amended, and under applicable state and local licensing requirements and he shall be responsible for determining that he and all Sub-bidders or prospective subcontractors are duly licensed in accordance with state and local authorities.

SECTION 3

BIDDING DOCUMENTS

SECTION IB - INSTRUCTIONS TO BIDDERS

3.1 COPIES

- 3.1.1 Prime bidders who are properly licensed by the Louisiana State Licensing Board for Contractors may obtain from the Architect (unless another issuing office is designated in the Advertisement for Bid) at least one set of complete Bidding Documents for the deposit, if any, stated in the Advertisement for Bid. Deposits for documents will be returned in accordance with law.
- 3.1.2 Bidding Documents will be issued in accordance with law.
- 3.1.3 Complete sets of Bidding Documents should be used in preparing bids; neither the Owner nor the Architect assume any responsibility for errors or misinterpretations resulting from the use of incomplete sets of Bidding Documents.
- 3.1.4 The Owner or the Architect, in making copies of the Bidding Documents available on the above terms, do so only for the purpose of obtaining bids on the Work and do not confer a license for any other use.

3.2 INTERPRETATION OR CORRECTION OF BIDDING DOCUMENTS

- 3.2.1 Bidders shall promptly notify the Architect of any ambiguity, inconsistency or error which they may discover upon examination of the Bidding Documents or of the site and local conditions.
- 3.2.2 Any interpretation, correction or change of the Bidding Documents will be made by Addendum. Interpretations, corrections or changes of the Bidding Documents made in any other manner will not be binding upon the Owner and Bidders shall not rely upon such interpretations, corrections and changes.

3.3 SUBSTITUTIONS/PRIOR APPROVALS

- 3.3.1 The materials, products and equipment described in the Bidding Documents establish a standard of required function, dimension, appearance and quality to be met by any substitution proposed by the Bidder.
- 3.3.2 No substitution will be considered unless written request for approval has been submitted by the Bidder and has been received by the Architect and Owner at least ten (10) calendar days prior to the date for receipt of bids. Each such request shall include the name of the manufacturer and distributor of the materials or equipment of the substitute and a complete description of the proposed substitute including drawings, cuts, performance and test data and any other information necessary for an evaluation. A statement setting forth any changes in other materials, equipment or work that incorporation of the substitute would require shall be included. The burden of proof of the merit of the proposed substitute is upon the Bidder. The decision of the Owner concerning any substitute shall be final.
- 3.3.3 If the Owner approves any proposed substitution, such approval will be set forth in an Addendum. Bidder shall not rely upon approvals made in any other manner, whether oral or in writing.

3.4 ADDENDA

- 3.4.1 Addenda will be transmitted or delivered to all Bidders who have requested Bidding Documents in accordance with law.
- 3.4.2 Each Bidder should ascertain from the Architect prior to submitting a Bid that he has received all Addenda issued. All bids will be considered by the Owner as if the Bidder had received and considered all Addenda.

SECTION IB - INSTRUCTIONS TO BIDDERS

SECTION 4

BIDDING PROCEDURE

4.1 FORM AND STYLE

- 4.1.1 Bids should be submitted on the Uniform Public Work Bid Form provided by the Owner. The form can be removed from the project manual or specifications. A duplicate copy is also acceptable.
- 4.1.2 Information requested on the Uniform Public Work Bid Form should be filled in by typewriter or legible hand printing or writing in ink.
- 4.1.3 Where so indicated by the makeup of the Uniform Public Work Bid Form, prices should be expressed in both words and figures, and in case of discrepancy between the two, the amount expressed in words shall govern.
- 4.1.4 All requested alternates shall be Bid.
- 4.1.5 Bidder shall not qualify his Bid in any manner.
- 4.1.6 Each Bid shall state the name of the Bidder. Written evidence of the authority of the person signing the Bid, if required by law, should be attached to the bid. Bidders are instructed to carefully review the law and the Uniform Public Work Bid Form for requirements in submission of a bid.
- 4.1.7 Bidder shall certify that he is properly licensed and should show his license number on the Uniform Public Work Bid Form in the designated space and shall show his license number on the bid envelope. Failure of the Bidder to certify that he is licensed or to include the contractor's license number on the bid envelope may result in the Bid being automatically rejected, so marked, returned to the Bidder, and not read aloud in accordance with Louisiana Revised Statute 37:2163.
- 4.1.8 Bidders should attach or enclose with the signed Uniform Public Work Bid Form all other necessary documents, including but not limited to written proof as set forth in Section 4.1.6 and the Bid Security.

4.2 BID SECURITY

- 4.2.1 Bids may not be considered or accepted if the Bid is not accompanied by bid security in an amount of five percent (5%) of the Base Bid. The bid security shall be in the form of a certified check or cashier's check drawn on a bank insured by the Federal Deposit Insurance Corporation, or a bid bond written by a surety company licensed to do business in the state of Louisiana and qualified as required by the provisions of Louisiana Revised Statute 38:2218 and 38:2219. Any bond should be accompanied by the appropriate power of attorney with a valid effective date.
- 4.2.2 Bid security furnished by the Bidder should guarantee that the Bidder will, if awarded the Contract, perform according to the terms of his Bid and the Bidding Documents and will enter into the Contract with the Owner.
- 4.2.3 Should the Bidder fail to perform according to his Bid and the Bidding Documents, the amount of the bid security shall be forfeited to the Owner as liquidated damages, not as a penalty.

SECTION IB - INSTRUCTIONS TO BIDDERS

4.2.4 The Owner will have the right to retain the bid security of bidders until either (a) the Contract has been executed and Bonds have been furnished by the Bidder awarded the Contract, or (b) the time for the rejection of all Bids by the Owner has expired.

4.3 SUBMISSION OF BIDS

4.3.1 The signed Uniform Public Work Bid Form, the bid security, and any other documents to be submitted with the Uniform Public Work Bid Form should be enclosed in a sealed, opaque envelope. The envelope should be addressed to St. Tammany Parish School Board, 321 N. Theard, Covington, Louisiana 70433 and be plainly marked "**BIDS ON CONSTRUCTION OF (Name of Project) TO BE OPENED (Date)**" and include the Bidder's name, address, and **shall** include the Louisiana contractor's license number. If the Bid is sent by mail, the sealed envelope should be enclosed in a separate mailing envelope with the notation "BID ENCLOSED" on the face thereof.

4.3.2 Bids shall be deposited at the designated location prior to the time and date for receipt of bids indicated in the Advertisement for Bid, or any extension thereof made by Addendum. Bidders are responsible for timely delivery at the location designated for receipt of Bids. Delays in the U.S. Mail or any other agent or delivery service remain the responsibility of the Bidder. Bids received after the time and date for receipt of bids will be returned unopened.

4.4 MODIFICATION OR WITHDRAWAL OF BID

4.4.1 A Bid may not be modified, withdrawn or canceled by the Bidder except in accordance with law.

4.4.2 Prior to the time and date designated for receipt of Bids, Bids submitted early may be modified or withdrawn only by written notice to the party receiving Bids at the place and prior to the time designated for opening of Bids

4.4.3 Withdrawn Bids may be resubmitted up to the time designated for the opening of Bids.

4.4.4 Bid security should be in an amount sufficient for the Bid as modified or resubmitted.

SECTION 5

CONSIDERATION OF BIDS

5.1 OPENING OF BIDS

5.1.1 Unless stated otherwise in the Advertisement for Bids, the properly identified Bids received on time will be opened publicly, will be read aloud, and an abstract of the amounts of the Base Bids and Alternates, if any, will be made available to Bidders.

5.2 REJECTION OF BIDS

5.2.1 The Owner shall have the right to reject any or all Bids in accordance with law.

5.3 ACCEPTANCE OF BID (AWARD)

5.3.1 The Owner shall award a contract to the lowest responsive and responsible Bidder provided the Bid has been submitted in accordance with law, and the Owner does not reject any or all Bids in accordance with law.

SECTION IB - INSTRUCTIONS TO BIDDERS

SECTION 6

SUBMISSIONS

- 6.1 If required by the Owner, the apparent low Bidder shall submit to the Architect and the Owner prior to award of the Contract, written documentation from any manufacturer that the manufacturer will issue the guarantee, such as a roof system guarantee, based on the specified system or equipment and include the name of the applicator acceptable to the manufacturer for installing the specified system and all requirements of the manufacturer which must be met in order for the guarantee to issue. The manufacturer shall be one that has received prior approval or is named in the specifications.

SECTION 7

PERFORMANCE BOND AND LABOR AND MATERIAL PAYMENT BOND

- 7.1 The successful Bidder shall furnish and pay for a performance bond and a statutory payment bond for public works, in accordance with the Contract Documents and Louisiana Revised Statute 38:2219 as amended.
- 7.2 The Bonds shall be issued in accordance with the provisions of Louisiana Revised Statute 38:2216 and 2219 as amended, except that they will be in the amount of one hundred percent of the Contract amount.
- 7.3 The Owner may record the executed Agreement and Bonds with the Clerk of Court for the Parish of St. Tammany.

SECTION 8

FORM OF AGREEMENT BETWEEN OWNER AND CONTRACTOR

- 8.1 Unless otherwise provided in the Bidding Documents, the Agreement and bond forms for the Work will be written on the forms as attached in the Contract Documents. Within five (5) days after the proposed agreement is presented to the Successful Bidder for execution, the Successful Bidder and his surety must execute the Agreement.

SECTION 9

AFFIDAVIT OF COMPLIANCE WITH LOUISIANA REVISED STATUTES 38:2212.9, 2224 AND 2227

- 9.1 Each person submitting a Bid, prior to an award of the Contract to them, will be required to sign and execute an affidavit before a Notary Public in the form provided to the effect that Bidder is qualified in accordance with law to Bid on the Work and to undertake the Work, and Bidder has not colluded with any person, firm, or corporation in regard to any Bid submitted, all in accordance with law. The form of the affidavit is in the Bidding Documents.

SECTION 10

UNIT PRICES

- 10.1 Unit prices other than those requested in the Uniform Public Work Bid Form should not be submitted with any Bid.

SECTION IB - INSTRUCTIONS TO BIDDERS

- 10.2 Unit prices furnished by the Contractor in the form of a proposal shall not be construed as an authorization to perform work or expend monies. Any change in the Work must be authorized by a written change order and signed in accordance with the Contract Documents.

SECTION 11

RELIEF FROM BID MISTAKE

- 11.1 Bidders are advised to review the provisions of law, particularly Louisiana Revised Statute 38:2214 C and D, as amended from time to time, to support an application to withdraw a Bid.
- 11.2 In the event a Bidder, after opening of the bids, attempts to utilize the provisions of Louisiana Revised Statute 38:2214 C to attempt to withdraw its bid, the Owner will be the sole party to determine whether the alleged bid mistake is substantial.

SECTION 12

PRE-BID CONFERENCE

- 12.1 A pre-bid conference will be held at the time and place designated in the Advertisement for Bids. Bidders are strongly urged to attend and participate in the conference.

SECTION 13

COMPLETION TIME AND LIQUIDATED DAMAGES

- 13.1 The completion of the Work must be within the time stated in these Instructions to Bidders, subject to any extensions as may be granted in accordance with Contract Documents or the contractor shall pay the Liquidated Damages in the amount as stated in these Instructions to Bidders.

END OF SECTION IB
12/10/15

SECTION IC -PAYMENT OF TAXES

The Bidder is responsible for the payment of all applicable sales, use or other taxes relating to any materials or services to which such taxes are imposed arising from its Bid or the Contract.

END OF SECTION IC

SECTION IIA - AGREEMENT

SAMPLE

**AGREEMENT BETWEEN
ST. TAMMANY PARISH SCHOOL BOARD
AND**

**STATE OF LOUISIANA
PARISH OF ST. TAMMANY
CITY OF COVINGTON**

AN AGREEMENT made and entered into this ____ day of _____, 2____, by and between:

ST. TAMMANY PARISH SCHOOL BOARD, located at 321 N. Theard, Covington, LA 70433 herein represented by _____, its **Superintendent** and _____, its **President**, duly authorized, hereinafter called "Owner", and

_____, located at _____, a corporation organized and created under the laws of the State of _____, herein represented by _____, its _____, duly authorized by a resolution of the Board of Directors of said corporation, adopted at a meeting held on _____, a certified copy of which is annexed hereto for reference, hereinafter called "Contractor."

The said Contractor, has agreed, and does by these presents agree, for the consideration mentioned and contained herein, to furnish all labor and materials, tools, equipment, supplies, utilities, charged fees, permits and all other construction accessories and services required to build, construct and complete in a thorough and workmanlike manner: _____ in strict accordance with the Contract Documents prepared by _____ for St. Tammany Parish School Board.

The Owner will pay and the Contractor will accept in full consideration for the performance of the contract, the sum of DOLLARS (\$_____), which sum includes all taxes and represents the Base Bid plus Alternates ____ and subject to additions and deductions as provided in the Contract Documents.

The said Contract Documents, including by way of example and not of limitation, the Drawings, dated _____, the Specifications, dated _____, the Advertisement for Bids, Instructions to Bidders, Contractor's Bid Proposal Form, General Conditions, Supplementary Conditions, Special Conditions, Addenda number __, dated _____, which impose duties and obligations upon appearers herein. All of the provisions contained in the aforementioned Contract Documents, and as further set forth below are contained herein by reference with the same force and effect as though said Contract Documents were herein set out in full. An enumeration of the Contract Documents is as follows:

Contractor agrees to complete fully all work included in this Agreement within _____(____) consecutive calendar days from the date of Notice to Proceed as issued by the Architect, subject to adjustments of the Contract Time as provided in the Contract Documents. Contractor shall be assessed Liquidated Damages, in the sum of _____ Dollars (\$_____) for each consecutive calendar day which the Work is not complete beginning with the first day beyond the completion time stated above. Said sum shall in no event be construed to be a penalty; but only as damages fixed and agreed upon in advance.

Contractor agrees to do and perform each and every one of the obligations contained in and, in conformity with, the said Contract Documents.

In accordance with Louisiana Revised Statute 23:1061(A), the parties hereby agree that Owner is entitled to and does hereby adopt a statutory employment relationship with any person(s) employed by or under Contractor, including but not limited to all subcontractor or materialmen or supplier employees. Contractor and Owner do hereby acknowledge

SECTION IIA - AGREEMENT

that the work performed by Contractor is an integral part of or essential to the ability of Owner to carry out its constitutional and statutory duties to provide educational services. Contractor agrees to provide workers compensation insurance coverage as provided for in the Contract Documents and Supplementary Conditions and holds Owner harmless and indemnifies Owner in the event of any workers= compensation claim is asserted against Owner for any persons defined herein.

In consideration of the faithful and complete performance by the Contractor of all and singular the obligations by Contractor herein assumed, the ST. TAMMANY PARISH SCHOOL BOARD hereby agrees to pay unto the said Contractor, its successors, legal representatives and assigns, at the times and in the manner set forth in the specifications above referred to, the price for the work to be done under this contract, in accordance with the proposal of said Contractor, duly accepted by Owner.

Contractor by signing this contract consents and yields to the exclusive venue and jurisdiction of the Twenty-Second District Court for the Parish of St. Tammany, State of Louisiana, and does formally waive any and all claims of entitlement to removal of any case from this jurisdiction, including any removal of any claim to any Federal Court. Contractor waives any claim of lack of jurisdiction, on account of its residence elsewhere, in the event of a law suit filed under this contract or the bonds furnished for and on behalf of the Contractor at the time of the execution of this Agreement.

Contractor has separately furnished a performance bond and a labor and materials payment bond issued by _____, this date to the Owner which bonds are furnished in accordance with the requirements of the Contract Documents and for recording in the Office of the Recorder of Mortgages in the Parish of St. Tammany.

THIS AGREEMENT is entered into as of the date first written above and is executed in at least five originals.

WITNESSES

WITNESSES

ST. TAMMANY PARISH SCHOOL BOARD

By: _____
(NAME)
Superintendent

By: _____
(NAME)
President

(CONTRACTOR)

By: _____
(NAME)
(Title)

12/10/15

SECTION IIC - LABOR AND MATERIALS PAYMENT BOND

**SAMPLE
LABOR AND MATERIALS PAYMENT BOND**

KNOW ALL MEN BY THESE PRESENTS that _____ (insert full name and address or legal title of Contractor) _____; as Principal, hereinafter called Contractor, and _____ (insert full name and address or legal title of Surety) _____, a corporation duly organized under the laws of the State of _____, and authorized to do business in the state of Louisiana, as Surety, hereinafter called Surety, are held and firmly bound unto **ST. TAMMANY PARISH SCHOOL BOARD, 321 N. Theard, Covington, Louisiana 70433**, as Obligee, hereinafter called Owner, in the amount of _____ Dollars (\$_____) for the payment whereof Contractor and Surety bind themselves, their heirs, executors, administrators, successors and assigns, jointly and severally, firmly by these presents.

WHEREAS, Contractor has by written Agreement dated _____, entered into a Contract with Owner for (insert full name, address and description of project) _____, in accordance with the Drawings and Specifications prepared by _____ (insert full name and address or legal title of Architect) _____, which Contract and Contract Documents referred to therein are and by reference made a part hereof, and is hereinafter referred to as the Contract.

NOW, THEREFORE, THE CONDITION of this obligation is such that, if the said Contractor shall well and faithfully and shall promptly pay all claimants as provided by law in LA R.S. 38:2242 and pay all wages of laborers, workmen, or mechanics, to be employed by Contractor for all work done or labor performed, or who may be employed by any sub-contractor; and shall promptly pay all furnishers of material supplied to Contractor, or by or to sub-contractors, and used in the construction, erection, alteration, installation, or repair called for by the aforesaid Contract; and shall promptly pay for all materials or supplies furnished to said Contractor, or by or to any sub-contractor, for use in machines used by the Contractor, or any sub-contractor, in the construction, erection, alteration, installation, or repair of the work specified in the aforesaid Contract; and shall fully secure and protect the ST. TAMMANY PARISH SCHOOL BOARD, its legal successor and representative, from all liability in the premises, and from all loss or expense of any kind, incurred by the Owner, including all costs of court and all attorney's fees made necessary or arising from the failure, refusal or neglect of the Contractor to comply with the obligations assumed by Contractor; and, likewise, shall deliver all such work to the said ST. TAMMANY PARISH SCHOOL BOARD free from all claims, liens and expenses, then this bond shall become null and void, otherwise, it shall remain in full force and effect.

Contractor and Surety do, by act of signing this Bond, consent and yield to the exclusive venue and jurisdiction of the Twenty-Second District Court for the Parish of St. Tammany, State of Louisiana and do formally waive fully and all claims of entitlement to removal of any case from this jurisdiction, including any removal of any claim to any Federal Court. Contractor and Surety waive any claim of lack of jurisdiction on account of their residence elsewhere, in the event of a law suit under the Contract or this Bond.

This is a statutory bond furnished pursuant to the provisions of Louisiana Revised Statute 38:2241 *et seq.* as amended or revised.

Signed and Sealed this _____ day of _____, _____.

(SEAL)
PRINCIPAL (CONTRACTOR)

(SEAL)
SURETY

12/10/15

SECTION IID - AFFIDAVIT OF COMPLIANCE WITH LOUISIANA REVISED STATUTES 38:2212.9, 38:2224 AND 38:2227

**SAMPLE
AFFIDAVIT OF COMPLIANCE WITH LOUISIANA REVISED STATUTES 38:2212.9, 38:2224 AND 38:2227**

STATE OF _____

PARISH/COUNTY OF _____

PROJECT NO. _____

NAME _____

LOCATION _____

AFFIDAVIT

BEFORE ME, the undersigned authority, duly commissioned and qualified within and for the state and parish aforesaid, personally came and appeared (name) representing (company) who, being by me first duly sworn deposed and said that he/she has read and signed this affidavit and he/she does hereby attest, under oath, as follows:

(1) That affiant and his/her firm employed no person, corporation, firm, association, or other organization, either directly or indirectly, to secure the public contract for the above-referenced project with the St. Tammany Parish School Board under which he will, if awarded the contract, receive or have received payment, other than persons regularly employed by the affiant whose services in connection with the construction, alteration or demolition of the public building or project or in securing the public contract were in the regular course of their duties for affiant;

(2) That no part of the contract price to be received or received by affiant or his/her firm was paid or will be paid to any person, corporation, firm, association, or other organization for soliciting the contract, other than the payment of their normal compensation to persons regularly employed by the affiant whose services in connection with the construction of the public building or project were in the regular course of their duties for affiant;

(3) That neither affiant, nor any partner, incorporator, director, manager, officer, organizer, or member who has a minimum of ten percent ownership in the bidding entity, has been convicted of, or has entered a plea of guilty or nolo contendere to any crimes enumerated in Louisiana Revised Statute 38:2227, or equivalent federal crimes; and

(4) That neither affiant, nor any individual with an ownership interest of five percent or more in his/her firm has been convicted of, or has entered a plea of guilty or nolo contendere to any state felony crime or equivalent federal felony crime committed in the solicitation or execution of a contract or bid awarded under the laws governing public contracts as described in Louisiana Revised Statute 38:2212.8.

Bidder or representative to sign and type name below signature.

Affiant

SWORN TO AND SUBSCRIBED BEFORE ME THIS _____ day of _____, 2_____.

NOTARY PUBLIC

SECTION IIIC - CHANGE ORDER

CHANGE ORDER NO: _____

PROJECT: _____

DATE: _____

PROJECT NO: _____

CONTRACT DATE: _____

JOB NO: _____

TO: CONTRACTOR: _____
(Name and Address)

You are directed to make the following change in this contract: (attach itemized breakdown to show cost including materials quantities, material costs, taxes, insurance, employee benefits, other related costs, profit and overhead):

NOT VALID UNTIL SIGNED BY OWNER AND CONTRACTOR

The Original Contract Sum \$ _____

Net Change by previous Change Orders \$ _____

Contract Sum Prior to this Change \$ _____

Contract Sum will be (increased) (decreased)
(unchanged) by this Change \$ _____

New Contract Sum including this Change \$ _____

Contract Time will be (increased) (decreased)
(unchanged) by _____ days

Revised Contract Completion Date as
of the date of this Change Order is _____

Change Order is:

RECOMMENDED:

(Architect)

ACCEPTED:

(Contractor)

APPROVED:
St. Tammany Parish School Board
(Owner)

By: _____

(Typed name)

By: _____

(Typed name)

By: _____
Frank J. Jabbia
(Typed name)

Date: _____

Date: _____

Date: _____

SECTION 01 10 00
SUMMARY OF WORK

1. GENERAL

1.1 SUMMARY

A. Section Includes:

1. Project information.
2. Work covered by Contract Documents.
3. Coordination with occupants.
4. Work restrictions.
5. Specification and drawing conventions.
6. Miscellaneous provisions.

1.2 PROJECT INFORMATION

A. Project Identification: **Cafetorium HVAC Replacement**
Boyet Junior High School Gymnasium
Project No: 428

B. Project Location: **Boyet Junior High School**
59295 Rebel Dr,
Slidell, LA 70461

C. Owner: **St Tammany Parish School Board**
C.J. Schoen Administrative Complex
321 N. Theard
Covington, Louisiana 70433

Owner's Representative: **Cameron Tipton, Chief of Construction**

D. Engineer: **Dammon Engineering, Inc.**
Brian Mistich, Chief Engineer
554 Old Spanish Trail
Slidell, LA 70458

1. Contact: **David Dammon**
(985) 649-5832

1.3 WORK COVERED BY CONTRACT DOCUMENTS

A. The Work of this Project is defined by the Contract Documents and consists of the following:

1. This project consists of the removal and replacement of the existing HVAC equipment: air handler units, condensing units, and demolition of some heaters within the approximately 13,000 sq ft gymnasium.

B. Type of Contract.

1. Project will be constructed under a single prime contract.

1.4 COORDINATION WITH OCCUPANTS

- A. Owner Occupancy: Owner will occupy site and adjacent buildings during the entire construction period. Owner will, at his/her expense, rent a portable building for day to day operations. Cooperate with Owner during construction operations to minimize conflicts and facilitate Owner usage. Perform the Work so as not to interfere with Owner's day-to-day operations.

1. Maintain access to existing walkways, corridors, and other adjacent occupied or used facilities. Do not close or obstruct walkways, corridors, or other occupied or used facilities without written permission from Owner and approval of authorities having jurisdiction.
2. Notify Owner not less than 72 hours in advance of activities that will affect Owner's operations.

1.5 ACCESS TO SITE

- A. General: Contractor shall have limited use of Project site for construction operations. All contractor and their employees, vendors and sub-contractors' and their employees shall provide necessary documentation to the contact at Troop L, showing that they have a legal status for working within the United States. Acceptable forms of documentation would be a valid state driver's license, an ID or country passport, all of which must have a photo ID identifying the person.

- B. Use of Site: Limit use of Project site to work in areas indicated. Do not disturb portions of Project site beyond areas in which the Work is indicated.

1. Limits: Confine construction operations to interior of building under renovation.
2. Driveways, Walkways and Entrances: Keep driveways, parking areas, loading areas, and entrances serving premises clear and available to Owner, Owner's employees, and emergency vehicles at all times. Do not use these areas for parking or storage of materials.
 - a. Schedule deliveries to minimize use of driveways and entrances by construction operations.
 - b. Schedule deliveries to minimize space and time requirements for storage of materials and equipment on-site.

- C. Condition of Existing Building: Maintain portions of existing building affected by construction operations in a weathertight condition throughout construction period. Repair damage caused by construction operations.

- D. On-Site Work Hours: Limit work at the facility from sun-up to sundown, 7 days a week except Holidays or as otherwise directed. Finishing work that is conducted inside with no major movement outside (e.g., trash removal by large trucks and/or machinery, etc. - high noise), may be done to later hours, e.g., 10 pm.
- E. Noise, Vibration, and Odors: Coordinate operations that may result in high levels of noise and vibration, odors, or other disruption to Owner occupancy with Owner.
- F. Controlled Substances: Use of tobacco products and other controlled substances is not permitted on Project site.

1.6 WORK SEQUENCE

- A. On-site construction operations for this project must take place during the number of days specified in contract. Construction Work shall be separated into two phases as follows:
 - 1. Phase I – (Administrative Activities) A written Notice to Proceed (NTP) will be issued for all “pre-demolition” activities including but not limited to submittal review/processing of shop drawings, material procurement, on-site nondestructive measuring, staging/storing of materials and permitting. Note: this NTP does not allow demolition or disruptive work. Phase I will be completed within One Hundred Twenty (120) consecutive days of the “Notice to Proceed” (NTP) from the Owner. This NTP for Phase One is intended to be issued in February 2024.
 - 2. Phase 2 – (Demolition & Construction) A written Notice to Proceed (NTP), will be issued for all Demolition & Construction activities such that all work in the Original Contract Documents can be completed prior to the opening of the 2024-2025 school year. Contractors are urged to have all materials approved and on site or with a valid ship date, prior to this NTP to minimize delays. Phase II will be completed within Sixty (60) consecutive days of the “Notice to Proceed” from the Owner. This NTP for Phase Two is intended to start the beginning of June 2024.

1.7 SPECIFICATION AND DRAWING CONVENTIONS

- A. Specification Content: The Specifications use certain conventions for the style of language and the intended meaning of certain terms, words, and phrases when used in particular situations. These conventions are as follows:
 - 1. Imperative mood and streamlined language are generally used in the Specifications. The words "shall," "shall be," or "shall comply with," depending on the context, are implied where a colon (:) is used within a sentence or phrase.
 - 2. Specification requirements are to be performed by Contractor.
- B. Division 01 General Requirements: Requirements of Sections in Division 01 apply to the Work of all Sections in the Specifications.

- C. Drawing Coordination: Requirements for materials and products identified on Drawings are described in detail in the Specifications. One or more of the following are used on Drawings to identify materials and products:
1. Terminology: Materials and products are identified by the typical generic terms used in the individual Specifications Sections.
 2. Abbreviations: Materials and products are identified by abbreviations scheduled on Drawings.
 3. Keynoting: Materials and products are identified by reference keynotes referencing Specification Section numbers found in this Project Manual.

2.PRODUCTS (Not Used)

3.EXECUTION (Not Used)

END OF SECTION 01 10 00

SECTION 01 26 00
CONTRACT MODIFICATION PROCEDURES

PART 1 - GENERAL

1.1 SUMMARY

- A. Section includes administrative and procedural requirements for handling and processing Contract modifications.

1.2 MINOR CHANGES IN THE WORK

- A. Engineer will issue supplemental instructions authorizing minor changes in the Work, not involving adjustment to the Contract Sum or the Contract Time, on "Engineer's Supplemental Instructions."

1.3 PROPOSAL REQUESTS

- A. Owner-Initiated Proposal Requests: Engineer will issue a detailed description of proposed changes in the Work that may require adjustment to the Contract Sum or the Contract Time. If necessary, the description will include supplemental or revised Drawings and Specifications.
 - 1. Work Change Proposal Requests issued by Engineer are not instructions either to stop work in progress or to execute the proposed change.
 - 2. Within the time specified in Proposal Request after receipt of Proposal Request, submit a quotation estimating cost adjustments to the Contract Sum and the Contract Time necessary to execute the change.
 - a. Include a list of quantities of products required or eliminated and unit costs, with total amount of purchases and credits to be made. If requested, furnish survey data to substantiate quantities.
 - b. Indicate applicable taxes, delivery charges, equipment rental, and amounts of trade discounts.
 - c. Include costs of labor and supervision directly attributable to the change.
 - d. Include an updated Contractor's construction schedule that indicates the effect of the change, including, but not limited to, changes in activity duration, start and finish times, and activity relationship. Use available total float before requesting an extension of the Contract Time.
 - e. Quotation Form: Use forms provided by Owner.
- B. Contractor-Initiated Work Change Proposals: If latent or changed conditions require modifications to the Contract, Contractor may initiate a claim by submitting a request for a change to Engineer.

1. Include a statement outlining reasons for the change and the effect of the change on the Work. Provide a complete description of the proposed change. Indicate the effect of the proposed change on the Contract Sum and the Contract Time.
2. Include a list of quantities of products required or eliminated and unit costs, with total amount of purchases and credits to be made. If requested, furnish survey data to substantiate quantities.
3. Indicate applicable taxes, delivery charges, equipment rental, and amounts of trade discounts.
4. Include costs of labor and supervision directly attributable to the change.
5. Include an updated Contractor's construction schedule that indicates the effect of the change, including, but not limited to, changes in activity duration, start and finish times, and activity relationship. Use available total float before requesting an extension of the Contract Time.
6. Work Change Proposal Request Form: Use form provided by Designer.

1.4 CHANGE ORDER PROCEDURES

- A. On Owner's approval of a Work Change Proposal Request, Designer will issue a Change Order for signatures of Owner and Contractor on form included in Project Specification.

1.5 CONSTRUCTION CHANGE DIRECTIVE

- A. Construction Change Directive: Engineer may issue a Construction Change Directive on AIA form G714. Construction Change Directive instructs Contractor to proceed with a change in the Work, for subsequent inclusion in a Change Order.
 1. Construction Change Directive contains a complete description of change in the Work. It also designates method to be followed to determine change in the Contract Sum or the Contract Time.
- B. Documentation: Maintain detailed records on a time and material basis of work required by the Construction Change Directive.
 1. After completion of change, submit an itemized account and supporting data necessary to substantiate cost and time adjustments to the Contract.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION 01 26 00

SECTION 01 31 00
PROJECT MANAGEMENT AND COORDINATION

PART 1 - GENERAL

1.1 SUMMARY

- A. Section includes administrative provisions for coordinating construction operations on Project including, but not limited to, the following:
 - 1. Coordination drawings.
 - 2. Requests for Information (RFIs).
 - 3. Project meetings.

- B. Related Sections:
 - 1. Section 01 73 00 "Execution".
 - 2. Section 01 26 00 "Contract Modification Procedures".

1.2 DEFINITIONS

- A. RFI: Request from Owner, Engineer, or Contractor seeking information required by or clarifications of the Contract Documents.

1.3 INFORMATIONAL SUBMITTALS

- A. Subcontract List: Prepare a written summary identifying individuals or firms proposed for each portion of the Work, including those who are to furnish products or equipment fabricated to a special design. Include the following information in tabular form:
 - 1. Name, address, and telephone number of entity performing subcontract or supplying products.
 - 2. Number and title of related Specification Section(s) covered by subcontract.
 - 3. Drawing number and detail references, as appropriate, covered by subcontract.

1.4 GENERAL COORDINATION PROCEDURES

- A. Coordination: Coordinate construction operations included in different Sections of the Specifications to ensure efficient and orderly installation of each part of the Work. Coordinate construction operations, included in different Sections, that depend on each other for proper installation, connection, and operation.

1. Schedule construction operations in sequence required to obtain the best results where installation of one part of the Work depends on installation of other components, before or after its own installation.
 2. Coordinate installation of different components to ensure maximum performance and accessibility for required maintenance, service, and repair.
 3. Make adequate provisions to accommodate items scheduled for later installation.
- B. Prepare memoranda for distribution to each party involved, outlining special procedures required for coordination. Include such items as required notices, reports, and list of attendees at meetings.
1. Prepare similar memoranda for Owner through Designer and separate contractors if coordination of their Work is required.
- C. Administrative Procedures: Coordinate scheduling and timing of required administrative procedures with other construction activities to avoid conflicts and to ensure orderly progress of the Work. Such administrative activities include, but are not limited to, the following:
1. Preparation of Contractor's construction schedule.
 2. Preparation of the schedule of values.
 3. Installation and removal of temporary facilities and controls.
 4. Delivery and processing of submittals.
 5. Project closeout activities.
 6. Startup and adjustment of systems.

1.5 REQUESTS FOR INFORMATION (RFIs)

- A. General: Immediately on discovery of the need for additional information or interpretation of the Contract Documents, Contractor shall prepare and submit an RFI in the form specified.
1. Engineer will not accept RFIs submitted to Engineer by other entities controlled by Contractor. Any such RFI submittals will be reported to the Contractor by the Engineer.
 2. Coordinate and submit RFIs in a prompt manner so as to avoid delays in Contractor's work or work of subcontractors.
- B. Content of the RFI: Include a detailed, legible description of item needing information or interpretation and the following:
1. Project name.
 2. Project number.
 3. Date.
 4. Name of Contractor.
 5. Name of Engineer.
 6. RFI number, numbered sequentially.
 7. RFI subject.
 8. Specification Section number and title and related paragraphs, as appropriate.
 9. Drawing number and detail references, as appropriate.
 10. Field dimensions and conditions, as appropriate.

11. Contractor's suggested resolution. If Contractor's solution(s) impacts the Contract Time or the Contract Sum, Contractor shall state impact in the RFI.
 12. Contractor's signature.
 13. Attachments: Include sketches, descriptions, measurements, photos, Product Data, Shop Drawings, coordination drawings, and other information necessary to fully describe items needing interpretation.
- C. RFI Forms: AIA Document G716.
- D. Engineer's Action: Engineer will review each RFI, determine action required, and respond. Allow seven (7) working days for Engineer's response for each RFI. RFIs received by Engineer after 1:00 p.m. will be considered as received the following working day.
1. The following RFIs will be returned, with Engineer informing Contractor of "no action":
 - a. Requests for approval of submittals.
 - b. Requests for approval of substitutions.
 - c. Requests for coordination information already indicated in the Contract Documents.
 - d. Requests for adjustments in the Contract Time or the Contract Sum.
 - e. Requests for interpretation of Engineer's actions on submittals.
 - f. Incomplete RFIs or inaccurately prepared RFIs.
 2. Engineer's action may include a request for additional information, in which case Engineer's time for response will date from time of receipt of additional information.
 3. Engineer's action on RFIs that may result in a change to the Contract Time or the Contract Sum may be eligible for Contractor to submit Change Proposal according to Section 01 26 00 "Contract Modification Procedures."
 - a. If Contractor believes the RFI response warrants change in the Contract Time or the Contract Sum, notify Engineer in writing within ten (10) days of receipt of the RFI response.
- E. On receipt of Engineer's action, immediately distribute the RFI response to affected parties. Review response and notify Engineer within seven (7) days if Contractor disagrees with response.
1. Identification of related Minor Change in the Work, Construction Change Directive, and Proposal Request, as appropriate.
 2. Identification of related Field Order, Work Change Directive, and Proposal Request, as appropriate.
- 1.6 PROJECT MEETING
- A. Preconstruction Conference: Designer will schedule and conduct a preconstruction conference at Project site before starting construction, at a time convenient to Owner and Contractor.
1. Attendees: Authorized representatives of Owner, Engineer, and their consultants; Contractor and its superintendent; major subcontractors; suppliers; and other concerned

parties shall attend the conference. Participants at the conference shall be familiar with Project and authorized to conclude matters relating to the Work.

2. Contractor shall furnish to the Engineer and Owner at the Preconstruction Conference:
 - a. The Schedule of Values.
 - b. List of Subcontractors.
 - c. Information listed in Paragraph 7.1 of the Supplementary Conditions.
 - d. The Construction Schedule.

 3. Agenda: Discuss items of significance that could affect progress, including the following:
 - a. Designation of key personnel and their duties.
 - b. Change Orders.
 - c. Invoice Procedures.
 - d. Prior Approval.
 - e. Testing Lab, Procedures for testing and inspecting.
 - f. Project Sign.
 - g. Meetings.
 - h. General Correspondence.
 - i. Shop Drawings.
 - j. Procedure for keeping Record Documents.
 - k. Security.
 - l. User's occupancy requirements.
 - m. Location of staging areas and use of the premises.
 - n. Parking availability.
 - o. Location and type of temporary facilities and utilities.
 - p. Responsibility for temporary facilities and controls.
 - q. Office, work, and storage areas.
 - r. Equipment deliveries.
 - s. Outages/Interruptions of Services.
 - t. Work restrictions.
 - u. Working hours.
 - v. Progress cleaning.
 - w. Safety and First Aid.
 - x. Use of any Asbestos Containing materials is prohibited.
 - y. Pre-Closeout Conference.

 4. Minutes: Designer will record and distribute meeting minutes.
- B. Preinstallation Conferences: Designer will conduct a preinstallation conference at Project site before each construction activity that requires coordination with other construction.
1. Attendees: Installer and representatives of manufacturers and fabricators involved in or affected by the installation and its coordination or integration with other materials and installations that have preceded or will follow, shall attend the meeting.
 2. Agenda: Review progress of other construction activities and preparations for the particular activity under consideration, including requirements for the following:
 - a. Contract Documents.

- b. Options.
 - c. Related RFIs.
 - d. Related Change Orders.
 - e. Purchases.
 - f. Deliveries.
 - g. Submittals.
 - h. Review of mockups.
 - i. Possible conflicts.
 - j. Compatibility problems.
 - k. Time schedules.
 - l. Weather limitations.
 - m. Manufacturer's written instructions.
 - n. Warranty requirements.
 - o. Compatibility of materials.
 - p. Acceptability of substrates.
 - q. Temporary facilities and controls.
 - r. Space and access limitations.
 - s. Regulations of authorities having jurisdiction.
 - t. Testing and inspecting requirements.
 - u. Installation procedures.
 - v. Coordination with other work.
 - w. Required performance results.
 - x. Protection of adjacent work.
 - y. Protection of construction and personnel.
3. Designer will record significant conference discussions, agreements, and disagreements, including required corrective measures and actions.
 4. Reporting: Designer will distribute minutes of the meeting to each party present and to other parties requiring information.
 5. Do not proceed with installation if the conference cannot be successfully concluded. Initiate whatever actions are necessary to resolve impediments to performance of the Work and reconvene the conference at earliest feasible date.
- C. Progress Meetings: Designer will conduct progress meetings at Project site at monthly intervals.
1. Attendees: In addition to representatives of Owner and Engineer, each contractor, subcontractor, supplier, and other entity concerned with current progress or involved in planning, coordination, or performance of future activities shall be represented at these meetings. All participants at the meeting shall be familiar with Project and authorized to conclude matters relating to the Work.
 2. Agenda: Review and correct or approve minutes of previous progress meeting. Review other items of significance that could affect progress. Include topics for discussion as appropriate to status of Project.
 - a. Contractor's Construction Schedule: Review progress since the last meeting. Determine whether each activity is on time, ahead of schedule, or behind schedule, in relation to Contractor's construction schedule. Determine how construction behind schedule will be expedited; secure commitments from parties involved to

do so. Discuss whether schedule revisions are required to ensure that current and subsequent activities will be completed within the Contract Time.

- 1) Review schedule for next period.
- b. Review present and future needs of each entity present, including the following:
- 1) Interface requirements.
 - 2) Sequence of operations.
 - 3) Status of submittals.
 - 4) Deliveries.
 - 5) Off-site fabrication.
 - 6) Access.
 - 7) Site utilization.
 - 8) Temporary facilities and controls.
 - 9) Progress cleaning.
 - 10) Quality and work standards.
 - 11) Status of correction of deficient items.
 - 12) Field observations.
 - 13) Status of RFIs.
 - 14) Status of proposal requests.
 - 15) Pending changes.
 - 16) Status of Change Orders.
 - 17) Pending claims and disputes.
 - 18) Documentation of information for payment requests.
3. Minutes: Entity responsible for conducting the meeting will record and distribute the meeting minutes to each party present and to parties requiring information.
- a. Schedule Updating: Revise Contractor's construction schedule after each progress meeting where revisions to the schedule have been made or recognized. Issue revised schedule concurrently with the report of each meeting.
- D. Pre-Closeout Conference: Designer will schedule and conduct a pre-closeout conference at the project site when construction is 75% to 85% complete.
1. Attendees: Authorized representatives of Owner, Engineer, and their consultants; Contractor and its superintendent; major subcontractors. Participants at the conference shall be familiar with Project and authorized to conclude matters relating to the Work.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION 01 31 00

SECTION 01 33 00
SUBMITTAL PROCEDURES

PART 1 - GENERAL

1.1 SUMMARY

- A. Section includes requirements for the submittal schedule and administrative and procedural requirements for submitting Shop Drawings, Product Data, Samples, and other submittals.

1.2 DEFINITIONS

- A. Action Submittals: Written and graphic information and physical samples that require Engineer's responsive action.
- B. Informational Submittals: Written and graphic information and physical samples that do not require Engineer's responsive action. Submittals may be rejected for not complying with requirements.

1.3 ACTION SUBMITTALS

- A. Submittal Schedule: Submit a schedule of submittals, arranged in chronological order by dates required by construction schedule. Include time required for review, ordering, manufacturing, fabrication, and delivery when establishing dates. Include additional time required for making corrections or revisions to submittals noted by Engineer and additional time for handling and reviewing submittals required by those corrections.

1.4 SUBMITTAL ADMINISTRATIVE REQUIREMENTS

- A. Engineer's Digital Data Files: Electronic copies of digital data files of the Contract Drawings will be provided by Engineer for Contractor's use in preparing submittals.
 - 1. Engineer will furnish Contractor one set of digital data drawing files of the Contract Drawings for use in preparing Shop Drawings.
 - a. Engineer makes no representations as to the accuracy or completeness of digital data drawing files as they relate to the Contract Drawings.
 - b. Contractor shall execute a data licensing agreement in the form of AIA Document C106, Digital Data Licensing Agreement.
- B. Coordination: Coordinate preparation and processing of submittals with performance of construction activities.

1. Coordinate each submittal with fabrication, purchasing, testing, delivery, other submittals, and related activities that require sequential activity.
 2. Coordinate transmittal of different types of submittals for related parts of the Work so processing will not be delayed because of need to review submittals concurrently for coordination.
 - a. Engineer reserves the right to withhold action on a submittal requiring coordination with other submittals until related submittals are received.
- C. Processing Time: Allow time for submittal review, including time for resubmittals, as follows. Time for review shall commence on Engineer's receipt of submittal. No extension of the Contract Time will be authorized because of failure to transmit submittals enough in advance of the Work to permit processing, including resubmittals.
1. Initial Review: Allow fifteen (15) work days for initial review of each submittal. Allow additional time if coordination with subsequent submittals is required. Engineer will advise Contractor when a submittal being processed must be delayed for coordination.
 2. Intermediate Review: If intermediate submittal is necessary, process it in same manner as initial submittal.
 3. Resubmittal Review: Allow fifteen (15) work days for review of each resubmittal.
- D. Electronic Submittals: Identify and incorporate information in each electronic submittal file as follows:
1. Assemble complete submittal package into a single indexed file incorporating submittal requirements of a single Specification Section and transmittal form with links enabling navigation to each item.
 2. Name file with submittal number or other unique identifier, including revision identifier.
 - a. File name shall use project identifier and Specification Section number followed by a decimal point and then a sequential number (e.g., LNHS-061000.01). Resubmittals shall include an alphabetic suffix after another decimal point (e.g., LNHS-061000.01.A).
 3. Provide means for insertion to permanently record Contractor's review and approval markings and action taken by Engineer.
 4. Transmittal Form for Electronic Submittals: Use electronic form acceptable to Engineer, containing the following information:
 - a. Project name.
 - b. Date.
 - c. Name and address of Engineer.
 - d. Name of Contractor.
 - e. Name of firm or entity that prepared submittal.
 - f. Names of subcontractor, manufacturer, and supplier.
 - g. Category and type of submittal.
 - h. Submittal purpose and description.
 - i. Specification Section number and title.

- j. Specification paragraph number or drawing designation and generic name for each of multiple items.
 - k. Drawing number and detail references, as appropriate.
 - l. Location(s) where product is to be installed, as appropriate.
 - m. Related physical samples submitted directly.
 - n. Indication of full or partial submittal.
 - o. Transmittal number, numbered consecutively.
 - p. Submittal and transmittal distribution record.
 - q. Other necessary identification.
 - r. Remarks.
5. Metadata: Include the following information as keywords in the electronic submittal file metadata:
- a. Project name.
 - b. Number and title of appropriate Specification Section.
 - c. Manufacturer name.
 - d. Product name.
- E. Options: Identify options requiring selection by Engineer.
- F. Deviations: Identify deviations from the Contract Documents on submittals, deviations will not be allowed if it changes “type.”
- G. Resubmittals: Make resubmittals in same form and number of copies as initial submittal.
- 1. Note date and content of previous submittal.
 - 2. Note date and content of revision in label or title block and clearly indicate extent of revision.
 - 3. Resubmit submittals until they are marked with approval notation from Engineer’s action stamp.
- H. Distribution: Furnish copies of final submittals to manufacturers, subcontractors, suppliers, fabricators, installers, authorities having jurisdiction, and others as necessary for performance of construction activities. Show distribution on transmittal forms.
- I. Use for Construction: Retain complete copies of submittals on Project site. Use only final action submittals that are marked with approval notation from Engineer's action stamp.

PART 2 - PRODUCTS

2.1 SUBMITTAL PROCEDURES

A. General Submittal Procedure Requirements:

- 1. Submit electronic submittals via email as PDF electronic files, photos shall be submitted under Section 01 32 33 “Photographic Documentation”.

- a. Engineer will return annotated PDF file. Annotate and retain one copy of file as an electronic Project record document file. Digital photographic documentation will not be returned. Incomplete submittals are unacceptable, will be considered nonresponsive, and will be returned for resubmittal without review.
 2. Certificates and Certifications Submittals: Provide a statement that includes signature of entity responsible for preparing certification. Certificates and certifications shall be signed by an officer or other individual authorized to sign documents on behalf of that entity.
 - a. Provide a digital signature with digital certificate on electronically-submitted certificates and certifications where indicated.
- B. Product Data: Collect information into a single submittal for each element of construction and type of product or equipment.
 1. If information must be specially prepared for submittal because standard published data are not suitable for use, submit as Shop Drawings, not as Product Data.
 2. Mark each submittal to show which products and options are applicable.
 3. Include the following information, as applicable:
 - a. Manufacturer's catalog cuts.
 - b. Manufacturer's product specifications.
 - c. Standard color charts.
 - d. Statement of compliance with specified referenced standards.
 - e. Testing by recognized testing agency.
 - f. Application of testing agency labels and seals.
 - g. Notation of coordination requirements.
 - h. Availability and delivery time information.
 4. For equipment, include the following in addition to the above, as applicable:
 - a. Wiring diagrams showing factory-installed wiring.
 - b. Printed performance curves.
 - c. Operational range diagrams.
 - d. Clearances required to other construction, if not indicated on accompanying Shop Drawings.
 5. Submit Product Data before or concurrent with Samples.
 6. Submit Product Data in the following format:
 - a. PDF Electronic file.
- C. Shop Drawings: Prepare Project-specific information, drawn accurately to scale. Do not base Shop Drawings on reproductions of the Contract Documents or standard printed data.

1. Preparation: Fully illustrate requirements in the Contract Documents. Include the following information, as applicable:
 - a. Identification of products.
 - b. Schedules.
 - c. Compliance with specified standards.
 - d. Notation of coordination requirements.
 - e. Notation of dimensions established by field measurement.
 - f. Relationship and attachment to adjoining construction clearly indicated.
 - g. Seal and signature of professional engineer if specified.
 2. Sheet Size: Except for templates, patterns, and similar full-size drawings, submit Shop Drawings on sheets at least 8-1/2 by 11 inches, but no larger than 30 by 42 inches.
 3. Submit Shop Drawings in the following format:
 - a. PDF Electronic file.
- D. Samples: Submit Samples for review of kind, color, pattern, and texture for a check of these characteristics with other elements and for a comparison of these characteristics between submittal and actual component as delivered and installed.
1. Transmit Samples that contain multiple, related components such as accessories together in one submittal package.
 2. Identification: Attach label on unexposed side of Samples that includes the following:
 - a. Generic description of Sample.
 - b. Product name and name of manufacturer.
 - c. Sample source.
 - d. Number and title of applicable Specification Section.
 3. For projects where electronic submittals are required, provide corresponding electronic submittal of Sample transmittal, digital image file illustrating Sample characteristics, and identification information for record.
 4. Disposition: Maintain sets of approved Samples at Project site, available for quality-control comparisons throughout the course of construction activity. Sample sets may be used to determine final acceptance of construction associated with each set.
 - a. Samples that may be incorporated into the Work are indicated in individual Specification Sections. Such Samples must be in an undamaged condition at time of use.
 - b. Samples not incorporated into the Work, or otherwise designated as Owner's property, are the property of Contractor.
 5. Samples for Initial Selection: Submit manufacturer's color charts consisting of units or sections of units showing the full range of colors, textures, and patterns available.
 - a. Number of Samples: Submit two (2) full set(s) of available choices where color, pattern, texture, or similar characteristics are required to be selected from manufacturer's product line. Engineer, will return submittal with options selected.

6. Samples for Verification: Submit full-size units or Samples of size indicated, prepared from same material to be used for the Work, cured and finished in manner specified, and physically identical with material or product proposed for use, and that show full range of color and texture variations expected. Samples include, but are not limited to, the following: partial sections of manufactured or fabricated components; small cuts or containers of materials; complete units of repetitively used materials; swatches showing color, texture, and pattern; color range sets; and components used for independent testing and inspection.
 - a. Number of Samples: Submit three (3) sets of Samples. Engineer will retain two (2) Sample sets; remainder will be returned.
 - 1) If variation in color, pattern, texture, or other characteristic is inherent in material or product represented by a Sample, submit at least three (3) sets of paired units that show approximate limits of variations.
- E. Product Schedule: As required in individual Specification Sections, prepare a written summary indicating types of products required for the Work and their intended location. Include the following information in tabular form:
 1. Submit product schedule in the following format:
 - a. PDF Electronic file.
- F. Application for Payment and Schedule of Values: Comply with requirements specified in Section 01 29 00 "Payment Procedures."
- G. Closeout Submittals and Maintenance Material Submittals: Comply with requirements specified in Section 01 77 00 "Closeout Procedures."
- H. Installer Certificates: Submit written statements on manufacturer's letterhead certifying that Installer complies with requirements in the Contract Documents and, where required, is authorized by manufacturer for this specific Project.
- I. Manufacturer Certificates: Submit written statements on manufacturer's letterhead certifying that manufacturer complies with requirements in the Contract Documents. Include evidence of manufacturing experience where required.
- J. Material Test Reports: Submit reports written by a qualified testing agency, on testing agency's standard form, indicating and interpreting test results of material for compliance with requirements in the Contract Documents.
- K. Product Test Reports: Submit written reports indicating that current product produced by manufacturer complies with requirements in the Contract Documents. Base reports on evaluation of tests performed by manufacturer and witnessed by a qualified testing agency, or on comprehensive tests performed by a qualified testing agency.
- L. Research Reports: Submit written evidence, from a model code organization acceptable to authorities having jurisdiction, that product complies with building code in effect for Project.

- M. Preconstruction Test Reports: Submit reports written by a qualified testing agency, on testing agency's standard form, indicating and interpreting results of tests performed before installation of product, for compliance with performance requirements in the Contract Documents.
- N. Compatibility Test Reports: Submit reports written by a qualified testing agency, on testing agency's standard form, indicating and interpreting results of compatibility tests performed before installation of product. Include written recommendations for primers and substrate preparation needed for adhesion.
- O. Field Test Reports: Submit written reports indicating and interpreting results of field tests performed either during installation of product or after product is installed in its final location, for compliance with requirements in the Contract Documents.
- P. Design Data: Prepare and submit written and graphic information, including, but not limited to, performance and design criteria, list of applicable codes and regulations, and calculations. Include list of assumptions and other performance and design criteria and a summary of loads. Include load diagrams if applicable. Provide name and version of software, if any, used for calculations. Include page numbers.

2.2 DELEGATED-DESIGN SERVICES

- A. Performance and Design Criteria: Where professional design services or certifications by a design professional are specifically required of Contractor by the Contract Documents, provide products complying with specific performance and design criteria indicated.
 - 1. If criteria indicated are not sufficient to perform services or certification required, submit a written request for additional information to Engineer.

PART 3 - EXECUTION

3.1 CONTRACTOR'S REVIEW

- A. Action and Informational Submittals: Review each submittal and check for coordination with other Work of the Contract and for compliance with the Contract Documents. Note corrections and field dimensions. Mark with approval stamp before submitting to Engineer.
- B. Project Closeout and Maintenance Material Submittals: See requirements in Section 01 77 00 "Closeout Procedures."
- C. Approval Stamp: Stamp each submittal with a uniform, approval stamp. Include Project name and location, submittal number, Specification Section title and number, name of reviewer, date of Contractor's approval, and statement certifying that submittal has been reviewed, checked, and approved for compliance with the Contract Documents.

3.2 ENGINEER'S ACTION

- A. General: Engineer will not review submittals that do not bear Contractor's approval stamp and will return them to Contractor without action.
- B. Action Submittals: Engineer will review each submittal, make marks to indicate corrections or revisions required, and return it. Engineer will stamp each submittal with an action stamp and will mark stamp appropriately to indicate action.
- C. Informational Submittals: Engineer will review each submittal and will not return it, or will return it if it does not comply with requirements. Engineer will forward each submittal to appropriate party.
- D. Incomplete submittals are unacceptable, will be considered nonresponsive, and will be returned for resubmittal without review.

END OF SECTION 01 33 00

SECTION 01 50 00
TEMPORARY FACILITIES AND CONTROLS

PART 1 - GENERAL

1.1 SUMMARY

- A. Section includes requirements for temporary utilities, support facilities, and security and protection facilities.
- B. Related Requirements:
 - 1. Section 01 10 00 "Summary" for work restrictions and limitations on utility interruptions.

1.2 USE CHARGES

- A. General: Installation and removal of and use charges for temporary facilities shall be included in the Contract Sum unless otherwise indicated. Allow other entities to use temporary services and facilities without cost, including, but not limited to, Owner's construction forces, Engineer, testing agencies, and authorities having jurisdiction.
- B. Water and Sewer Service from Existing System: Water from Owner's existing water system is available for use without metering and without payment of use charges. Provide connections and extensions of services as required for construction operations.
- C. Electric Power Service from Existing System: Electric power from Owner's existing system is available for use without metering and without payment of use charges. Provide connections and extensions of services as required for construction operations.

1.3 INFORMATIONAL SUBMITTALS

- A. Site Plan: Show temporary facilities, utility hookups, staging areas, and parking areas for construction personnel.
- B. Fire-Safety Program: Show compliance with requirements of NFPA 241 and authorities having jurisdiction. Indicate Contractor personnel responsible for management of fire prevention program.

1.4 QUALITY ASSURANCE

- A. Electric Service: Comply with NECA, NEMA, and UL standards and regulations for temporary electric service. Install service to comply with NFPA 70.
- B. Tests and Inspections: Arrange for authorities having jurisdiction to test and inspect each temporary utility before use. Obtain required certifications and permits.

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1.5 PROJECT CONDITIONS

- A. Temporary Use of Permanent Facilities: Engage Installer of each permanent service to assume responsibility for operation, maintenance, and protection of each permanent service during its use as a construction facility before Owner's acceptance, regardless of previously assigned responsibilities.

PART 2 - PRODUCTS

2.1 MATERIALS

- A. Portable Chain-Link Fencing: Minimum 2-inch, 0.148-inch thick, galvanized-steel, chain-link fabric fencing; minimum 6 feet high with galvanized-steel pipe posts; minimum 2-3/8-inch OD line posts and 2-7/8-inch OD corner and pull posts, with 1-5/8-inch OD top and bottom rails. Provide concrete or galvanized-steel bases for supporting posts.

2.2 TEMPORARY FACILITIES

- A. Field Offices, General: Prefabricated or mobile units with serviceable finishes, temperature controls, and foundations adequate for normal loading.
- B. Common-Use Field Office: Of sufficient size to accommodate needs of Owner, Engineer, and construction personnel office activities and to accommodate Project meetings specified in other Division 01 Sections. Keep office clean and orderly.
- C. Storage and Fabrication Sheds: Provide sheds sized, furnished, and equipped to accommodate materials and equipment for construction operations.

2.3 EQUIPMENT

- A. Fire Extinguishers: Portable, UL rated; with class and extinguishing agent as required by locations and classes of fire exposures.
- B. HVAC Equipment: Unless Owner authorizes use of permanent HVAC system, provide vented, self-contained, liquid-propane-gas or fuel-oil heaters with individual space thermostatic control.
 - 1. Use of gasoline-burning space heaters, open-flame heaters, or salamander-type heating units is prohibited.
 - 2. Heating Units: Listed and labeled for type of fuel being consumed, by a qualified testing agency acceptable to authorities having jurisdiction and marked for intended location and application.
 - 3. Permanent HVAC System: If Owner authorizes use of permanent HVAC system for temporary use during construction, provide filter with MERV of 8 at each return-air grille in system and remove at end of construction and clean HVAC system as required in Section 017700 "Closeout Procedures".

PART 3 - EXECUTION

3.1 INSTALLATION, GENERAL

- A. Locate facilities where they will serve Project adequately and result in minimum interference with performance of the Work. Relocate and modify facilities as required by progress of the Work.
 - 1. Locate facilities to limit site disturbance as specified in Section 011000 "Summary."
- B. Provide each facility ready for use when needed to avoid delay. Do not remove until facilities are no longer needed or are replaced by authorized use of completed permanent facilities.

3.2 TEMPORARY UTILITY INSTALLATION

- A. Sanitary Facilities: Provide temporary toilets, wash facilities, and drinking water for use of construction personnel. Comply with requirements of authorities having jurisdiction for type, number, location, operation, and maintenance of fixtures and facilities.
 - 1. Toilets: Use of Owner's existing toilet facilities will be permitted, as long as facilities are cleaned and maintained in a condition acceptable to Owner. At Substantial Completion, restore these facilities to condition existing before initial use.
- B. Heating and Cooling: Provide temporary heating and cooling required by construction activities for curing or drying of completed installations or for protecting installed construction from adverse effects of low temperatures or high humidity. Select equipment that will not have a harmful effect on completed installations or elements being installed.
- C. Ventilation and Humidity Control: Provide temporary ventilation required by construction activities for curing or drying of completed installations or for protecting installed construction from adverse effects of high humidity. Select equipment that will not have a harmful effect on completed installations or elements being installed. Coordinate ventilation requirements to produce ambient condition required and minimize energy consumption.
- D. Electric Power Service: Connect to Owner's existing electric power service. Maintain equipment in a condition acceptable to Owner.
- E. Lighting: Provide temporary lighting with local switching that provides adequate illumination for construction operations, observations, inspections, and traffic conditions.
 - 1. Install and operate temporary lighting that fulfills security and protection requirements without operating entire system.

3.3 SUPPORT FACILITIES INSTALLATION

- A. Parking: Use designated areas of Owner's existing parking areas for construction personnel.
- B. Lifts and Hoists: Provide facilities necessary for hoisting materials and personnel.

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1. Truck cranes and similar devices used for hoisting materials are considered "tools and equipment" and not temporary facilities.

3.4 SECURITY AND PROTECTION FACILITIES INSTALLATION

- A. Protection of Existing Facilities: Protect existing vegetation, equipment, structures, utilities, and other improvements at Project site and on adjacent properties. Repair damage to existing facilities.
- B. Environmental Protection: Provide protection, operate temporary facilities, and conduct construction as required to comply with environmental regulations and that minimize possible air, waterway, and subsoil contamination or pollution or other undesirable effects.

3.5 MOISTURE AND MOLD CONTROL

- A. Contractor's Moisture Protection Plan: Avoid trapping water in finished work. Document visible signs of mold that may appear during construction.

3.6 OPERATION, TERMINATION, AND REMOVAL

- A. Supervision: Enforce strict discipline in use of temporary facilities. To minimize waste and abuse, limit availability of temporary facilities to essential and intended uses.
- B. Maintenance: Maintain facilities in good operating condition until removal.
 1. Maintain operation of temporary enclosures, heating, cooling, humidity control, ventilation, and similar facilities on a 24-hour basis where required to achieve indicated results and to avoid possibility of damage.
 2. At Substantial Completion, repair, and clean permanent facilities used during construction period. Comply with final cleaning requirements specified in Section 017700 "Closeout Procedures."

END OF SECTION 015000

SECTION 01 73 00
EXECUTION

PART 1 - GENERAL

1.1 SUMMARY

- A. Section includes general administrative and procedural requirements governing execution of the Work including, but not limited to, the following:
1. Construction layout.
 2. Field engineering and surveying.
 3. Installation of the Work.
 4. Cutting and patching.
 5. Coordination of Owner-installed products.
 6. Progress cleaning.
 7. Starting and adjusting.
 8. Protection of installed construction.

1.2 QUALITY ASSURANCE

- A. Cutting and Patching: Comply with requirements for and limitations on cutting and patching of construction elements.
1. Operational Elements: Do not cut and patch operating elements and related components in a manner that results in reducing their capacity to perform as intended or that results in increased maintenance or decreased operational life or safety.
 2. Visual Elements: Do not cut and patch construction in a manner that results in visual evidence of cutting and patching.

PART 2 - PRODUCTS

2.1 MATERIALS

- A. General: Comply with requirements specified in other Sections.
- B. In-Place Materials: Use materials for patching identical to in-place materials. For exposed surfaces, use materials that visually match in-place adjacent surfaces to the fullest extent possible.

1. If identical materials are unavailable or cannot be used, use materials that, when installed, will provide a match acceptable to Engineer for the visual and functional performance of in-place materials.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examination and Acceptance of Conditions: Before proceeding with each component of the Work, examine substrates, areas, and conditions, with Installer or Applicator present where indicated, for compliance with requirements for installation tolerances and other conditions affecting performance. Record observations.
- B. Proceed with installation only after unsatisfactory conditions have been corrected. Proceeding with the Work indicates acceptance of surfaces and conditions.

3.2 PREPARATION

- A. Field Measurements: Take field measurements as required to fit the Work properly. Recheck measurements before installing each product. Where portions of the Work are indicated to fit to other construction, verify dimensions of other construction by field measurements before fabrication. Coordinate fabrication schedule with construction progress to avoid delaying the Work.
- B. Space Requirements: Verify space requirements and dimensions of items shown diagrammatically on Drawings.
- C. Review of Contract Documents and Field Conditions: Immediately on discovery of the need for clarification of the Contract Documents caused by differing field conditions outside the control of Contractor, submit a request for information to Engineer according to requirements in Section 01 31 00 "Project Management and Coordination."

3.3 CONSTRUCTION LAYOUT

- A. Verification: Before proceeding to lay out the Work, verify layout information shown on Drawings. If discrepancies are discovered, notify Engineer promptly.

3.4 INSTALLATION

- A. General: Locate the Work and components of the Work accurately, in correct alignment and elevation, as indicated.
 1. Make vertical work plumb and make horizontal work level.

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2. Where space is limited, install components to maximize space available for maintenance and ease of removal for replacement.
 3. Conceal pipes in finished areas unless otherwise indicated.
- B. Comply with manufacturer's written instructions and recommendations for installing products in applications indicated.
- C. Install products at the time and under conditions that will ensure the best possible results. Maintain conditions required for product performance until Substantial Completion.
- D. Conduct construction operations so no part of the Work is subjected to damaging operations or loading in excess of that expected during normal conditions of occupancy.
- E. Sequence the Work and allow adequate clearances to accommodate movement of construction items on site and placement in permanent locations.
- F. Tools and Equipment: Do not use tools or equipment that produce harmful noise levels.
- G. Templates: Obtain and distribute to the parties involved templates for work specified to be factory prepared and field installed. Check Shop Drawings of other work to confirm that adequate provisions are made for locating and installing products to comply with indicated requirements.
- H. Attachment: Provide blocking and attachment plates and anchors and fasteners of adequate size and number to securely anchor each component in place, accurately located and aligned with other portions of the Work. Where size and type of attachments are not indicated, verify size and type required for load conditions.
1. Mounting Heights: Where mounting heights are not indicated, mount components at heights directed by Engineer.
 2. Allow for building movement, including thermal expansion and contraction.
 3. Coordinate installation of anchorages. Furnish setting drawings, templates, and directions for installing anchorages, including sleeves, concrete inserts, anchor bolts, and items with integral anchors, that are to be embedded in concrete or masonry. Deliver such items to Project site in time for installation.
- I. Joints: Make joints of uniform width. Where joint locations in exposed work are not indicated, arrange joints for the best visual effect. Fit exposed connections together to form hairline joints.
- J. Hazardous Materials: Use products, cleaners, and installation materials that are not considered hazardous.

3.5 CUTTING AND PATCHING

- A. Cutting and Patching, General: Employ skilled workers to perform cutting and patching. Proceed with cutting and patching at the earliest feasible time, and complete without delay.

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1. Cut in-place construction to provide for installation of other components or performance of other construction, and subsequently patch as required to restore surfaces to their original condition.
- B. Existing Warranties: Remove, replace, patch, and repair materials and surfaces cut or damaged during installation or cutting and patching operations, by methods and with materials so as not to void existing warranties.
- C. Temporary Support: Provide temporary support of work to be cut.
- D. Protection: Protect in-place construction during cutting and patching to prevent damage. Provide protection from adverse weather conditions for portions of Project that might be exposed during cutting and patching operations.
- E. Adjacent Occupied Areas: Avoid interference with use of adjoining areas or interruption of free passage to adjoining areas.
- F. Existing Utility Services and Mechanical/Electrical Systems: Where existing services/systems are required to be removed, relocated, or abandoned, bypass such services/systems before cutting to prevent interruption to occupied areas.
- G. Cutting: Cut in-place construction by sawing, drilling, breaking, chipping, grinding, and similar operations, including excavation, using methods least likely to damage elements retained or adjoining construction. If possible, review proposed procedures with original Installer; comply with original Installer's written recommendations.
 1. In general, use hand or small power tools designed for sawing and grinding, not hammering and chopping. Cut holes and slots neatly to minimum size required, and with minimum disturbance of adjacent surfaces. Temporarily cover openings when not in use.
 2. Finished Surfaces: Cut or drill from the exposed or finished side into concealed surfaces.
 3. Cut using a cutting machine, such as an abrasive saw or a diamond-core drill.
 4. Excavating and Backfilling: Comply with requirements in applicable Sections where required by cutting and patching operations.
 5. Mechanical and Electrical Services: Cut off pipe or conduit to be removed. Cap, valve, or plug and seal remaining portion of pipe or conduit to prevent entrance of moisture or other foreign matter after cutting.
 6. Proceed with patching after construction operations requiring cutting are complete.
- H. Patching: Patch construction by filling, repairing, refinishing, closing up, and similar operations following performance of other work. Patch with durable seams that are as invisible as practicable. Provide materials and comply with installation requirements specified in other Sections, where applicable.
 1. Inspection: Where feasible, test and inspect patched areas after completion to demonstrate physical integrity of installation.
 2. Exposed Finishes: Restore exposed finishes of patched areas and extend finish restoration into retained adjoining construction in a manner that will minimize evidence of patching and refinishing.

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- I. Cleaning: Clean areas and spaces where cutting and patching are performed.

3.6 PROGRESS CLEANING

- A. General: Clean Project site and work areas daily, including common areas. Enforce requirements strictly. Dispose of materials lawfully.
 - 1. Comply with requirements in NFPA 241 for removal of combustible waste materials and debris.
 - 2. Do not hold waste materials more than seven days during normal weather or three days if the temperature is expected to rise above 80 deg F.
 - 3. Containerize hazardous and unsanitary waste materials separately from other waste. Mark containers appropriately and dispose of legally, according to regulations.
- B. Site: Maintain Project site free of waste materials and debris.
- C. Work Areas: Clean areas where work is in progress to the level of cleanliness necessary for proper execution of the Work.
 - 1. Remove liquid spills promptly.
 - 2. Where dust would impair proper execution of the Work, broom-clean or vacuum the entire work area, as appropriate.
- D. Installed Work: Keep installed work clean. Clean installed surfaces according to written instructions of manufacturer or fabricator of product installed, using only cleaning materials specifically recommended. If specific cleaning materials are not recommended, use cleaning materials that are not hazardous to health or property and that will not damage exposed surfaces.
- E. Concealed Spaces: Remove debris from concealed spaces before enclosing the space.
- F. Exposed Surfaces in Finished Areas: Clean exposed surfaces and protect as necessary to ensure freedom from damage and deterioration at time of Substantial Completion.
- G. Waste Disposal: Do not bury or burn waste materials on-site. Do not wash waste materials down sewers or into waterways.
- H. During handling and installation, clean and protect construction in progress and adjoining materials already in place. Apply protective covering where required to ensure protection from damage or deterioration at time of Substantial Completion.
- I. Clean and provide maintenance on completed construction as frequently as necessary through the remainder of the construction period. Adjust and lubricate operable components to ensure operability without damaging effects.
- J. Limiting Exposures: Supervise construction operations to assure that no part of the construction, completed or in progress, is subject to harmful, dangerous, damaging, or otherwise deleterious exposure during the construction period.

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3.7 STARTING AND ADJUSTING

- A. Start equipment and operating components to confirm proper operation. Remove malfunctioning units, replace with new units, and retest.
- B. Adjust equipment for proper operation. Adjust operating components for proper operation without binding.
- C. Test each piece of equipment to verify proper operation. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment.

3.8 PROTECTION OF INSTALLED CONSTRUCTION

- A. Provide final protection and maintain conditions that ensure installed Work is without damage or deterioration at time of Substantial Completion.
- B. Comply with manufacturer's written instructions for temperature and relative humidity.

END OF SECTION 01 73 00

SECTION 01 73 29
CUTTING AND PATCHING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. This Section includes procedural requirements for cutting and patching.

1.3 DEFINITIONS

- A. Cutting: Removal of in-place construction necessary to permit installation or performance of other Work.
- B. Patching: Fitting and repair work required to restore surfaces to original conditions after installation of other Work.

1.4 UNIT PRICES

- A. The measurement for payment for Demo/Cut CMU Wall(s) will be per square foot.
- B. Payment will be made at the contract price for Demo/Cut CMU Wall(s) for this scheduled item. Payment will constitute full compensation for furnishing all materials, equipment, tools, all labor and other incidentals necessary to complete the Demo/Cut of CMU Wall(s).

1.5 QUALITY ASSURANCE

- A. Operational Elements: Do not cut and patch operating elements and related components in a manner that results in reducing their capacity to perform as intended or that results in increased maintenance or decreased operational life or safety.
- B. Visual Requirements: Do not cut and patch construction in a manner that results in visual evidence of cutting and patching.

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1.6 WARRANTY

- A. Existing Warranties: Remove, replace, patch, and repair materials and surfaces cut or damaged during cutting and patching operations, by methods and with materials so as not to void existing warranties.

PART 2 - PRODUCTS

2.1 MATERIALS

- A. General: Comply with requirements specified in other Sections.
- B. In-Place Materials: Use materials identical to in-place materials. For exposed surfaces, use materials that visually match in-place adjacent surfaces to the fullest extent possible.
 - 1. If identical materials are unavailable or cannot be used, use materials that, when installed, will match the visual and functional performance of in-place materials.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine surfaces to be cut and patched and conditions under which cutting and patching are to be performed.
 - 1. Compatibility: Before patching, verify compatibility with and suitability of substrates, including compatibility with in-place finishes or primers.
 - 2. Proceed with installation only after unsafe or unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Temporary Support: Provide temporary support of Work to be cut.
- B. Protection: Protect in-place construction during cutting and patching to prevent damage. Provide protection from adverse weather conditions for portions of Project that might be exposed during cutting and patching operations.
- C. Adjoining Areas: Avoid interference with use of adjoining areas or interruption of free passage to adjoining areas.
- D. Existing Utility Services and Mechanical/Electrical Systems: Where existing services/systems are required to be removed, relocated, or abandoned, bypass such services/systems before cutting to prevent interruption to occupied areas.

3.3 PERFORMANCE

- A. General: Employ skilled workers to perform cutting and patching. Proceed with cutting and patching at the earliest feasible time, and complete without delay.
 - 1. Cut in-place construction to provide for installation of other components or performance of other construction, and subsequently patch as required to restore surfaces to their original condition.
- B. Cutting: Cut in-place construction by sawing, drilling, breaking, chipping, grinding, and similar operations, including excavation, using methods least likely to damage elements retained or adjoining construction. If possible, review proposed procedures with original Installer; comply with original Installer's written recommendations.
 - 1. In general, use hand or small power tools designed for sawing and grinding, not hammering and chopping. Cut holes and slots as small as possible, neatly to size required, and with minimum disturbance of adjacent surfaces. Temporarily cover openings when not in use.
 - 2. Finished Surfaces: Cut or drill from the exposed or finished side into concealed surfaces.
 - 3. Concrete and Masonry: Cut using a cutting machine, such as an abrasive saw or a diamond-core drill.
 - 4. Excavating and Backfilling: Comply with requirements in applicable Division 31 Sections where required by cutting and patching operations.
 - 5. Mechanical and Electrical Services: Cut off pipe or conduit in walls or partitions to be removed. Cap, valve, or plug and seal remaining portion of pipe or conduit to prevent entrance of moisture or other foreign matter after cutting.
 - 6. Proceed with patching after construction operations requiring cutting are complete.
- C. Patching: Patch construction by filling, repairing, refinishing, closing up, and similar operations following performance of other Work. Patch with durable seams that are as invisible as possible. Provide materials and comply with installation requirements specified in other Sections.
 - 1. Inspection: Where feasible, test and inspect patched areas after completion to demonstrate integrity of installation.
 - 2. Exposed Finishes: Restore exposed finishes of patched areas and extend finish restoration into retained adjoining construction in a manner that will eliminate evidence of patching and refinishing.
 - a. Clean piping, conduit, and similar features before applying paint or other finishing materials.
 - b. Restore damaged pipe covering to its original condition.
- D. Cleaning: Clean areas and spaces where cutting and patching are performed. Completely remove paint, mortar, oils, putty, and similar materials.

END OF SECTION 01 73 29

SECTION 01 77 00
CLOSEOUT PROCEDURES

PART 1 - GENERAL

1.1 SUMMARY

- A. Section includes administrative and procedural requirements for contract closeout, including, but not limited to, the following:
 - 1. Substantial Completion procedures preceding the Recommendation of Acceptance.
 - 2. Final completion procedures.
 - 3. Warranties.
 - 4. Final cleaning.
 - 5. Repair of the Work.

1.2 ACTION SUBMITTALS

- A. Contractor's List of Incomplete Items: Initial submittal at time of Substantial Completion.
- B. Certified List of Incomplete Items: Final submittal at Recommendation of Acceptance.

1.3 CLOSEOUT SUBMITTALS

- A. Certificates of Release: From authorities having jurisdiction.
- B. Certificate of Insurance: For continuing coverage.

1.4 MAINTENANCE MATERIAL SUBMITTALS

- A. Schedule of Maintenance Material Items: Contractor to provide four (4) copies of binders containing maintenance and warranty information.

1.5 SUBSTANTIAL COMPLETION PROCEDURES PRECEDING THE RECOMMENDATION OF ACCEPTANCE

- A. Contractor's List of Incomplete Items: Prepare and submit a preliminary list of items to be completed and corrected (Contractor's Preliminary Punch List).
- B. Submittals Prior to Substantial Completion: Complete the following a minimum of ten (10) days prior to requesting inspection for determining date of Recommendation of Acceptance. List items below that are incomplete at time of request.
 - 1. Certificates of Release: Obtain and submit releases from authorities having jurisdiction permitting Owner unrestricted use of the Work and access to services and utilities. Include occupancy permits, operating certificates, and similar releases.

2. Submit closeout submittals specified in other Division 01 Sections, including project record documents, operation and maintenance manuals, final completion construction photographic documentation, damage or settlement surveys, property surveys, and similar final record information.
 3. Submit closeout submittals specified in individual Sections, including specific warranties, workmanship bonds, final certifications, and similar documents.
 4. Submit maintenance material submittals specified in individual Sections, including tools, spare parts, extra materials, and similar items, and deliver to location designated by Engineer. Label with manufacturer's name and model number where applicable.
 - a. Schedule of Maintenance Material Items: Prepare and submit schedule of maintenance material submittal items, including name and quantity of each item and name and number of related Specification Section. Obtain Engineer's signature for receipt of submittals.
 5. Submit test/adjust records.
 6. Submit changeover information related to Owner's occupancy, use, operation, and maintenance.
- C. Procedures Prior to Substantial Completion: Complete the following a minimum of ten (10) days prior to requesting inspection for determining date of Recommendation of Acceptance. List items below that are incomplete at time of request.
1. Advise Owner through Designer of pending insurance changeover requirements.
 2. Complete startup and testing of systems and equipment.
 3. Perform preventive maintenance on equipment used prior to Substantial Completion.
 4. Instruct User's personnel in operation, adjustment, and maintenance of products, equipment, and systems.
 5. Advise Owner through Designer of any changeover in utilities.
 6. Terminate and remove temporary facilities from Project site, along with construction tools and similar elements.
 7. Complete final cleaning requirements, including touchup painting.
 8. Touch up and otherwise repair and restore marred exposed finishes to eliminate visual defects.
- D. Inspection: Submit a written request for inspection to determine Recommendation of Acceptance a minimum of ten (10) days prior to date the work will be completed and ready for final inspection and tests. On receipt of request, Engineer will either proceed with inspection or notify Contractor of unfulfilled requirements. Engineer will prepare the Recommendation of Acceptance after inspection or will notify Contractor of items, either on Contractor's list or additional items identified by Engineer, that must be completed or corrected before certificate will be issued.
1. Reinspection: Request reinspection when the Work identified in previous inspections as incomplete is completed or corrected.
 2. Results of completed inspection will form the basis of requirements for final completion.

1.6 FINAL COMPLETION PROCEDURES

- A. Preliminary Procedures: Before requesting final inspection for determining final completion, complete the following:

1. Submit a final Application for Payment according to Section 01 29 00 "Payment Procedures."
2. Certified List of Incomplete Items: Submit certified copy of Engineer's Substantial Completion inspection list of items to be completed or corrected (punch list), endorsed and dated by Engineer. Certified copy of the list shall state that each item has been completed or otherwise resolved for acceptance. Designer will verify.
3. Certificate of Insurance: Submit evidence of final, continuing insurance coverage complying with insurance requirements.
4. Instruct User's personnel in operation, adjustment, and maintenance of products, equipment, and systems.

B. Inspection: Submit a written request for final inspection to determine acceptance. On receipt of request, Engineer will either proceed with inspection or notify Contractor of unfulfilled requirements. Engineer will prepare a final Certificate for Payment after inspection or will notify Contractor of construction that must be completed or corrected before certificate will be issued.

1. Reinspection: Request reinspection when the Work identified in previous inspections as incomplete is completed or corrected.

1.7 PRELIMINARY LIST OF INCOMPLETE ITEMS (PUNCH LIST)

- A. Organization of List: Include name and identification of each item needing correction including, if necessary, areas disturbed by Contractor that are outside the limits of construction.
1. Submit preliminary list of incomplete items in PDF electronic file format.
 2. Designer will prepare final punch list.

1.8 SUBMITTAL OF PROJECT WARRANTIES

A. Time of Submittal: Submit written warranties on request of Engineer for designated portions of the Work where commencement of warranties other than date of Recommendation of Acceptance is indicated, or when delay in submittal of warranties might limit Owner's rights under warranty.

B. Organize warranty documents into an orderly sequence based on the table of contents of the Project Manual.

1. Bind warranties and bonds in heavy-duty, three-ring, vinyl-covered, loose-leaf binders, thickness as necessary to accommodate contents, and sized to receive 8-1/2-by-11-inch paper.
2. Provide heavy paper dividers with plastic-covered tabs for each separate warranty. Mark tab to identify the product or installation. Provide a typed description of the product or installation, including the name of the product and the name, address, and telephone number of Installer.
3. Identify each binder on the front and spine with the typed or printed title "WARRANTIES," Project name, and name of Contractor.
4. Warranty Electronic File: Scan warranties and bonds and assemble complete warranty and bond submittal package into a single indexed electronic PDF file with links enabling navigation to each item. Provide bookmarked table of contents at beginning of document.

- C. Provide additional copies of each warranty to include in operation and maintenance manuals, to be submitted in triplicate.

PART 2 - PRODUCTS

2.1 MATERIALS

- A. Cleaning Agents: Use cleaning materials and agents recommended by manufacturer or fabricator of the surface to be cleaned. Do not use cleaning agents that are potentially hazardous to health or property or that might damage finished surfaces.

PART 3 - EXECUTION

3.1 FINAL CLEANING

- A. General: Perform final cleaning. Conduct cleaning and waste-removal operations to comply with local laws and ordinances and Federal and local environmental and antipollution regulations.
 - 1. Clean exposed surfaces.
 - a. HEPA vacuum all surfaces.
 - b. Damp wipe all non-porous exposed surfaces including polyethylene sheets used to protect materials, external surfaces of ductwork, studs, and floors with clean rag and clean potable water or detergent solution.
 - c. Remove any poly sheeting protecting desks or equipment and HEPA vacuum all surfaces protected by poly sheeting.
 - d. Damp wipe non-porous surfaces protected by poly sheeting with clean water or a detergent solution.
- B. Cleaning: Employ experienced workers or professional cleaners for final cleaning. Clean each surface or unit to condition expected in an average commercial building cleaning and maintenance program. Comply with manufacturer's written instructions.
 - 1. Complete the following cleaning operations before requesting inspection for Recommendation of Acceptance for entire Project or for a designated portion of Project:
 - a. Clean Project site, yard, and grounds, in areas disturbed by construction activities, including landscape development areas, of rubbish, waste material, litter, and other foreign substances.
 - b. Sweep paved areas broom clean. Remove petrochemical spills, stains, and other foreign deposits.
 - c. Rake grounds that are neither planted nor paved to a smooth, even-textured surface.
 - d. Remove tools, construction equipment, machinery, and surplus material from Project site.

- e. Remove debris and surface dust from limited access spaces, including roofs, plenums, shafts, trenches, equipment vaults, manholes, attics, and similar spaces.
- f. Remove labels that are not permanent.
- g. Wipe surfaces of mechanical and electrical equipment if any and similar equipment. Remove excess lubrication, paint and mortar droppings, and other foreign substances.
- h. Clean plumbing fixtures to a sanitary condition, free of stains, including stains resulting from water exposure.
- i. Leave Project clean and ready for occupancy.

3.2 REPAIR OF THE WORK

- A. Complete repair and restoration operations before requesting inspection for determination of Recommendation of Acceptance.
- B. Repair or remove and replace defective construction. Repairing includes replacing defective parts, refinishing damaged surfaces, touching up with matching materials, and properly adjusting operating equipment. Where damaged or worn items cannot be repaired or restored, provide replacements. Remove and replace operating components that cannot be repaired. Restore damaged construction and permanent facilities used during construction to specified condition.
 - 1. Remove and replace chipped, scratched, and broken glass, reflective surfaces, and other damaged transparent materials.
 - 2. Touch up and otherwise repair and restore marred or exposed finishes and surfaces. Replace finishes and surfaces that already show evidence of repair or restoration.
 - a. Do not paint over "UL" and other required labels and identification, including mechanical and electrical nameplates. Remove paint applied to required labels and identification.
 - 3. Replace parts subject to operating conditions during construction that may impede operation or reduce longevity.

3.3 UNIT PRICES

- A. The measurement for payment to Provide Final Cleanup will be per square foot.
- B. Payment will be made at the contract price to Provide Final Cleanup for this scheduled item. Payment will constitute full compensation for furnishing all materials, equipment, tools, all labor and other incidentals necessary to complete the Final Cleanup.

END OF SECTION 01 77 00

SECTION 01 78 23
OPERATION AND MAINTENANCE DATA

PART 1 - GENERAL

1.1 SUMMARY

- A. Section includes administrative and procedural requirements for preparing operation and maintenance manuals, including the following:
1. Operation and maintenance documentation directory.
 2. Operation manuals for systems, subsystems, and equipment.
 3. Product maintenance manuals.
 4. Systems and equipment maintenance manuals.

1.2 CLOSEOUT SUBMITTALS

- A. Manual Content: Operations and maintenance manual content is specified in individual Specification Sections to be reviewed at the time of Section submittals. Submit reviewed manual content formatted and organized as required by this Section.
1. Engineer will comment on whether content of operations and maintenance submittals are acceptable.
 2. Where applicable, clarify and update reviewed manual content to correspond to revisions and field conditions.
- B. Format: Submit operations and maintenance manuals in the following format to the Engineer:
1. PDF electronic file. Assemble each manual into a composite electronically indexed file. Submit on digital media acceptable to Engineer.
 - a. Name each indexed document file in composite electronic index with applicable item name. Include a complete electronically linked operation and maintenance directory.
 - b. Enable inserted reviewer comments on draft submittals.
- C. Manual Submittal: Submit each manual in final form prior to requesting inspection for Substantial Completion and at least fifteen (15) days before commencing demonstration and training. Engineer will return copy with comments.
1. Correct or revise each manual to comply with Engineer's comments. Submit copies of each corrected manual within fifteen (15) days of receipt of Engineer's comments and prior to commencing demonstration and training.

PART 2 - PRODUCTS

2.1 REQUIREMENTS FOR EMERGENCY, OPERATION, AND MAINTENANCE MANUALS

- A. Directory: Prepare a single, comprehensive directory of emergency, operation, and maintenance data and materials, listing items and their location to facilitate ready access to desired information.
- B. Organization: Unless otherwise indicated, organize each manual into a separate section for each system and subsystem, and a separate section for each piece of equipment not part of a system. Each manual shall contain the following materials, in the order listed:
 - 1. Title page.
 - 2. Table of contents.
 - 3. Manual contents.
- C. Title Page: Include the following information:
 - 1. Subject matter included in manual.
 - 2. Name and address of Project.
 - 3. Name and address of Owner.
 - 4. Date of submittal.
 - 5. Name and contact information for Contractor.
 - 6. Name and contact information for Engineer.
 - 7. Names and contact information for major consultants to the Engineer that designed the systems contained in the manuals.
 - 8. Cross-reference to related systems in other operation and maintenance manuals.
- D. Table of Contents: List each product included in manual, identified by product name, indexed to the content of the volume, and cross-referenced to Specification Section number in Project Manual.
- E. Manual Contents: Organize into sets of manageable size. Arrange contents alphabetically by system, subsystem, and equipment. If possible, assemble instructions for subsystems, equipment, and components of one system into a single binder.
- F. Manuals, Electronic Files: Submit manuals in the form of a multiple file composite electronic PDF file for each manual type required.
 - 1. Electronic Files: Use electronic files prepared by manufacturer where available. Where scanning of paper documents is required, configure scanned file for minimum readable file size.
 - 2. File Names and Bookmarks: Enable bookmarking of individual documents based on file names. Name document files to correspond to system, subsystem, and equipment names used in manual directory and table of contents. Group documents for each system and subsystem into individual composite bookmarked files, then create composite manual, so that resulting bookmarks reflect the system, subsystem, and equipment names in a readily navigated file tree. Configure electronic manual to display bookmark panel on opening file.

- G. Manuals, Paper Copy: Submit manuals in the form of hard copy, bound and labeled volumes.
1. Binders: Heavy-duty, three-ring, vinyl-covered, loose-leaf binders, in thickness necessary to accommodate contents, sized to hold 8-1/2-by-11-inch paper; with clear plastic sleeve on spine to hold label describing contents and with pockets inside covers to hold folded oversize sheets.
 - a. Identify each binder on front and spine, with printed title "OPERATION AND MAINTENANCE MANUAL," Project title or name, and subject matter of contents, and indicate Specification Section number on bottom of spine. Indicate volume number for multiple-volume sets.
 2. Dividers: Heavy-paper dividers with plastic-covered tabs for each section of the manual. Mark each tab to indicate contents. Include typed list of products and major components of equipment included in the section on each divider, cross-referenced to Specification Section number and title of Project Manual.
 3. Protective Plastic Sleeves: Transparent plastic sleeves designed to enclose diagnostic software storage media for computerized electronic equipment.
 4. Drawings: Attach reinforced, punched binder tabs on drawings and bind with text.
 - a. If oversize drawings are necessary, fold drawings to same size as text pages and use as foldouts.
 - b. If drawings are too large to be used as foldouts, fold and place drawings in labeled envelopes and bind envelopes in rear of manual. At appropriate locations in manual, insert typewritten pages indicating drawing titles, descriptions of contents, and drawing locations.

2.2 OPERATION MANUALS

- A. Content: In addition to requirements in this Section, include operation data required in individual Specification Sections and the following information:
1. System, subsystem, and equipment descriptions. Use designations for systems and equipment indicated on Contract Documents.
 2. Performance and design criteria if Contractor is delegated design responsibility.
 3. Operating standards.
 4. Operating procedures.
 5. Operating logs.
 6. Wiring diagrams.
 7. Control diagrams.
 8. Piped system diagrams.
 9. Precautions against improper use.
 10. License requirements including inspection and renewal dates.
- B. Descriptions: Include the following:
1. Product name and model number. Use designations for products indicated on Contract Documents.
 2. Manufacturer's name.
 3. Equipment identification with serial number of each component.

4. Equipment function.
5. Operating characteristics.
6. Limiting conditions.
7. Performance curves.
8. Engineering data and tests.
9. Complete nomenclature and number of replacement parts.

C. Operating Procedures: Include the following, as applicable:

1. Startup procedures.
2. Equipment or system break-in procedures.
3. Routine and normal operating instructions.
4. Regulation and control procedures.
5. Instructions on stopping.
6. Normal shutdown instructions.
7. Seasonal and weekend operating instructions.
8. Required sequences for electric or electronic systems.
9. Special operating instructions and procedures.

D. Piped Systems: Diagram piping as installed, and identify color-coding where required for identification.

2.3 PRODUCT MAINTENANCE MANUALS

A. Content: Organize manual into a separate section for each product, material, and finish. Include source information, product information, maintenance procedures, repair materials and sources, and warranties and bonds, as described below.

B. Source Information: List each product included in manual, identified by product name and arranged to match manual's table of contents. For each product, list name, address, and telephone number of Installer or supplier and maintenance service agent, and cross-reference Specification Section number and title in Project Manual.

C. Product Information: Include the following, as applicable:

1. Product name and model number.
2. Manufacturer's name.
3. Color, pattern, and texture.
4. Material and chemical composition.
5. Reordering information for specially manufactured products.

D. Maintenance Procedures: Include manufacturer's written recommendations and the following:

1. Inspection procedures.
2. Types of cleaning agents to be used and methods of cleaning.
3. List of cleaning agents and methods of cleaning detrimental to product.
4. Schedule for routine cleaning and maintenance.
5. Repair instructions.

- E. Repair Materials and Sources: Include lists of materials and local sources of materials and related services.
- F. Warranties and Bonds: Include copies of warranties and bonds and lists of circumstances and conditions that would affect validity of warranties or bonds.

2.4 SYSTEMS AND EQUIPMENT MAINTENANCE MANUALS

- A. Content: For each system, subsystem, and piece of equipment not part of a system, include source information, manufacturers' maintenance documentation, maintenance procedures, maintenance and service schedules, spare parts list and source information, maintenance service contracts, and warranty and bond information, as described below.
- B. Source Information: List each system, subsystem, and piece of equipment included in manual, identified by product name and arranged to match manual's table of contents. For each product, list name, address, and telephone number of Installer or supplier and maintenance service agent, and cross-reference Specification Section number and title in Project Manual.
- C. Manufacturers' Maintenance Documentation: Manufacturers' maintenance documentation including the following information for each component part or piece of equipment:
 - 1. Standard maintenance instructions and bulletins.
 - 2. Drawings, diagrams, and instructions required for maintenance, including disassembly and component removal, replacement, and assembly.
 - 3. Identification and nomenclature of parts and components.
 - 4. List of items recommended to be stocked as spare parts.
- D. Maintenance Procedures: Include the following information and items that detail essential maintenance procedures:
 - 1. Test and inspection instructions.
 - 2. Troubleshooting guide.
 - 3. Precautions against improper maintenance.
 - 4. Disassembly; component removal, repair, and replacement; and reassembly instructions.
 - 5. Aligning, adjusting, and checking instructions.
 - 6. Demonstration and training video recording, if available.
- E. Maintenance and Service Schedules: Include service and lubrication requirements, list of required lubricants for equipment, and separate schedules for preventive and routine maintenance and service with standard time allotment.
- F. Spare Parts List and Source Information: Include lists of replacement and repair parts, with parts identified and cross-referenced to manufacturers' maintenance documentation and local sources of maintenance materials and related services.
- G. Maintenance Service Contracts: Include copies of maintenance agreements with name and telephone number of service agent.
- H. Warranties and Bonds: Include copies of warranties and bonds and lists of circumstances and conditions that would affect validity of warranties or bonds.

PART 3 - EXECUTION

3.1 MANUAL PREPARATION

- A. Product Maintenance Manual: Assemble a complete set of maintenance data indicating care and maintenance of each product, material, and finish incorporated into the Work.
- B. Operation and Maintenance Manuals: Assemble a complete set of operation and maintenance data indicating operation and maintenance of each system, subsystem, and piece of equipment not part of a system.
- C. Manufacturers' Data: Where manuals contain manufacturers' standard printed data, include only sheets pertinent to product or component installed. Mark each sheet to identify each product or component incorporated into the Work. If data include more than one item in a tabular format, identify each item using appropriate references from the Contract Documents. Identify data applicable to the Work and delete references to information not applicable.
- D. Drawings: Prepare drawings supplementing manufacturers' printed data to illustrate the relationship of component parts of equipment and systems and to illustrate control sequence and flow diagrams. Coordinate these drawings with information contained in record Drawings to ensure correct illustration of completed installation.
 - 1. Do not use original project record documents as part of operation and maintenance manuals.
- E. Comply with Section 01 77 00 "Closeout Procedures" for schedule for submitting operation and maintenance documentation.

END OF SECTION 01 78 23

SECTION 01 78 39
PROJECT RECORD DOCUMENTS

PART 1 - GENERAL

1.1 SUMMARY

- A. Section includes administrative and procedural requirements for project record documents, including the following:
 - 1. Record Drawings.
 - 2. Record Specifications.
 - 3. Record Product Data.

1.2 CLOSEOUT SUBMITTALS

- A. Marked up Record Drawings: Comply with the following:
 - 1. Submit one (1) color paper-copy set(s) of marked-up record prints. Print each drawing, whether or not changes and additional information were recorded.
 - 2. Submit PDF electronic files of color scanned record prints.
 - 3. Engineer will indicate whether general scope of changes, additional information recorded, and quality of mark-ups are acceptable.
- B. Record Specifications: Submit one paper copy or annotated PDF electronic files of Project's Specifications, including addenda and contract modifications.
- C. Record Product Data: Submit one paper copy or annotated PDF electronic files and directories of each submittal.

PART 2 - PRODUCTS

2.1 RECORD DRAWINGS

- A. Record Prints: Maintain one set of marked-up paper copies of the Contract Drawings and Shop Drawings, incorporating new and revised Drawings as modifications are issued.
 - 1. Preparation: Mark record prints to show the actual installation where installation varies from that shown originally. Require individual or entity who obtained record data, whether individual or entity is Installer, subcontractor, or similar entity, to provide information for preparation of corresponding marked-up record prints.
 - a. Give particular attention to information on concealed elements that would be difficult to identify or measure and record later.

- b. Record data as soon as possible after obtaining it.
 - c. Record and check the markup before enclosing concealed installations.
2. Mark the Contract Drawings and Shop Drawings completely and accurately. Use personnel proficient at recording graphic information in production of marked-up record prints.
 3. Mark record sets with erasable, red-colored pencil. Use other colors to distinguish between changes for different categories of the Work at same location.
 4. Note Construction Change Directive numbers, alternate numbers, Change Order numbers, and similar identification, where applicable.

2.2 RECORD SPECIFICATIONS

- A. Preparation: Mark Specifications to indicate the actual product installation where installation varies from that indicated in Specifications, addenda, and contract modifications.
 1. Give particular attention to information on concealed products and installations that cannot be readily identified and recorded later.
 2. Mark copy with the proprietary name and model number of products, materials, and equipment furnished, including substitutions and product options selected.
 3. Record the name of manufacturer, supplier, Installer, and other information necessary to provide a record of selections made.
 4. Note related Change Orders, record Product Data, and record Drawings where applicable.
- B. Format: Submit record Specifications as paper copy or annotated PDF electronic file.

2.3 RECORD PRODUCT DATA

- A. Preparation: Mark Product Data to indicate the actual product installation where installation varies substantially from that indicated in Product Data submittal.
 1. Give particular attention to information on concealed products and installations that cannot be readily identified and recorded later.
 2. Include significant changes in the product delivered to Project site and changes in manufacturer's written instructions for installation.
 3. Note related Change Orders, record Specifications, and record Drawings where applicable.
- B. Format: Submit record Product Data as paper copy, annotated PDF electronic files or scanned PDF electronic file(s) of marked-up paper copy of Product Data.

2.4 MISCELLANEOUS RECORD SUBMITTALS

- A. Assemble miscellaneous records required by other Specification Sections for miscellaneous record keeping and submittal in connection with actual performance of the Work. Bind or file miscellaneous records and identify each, ready for continued use and reference.

- B. Format: Submit miscellaneous record submittals as paper copy, annotated PDF electronic files or scanned PDF electronic file(s) of marked-up paper copy of Product Data.

PART 3 - EXECUTION

3.1 RECORDING AND MAINTENANCE

- A. Recording: Maintain one copy of each submittal during the construction period for project record document purposes. Post changes and revisions to project record documents as they occur; do not wait until end of Project.
- B. Maintenance of Record Documents and Samples: Store record documents and Samples in the field office apart from the Contract Documents used for construction. Do not use project record documents for construction purposes. Maintain record documents in good order and in a clean, dry, legible condition, protected from deterioration and loss. Provide access to project record documents for Engineer's reference during normal working hours.

END OF SECTION 01 78 39

DIVISION 2

Existing Conditions



DAMMON
ENGINEERING, INC.

DAMMON ENGINEERING, INC.
554 OLD SPANISH TRAIL
SLIDELL, LOUISIANA 70458
Phone: 985-649-5832
dammonengineering.com
info@dammonengineering.com

SECTION 02 41 19
SELECTIVE DEMOLITION

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. This Section includes the following:
 - 1. Demolition and removal of selected equipment within the building.
 - 2. Salvage of existing items to be reused or recycled.

1.3 DEFINITIONS

- A. Remove: Detach items from existing construction and legally dispose of them off-site, unless indicated to be removed and salvaged or removed and reinstalled.
- B. Remove and Salvage: Detach items from existing construction and deliver them to User ready for reuse.
- C. Remove and Reinstall: Detach items from existing construction, prepare them for reuse, and reinstall them where indicated.
- D. Existing to Remain: Existing items of construction that are not to be removed and that are not otherwise indicated to be removed, removed and salvaged, or removed and reinstalled.

1.4 MATERIALS OWNERSHIP

- A. Historic items, relics, and similar objects including, but not limited to, cornerstones and their contents, commemorative plaques and tablets, antiques, and other items of interest or value to Owner that may be encountered during selective demolition remain Owner's property. Carefully remove and salvage each item or object in a manner to prevent damage and deliver promptly to User.

1.5 SUBMITTALS

- A. Schedule of Selective Demolition Activities: Indicate the following:
1. Detailed sequence of selective demolition and removal work, with starting and ending dates for each activity. Ensure User's on-site operations are uninterrupted.
 2. Interruption of utility services. Indicate how long utility services will be interrupted.
 3. Coordination for shutoff, capping, and continuation of utility services.
 4. Coordination of User's continuing occupancy of portions of existing building and of User's partial occupancy of completed Work.
 5. Means of protection for items to remain and items in path of waste removal from building.
 6. Method of providing on-site security.
- B. Inventory: After selective demolition is complete, submit a list of items that have been removed and salvaged.
- C. Predemolition Photographs or Videotapes: Show existing conditions of adjoining construction and site improvements, including finish surfaces that might be misconstrued as damage caused by selective demolition operations.

1.6 QUALITY ASSURANCE

- A. Regulatory Requirements: Comply with governing EPA notification regulations before beginning selective demolition. Comply with hauling and disposal regulations of authorities having jurisdiction.
- B. Standards: Comply with ANSI A10.6 and NFPA 241.
- C. Pre-demolition Conference: Conduct conference at Project site to comply with requirements in Section 01 31 00 "Project Management and Coordination." Review methods and procedures related to selective demolition including, but not limited to, the following:
1. Inspect and discuss condition of construction to be selectively demolished.
 2. Review and finalize selective demolition schedule and verify availability of materials, demolition personnel, equipment, and facilities needed to make progress and avoid delays.
 3. Review requirements of work performed by other trades that rely on substrates exposed by selective demolition operations.
 4. Review areas where existing construction is to remain and requires protection.
 5. Review procedures for site security and work site access.
 6. Review procedure(s) for identification and or removal of any asbestos that may be found during demolition.

1.7 PROJECT CONDITIONS

- A. User will occupy portions of building immediately adjacent to selective demolition area. Conduct selective demolition so that User's operations will not be disrupted.
 - 1. Comply with requirements specified in Section 01 10 00 "Summary of Work."
- B. Conditions existing at time of inspection for bidding purpose will be maintained by Owner as far as practical.
- C. Notify Architect in writing of discrepancies between existing conditions and Drawings before proceeding with selective demolition.
- D. Hazardous Materials:
 - 1. Upon encountering any previously unidentified materials which he suspects may contain asbestos, the Contractor shall immediately cease all work in the immediate vicinity of the suspected materials and notify the Designer and the Owner. The Owner shall retain consultants to identify the suspected materials. Upon identification, the Owner reserves the right to contract separately for the removal or require the Contractor (if qualified) to remove said materials in accordance with the following provision. In any case, the work shall be performed by a licensed and certified Abatement Contractor.
 - 2. The Louisiana Department of Environmental Quality (D.E.Q.) has issued the Louisiana Emission Standards for Hazardous Air Pollutants. Where asbestos is encountered in a project, the Contractor shall comply with all laws and ordinances pertaining to asbestos handling and abatement, including the latest revision of LAC 33:III, Chapter 25, Subchapter F, Emission Standards for Hazardous Air Pollutants, LAC 33: III, Chapter 27, Asbestos Containing Materials in Schools and Public Buildings and LAC:33III, Chapter 51, Subchapter M, Section 5151, Emission Standards for Asbestos.

Notification should be addressed to:

Asbestos Supervisor
Louisiana Department of Environmental
Quality
Air Quality Division
Post Office Box 4313
Baton Rouge, Louisiana 70831-4313

3. If the Owner chooses to remove any previously unidentified materials by utilizing different Contractors, the Contractor shall cooperate fully with the Owner's consultants and asbestos abatement Contractor permitting them full access to the project, and shall not resume work in the vicinity of the suspected materials until advised by the Designer and the Owner that it is safe to do so.

4. The Designer shall specify the use of third party air monitoring firms (with no ownership associations with the contractor) in an expanded inspection role as follows: document daily work activities, number of workers present, track and quantify removal

quantities (where necessary and where unit pricing is called for in specifications), perform pre-clearance inspection and verify on a daily basis the contractor work with the design documents and report to the designer any conflicts.

5. If materials suspected of containing hazardous materials are encountered, do not disturb; immediately notify both Architect and Owner in writing.

E. Storage or sale of removed items or materials on-site is not permitted.

F. Utility Service: Maintain existing utilities indicated to remain in service and protect them against damage during selective demolition operations.

1. Maintain fire-protection facilities and life safety components in service during selective demolition operations.

1.8 WARRANTY

A. Existing Warranties: Remove, replace, patch, and repair materials and surfaces cut or damaged during selective demolition, by methods and with materials so as not to void existing warranties.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION

3.1 EXAMINATION

A. Verify that utilities have been disconnected and capped.

B. Survey existing conditions and correlate with requirements indicated to determine extent of selective demolition required.

C. Inventory and record the condition of items to be removed and reinstalled and items to be removed and salvaged.

D. When unanticipated mechanical, electrical, or structural elements that conflict with intended function or design are encountered, investigate and measure the nature and extent of conflict. Promptly submit a written report to Owner and Architect.

E. Survey of Existing Conditions: Record existing conditions by use of preconstruction photographs or preconstruction videotapes.

1. Before selective demolition or removal of existing building elements that will be reproduced or duplicated in final Work, make permanent record of measurements, materials, and construction details required to make exact reproduction.

F. Perform surveys as the Work progresses to detect hazards resulting from selective demolition activities.

G. All existing insulation above affected ceilings is to be removed and stored prior to demolition.

3.2 UTILITY SERVICES AND MECHANICAL/ELECTRICAL SYSTEMS

A. Existing Services/Systems: Maintain services/systems indicated to remain and protect them against damage during selective demolition operations.

1. Comply with requirements for existing services/systems interruptions specified in Section 01 10 00 "Summary of Work."

B. Service/System Requirements: Locate, identify, disconnect, and seal or cap off indicated utility services and mechanical/electrical systems serving areas to be selectively demolished.

1. Arrange to shut off indicated utilities with utility companies.
2. If services/systems are required to be removed, relocated, or abandoned, before proceeding with selective demolition provide temporary services/systems that bypass area of selective demolition and that maintain continuity of services/systems to other parts of building.
3. Cut off pipe or conduit to be removed. Cap, valve, or plug and seal remaining portion of pipe or conduit after bypassing.

3.3 PREPARATION

A. Site Access and Temporary Controls: Conduct selective demolition and debris-removal operations to ensure minimum interference with roads, streets, walks, walkways, and other adjacent occupied and used facilities.

1. Comply with requirements for access and protection specified in Section 01 50 00 "Temporary Facilities and Controls."

B. Temporary Facilities: Provide temporary barricades and other protection by Authority Having Jurisdiction required to prevent injury to people and damage to adjacent buildings and facilities to remain.

1. Provide protection to ensure safe passage of people around selective demolition area and to and from occupied portions of building.
2. Protect walls, ceilings, floors, and other existing finish work that are to remain or that are exposed during selective demolition operations.
3. Cover equipment or any other items that have not been removed.
4. Comply with requirements for temporary enclosures, run-off control specified in Section 01 50 00 "Temporary Facilities and Controls."

C. Temporary Shoring: Provide and maintain shoring, bracing, and structural supports as required to preserve stability and prevent movement, settlement, or collapse of construction and finishes to remain, and to prevent unexpected or uncontrolled movement or collapse of construction being demolished.

1. Strengthen or add new supports when required during progress of selective demolition.

3.4 SELECTIVE DEMOLITION, GENERAL

A. General: Demolish and remove existing construction only to the extent required and as indicated. Use methods required to complete the Work within limitations of governing regulations and as follows:

1. Proceed with selective demolition systematically.
2. Neatly cut openings and holes plumb, square, and true to dimensions required. Use cutting methods least likely to damage construction to remain or adjoining construction. Use hand tools or small power tools designed for sawing or grinding, not hammering and chopping, to minimize disturbance of adjacent surfaces. Temporarily cover openings to remain.
3. Cut or drill from the exposed or finished side into concealed surfaces to avoid marring existing finished surfaces.
4. Do not use cutting torches until work area is cleared of flammable materials. At concealed spaces, such as duct and pipe interiors, verify condition and contents of hidden space before starting flame-cutting operations. Maintain **fire watch and** portable fire-suppression devices during flame-cutting operations.
5. Maintain adequate ventilation when using cutting torches.
6. Remove decayed, vermin-infested, or otherwise dangerous or unsuitable materials and promptly dispose of off-site.
7. Dispose of demolished items and materials promptly.

B. Removed and Salvaged Items:

1. Clean salvaged items.
2. Store items in a secure area until delivery to User. Verify location with User.

C. Removed and Reinstalled Items:

1. Clean and repair items to functional condition adequate for intended reuse. Paint equipment to match new equipment.
2. Pack or crate items after cleaning and repairing. Identify contents of containers.
3. Protect items from damage during transport and storage.
4. Reinstall items in locations indicated. Comply with installation requirements for new materials and equipment. Provide connections, supports, and miscellaneous materials necessary to make item functional for use indicated.

- D. Existing Items to Remain: Protect construction indicated to remain against damage and soiling during selective demolition. When permitted by Architect, items may be removed to a suitable, protected storage location during selective demolition and cleaned and reinstalled in their original locations after selective demolition operations are complete. Coordinate location with User.

3.5 SELECTIVE DEMOLITION PROCEDURES FOR SPECIFIC MATERIALS

- A. Concrete: Demolish in sections. Cut concrete full depth at junctures with construction to remain and at regular intervals, using power-driven saw, then remove concrete between saw cuts.
- B. Masonry: Demolish in small sections. Cut masonry at junctures with construction to remain, using power-driven saw, then remove masonry between saw cuts.
- C. Concrete Slabs-on-Grade: Saw-cut perimeter of area to be demolished, then break up and remove.
- D. Suspended Drywall Ceiling: Remove and store insulation prior to starting the demolition of the suspended drywall ceiling.

3.6 DISPOSAL OF DEMOLISHED MATERIALS

- A. General: Except for items or materials indicated to be reused, salvaged, reinstalled, or otherwise indicated to remain Owner's property, remove demolished materials from Project site and legally dispose of them in an EPA-approved landfill.
1. Do not allow demolished materials to accumulate on-site.
 2. Remove and transport debris in a manner that will prevent spillage on adjacent surfaces and areas.
 3. Remove all debris from work site daily to Staging Area.
- B. Burning: Do not burn demolished materials.
- C. Disposal: Transport demolished materials off Owner's property and legally dispose of them.

3.7 CLEANING

- A. Clean adjacent structures and improvements of dust, dirt, and debris caused by selective demolition operations. Return adjacent areas to condition existing before selective demolition operations began.

END OF SECTION 02 41 19

DIVISION **5**

Metals



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SECTION 05 12 00

STRUCTURAL STEEL FRAMING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. This Section includes the following:
 - 1. Structural steel.
 - 2. Architecturally exposed structural steel.
 - 3. Grout.

1.3 DEFINITIONS

- A. Structural Steel: Elements of structural-steel frame, as classified by AISC's "Code of Standard Practice for Steel Buildings and Bridges," that support design loads.
- B. Architecturally Exposed Structural Steel: Structural steel designated as architecturally exposed structural steel in the Contract Documents.

1.4 PERFORMANCE REQUIREMENTS

- A. Connections: Provide details of connections required by the Contract Documents to be selected or completed by structural-steel fabricator to withstand loads indicated and comply with other information and restrictions indicated.
 - 1. Select and complete connections using schematic details indicated and AISC's "Manual of Steel Construction, Load and Resistance Factor Design,"
 - 2. Engineering Responsibility: Fabricator's responsibilities include using a qualified professional engineer to prepare structural analysis data for structural-steel connections.

1.5 SUBMITTALS

- A. Product Data: For each type of product indicated.
- B. Shop Drawings: Show fabrication of structural-steel components.

1. Include details of cuts, connections, splices, camber, holes, and other pertinent data.
2. Include embedment drawings.
3. Indicate welds by standard AWS symbols, distinguishing between shop and field welds, and show size, length, and type of each weld.
4. Indicate type, size, and length of bolts, distinguishing between shop and field bolts. Identify pretensioned and slip-critical high-strength bolted connections.
5. For structural-steel connections indicated to comply with design loads, include structural analysis data prepared by the qualified professional engineer responsible for their preparation.

C. Welding certificates.

D. Mill Test Reports: Signed by manufacturers certifying that the following products comply with requirements:

1. Structural steel including chemical and physical properties.
2. Bolts, nuts, and washers including mechanical properties and chemical analysis.
3. Direct-tension indicators.
4. Tension-control, high-strength bolt-nut-washer assemblies.
5. Shear stud connectors.
6. Shop primers.
7. Nonshrink grout.

E. Source quality-control test reports.

1.6 QUALITY ASSURANCE

A. Installer Qualifications: A qualified installer who participates in the AISC Quality Certification Program and is designated an AISC-Certified Erector.

B. Fabricator Qualifications: A qualified fabricator who participates in the AISC Quality Certification Program and is designated an AISC-Certified Plant.

C. Shop-Painting Applicators: Qualified according to "Standard Procedure for Evaluating Qualifications of Shop Painting Applicators."

D. Welding: Qualify procedures and personnel according to AWS D1.1, "Structural Welding Code--Steel."

E. Comply with applicable provisions of the following specifications and documents:

1. AISC's "Code of Standard Practice for Steel Buildings and Bridges."
2. AISC's "Seismic Provisions for Structural Steel Buildings" and "Supplement No. 2."
3. AISC's "Specification for Structural Steel Buildings--Allowable Stress Design and Plastic Design or Load and Resistance Factor Design Specification for Structural Steel Buildings."
4. AISC's "Specification for the Design of Steel Hollow Structural Sections."

5. AISC's "Specification for Allowable Stress Design of Single-Angle Members or Specification for Load and Resistance Factor Design of Single-Angle Members."
 6. RCSC's "Specification for Structural Joints Using ASTM A 325 or A 490 Bolts."
- F. Mockups: Build mockups of architecturally exposed structural steel to set quality standards for fabrication and installation.
1. Coordinate finish painting requirements with Division 9 painting Sections.
 2. Approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.
- G. Preinstallation Conference: Conduct conference at Project site to comply with requirements in Division 1 Section "Project Management and Coordination."

1.7 DELIVERY, STORAGE, AND HANDLING

- A. Store materials to permit easy access for inspection and identification. Keep steel members off ground and spaced by using pallets, dunnage, or other supports and spacers. Protect steel members and packaged materials from erosion and deterioration.
1. Store fasteners in a protected place. Clean and relubricate bolts and nuts that become dry or rusty before use.
 2. Do not store materials on structure in a manner that might cause distortion, damage, or overload to members or supporting structures. Repair or replace damaged materials or structures as directed.

1.8 COORDINATION

- A. Furnish anchorage items to be embedded in or attached to other construction without delaying the Work. Provide setting diagrams, sheet metal templates, instructions, and directions for installation.

PART 2 - PRODUCTS

2.1 STRUCTURAL-STEEL MATERIALS

- A. W-Shapes: ASTM A 992/A 992M, Grade 50.
- B. Channels, Angles, M or, S-Shapes: ASTM A 36/A 36M.
- C. Plate and Bar: ASTM A 36/A 36M.
- D. Corrosion-Resisting Structural Steel: ASTM A 588/A 588M, Grade 50.

- E. Cold-Formed Hollow Structural Sections: ASTM A 500, Grade B or C, structural tubing.
- F. Corrosion-Resisting Cold-Formed Hollow Structural Sections: ASTM A 847, structural tubing.
- G. Steel Pipe: ASTM A 53/A 53M, Type E or S, Grade B.
 - 1. Weight Class: Standard.
 - 2. Finish: Black, except where indicated to be galvanized.
- H. Medium-Strength Steel Castings: ASTM A 27/A 27M, Grade 65-35, carbon steel.
- I. High-Strength Steel Castings: ASTM A 148/A 148M, Grade 80-50, carbon or alloy steel.
- J. Welding Electrodes: Comply with AWS requirements.

2.2 BOLTS, CONNECTORS, AND ANCHORS

- A. High-Strength Bolts, Nuts, and Washers: ASTM A 325, Type 1, heavy hex steel structural bolts; ASTM A 563 heavy hex carbon-steel nuts; and ASTM F 436 hardened carbon-steel washers.
 - 1. Finish: Mechanically deposited zinc coating, ASTM B 695, Class 50.
 - 2. Direct-Tension Indicators: ASTM F 959, Type 325 compressible-washer type.
 - a. Finish: Plain Mechanically deposited zinc coating, ASTM B 695, Class 50.
- B. High-Strength Bolts, Nuts, and Washers: ASTM A 490, Type 1, heavy hex steel structural bolts; ASTM A 563 heavy hex carbon-steel nuts; and ASTM F 436) hardened carbon-steel washers, plain.
 - 1. Direct-Tension Indicators: ASTM F 959, Type 490 compressible-washer type, plain.
- C. Tension-Control, High-Strength Bolt-Nut-Washer Assemblies: ASTM F 1852, Type 1, [heavy hex] [round] head steel structural bolts with splined ends; ASTM A 563 heavy hex carbon-steel nuts; and ASTM F 436 hardened carbon-steel washers.
 - 1. Finish: Plain Mechanically deposited zinc coating, ASTM B 695, Class 50.
- D. Shear Connectors: ASTM A 108, Grades 1015 through 1020, headed-stud type, cold-finished carbon steel; AWS D1.1, Type B.
- E. Unheaded Anchor Rods: ASTM F 1554, Grade 36 ASTM F 1554, Grade 55, weldable ASTM A 354 ASTM A 449 ASTM A 572/A 572M, Grade 50.
 - 1. Configuration: Hooked.

2. Nuts: ASTM A 563 [heavy]hex carbon steel.
3. Plate Washers: ASTM A 36/A 36M carbon steel.
4. Washers: ASTM F 436 hardened carbon steel.
5. Finish: Hot-dip zinc coating, ASTM A 153/A 153M, Class C Mechanically deposited zinc coating, ASTM B 695, Class 50.

F. Headed Anchor Rods: ASTM F 1554, Grade 36 ASTM F 1554, Grade 55, weldable ASTM A 307, Grade A , straight.

1. Nuts: ASTM A 563 heavy hex carbon steel.
2. Plate Washers: ASTM A 36/A 36M carbon steel.
3. Washers: ASTM F 436 hardened carbon steel.
4. Finish: Hot-dip zinc coating, ASTM A 153/A 153M, Class C.

G. Threaded Rods: ASTM A 307, Grade A .

1. Nuts: ASTM A 563 heavy hex carbon steel.
2. Washers: ASTM A 36/A 36M carbon steel.
3. Finish: Hot-dip zinc coating, ASTM A 153/A 153M, Class C.

H. Clevises Turnbuckles: ASTM A 108, Grade 1035, cold-finished carbon steel.

I. Eye Bolts and Nuts: ASTM A 108, Grade 1030, cold-finished carbon steel.

J. Sleeve Nuts: ASTM A 108, Grade 1018, cold-finished carbon steel.

2.3 PRIMER

A. Primer: Fabricator's standard lead- and chromate-free, nonasphaltic, rust-inhibiting primer.

B. Galvanizing Repair Paint: MPI#18, MPI#19, or SSPC-Paint 20.

2.4 GROUT

A. Cement Grout: Portland cement, ASTM C 150, Type I; and clean, natural sand, ASTM C 404, Size No. 2. Mix at ratio of 1 part cement to 2-1/2 parts sand, by volume, with minimum water required for placement and hydration.

B. Metallic, Shrinkage-Resistant Grout: ASTM C 1107, factory-packaged, metallic aggregate grout, mixed with water to consistency suitable for application and a 30-minute working time.

C. Nonmetallic, Shrinkage-Resistant Grout: ASTM C 1107, factory-packaged, nonmetallic aggregate grout, noncorrosive, nonstaining, mixed with water to consistency suitable for application and a 30-minute working time.

2.5 FABRICATION

- A. Structural Steel: Fabricate and assemble in shop to greatest extent possible. Fabricate according to AISC's "Code of Standard Practice for Steel Buildings and Bridges" and AISC's "Specification for Structural Steel Buildings--Allowable Stress Design and Plastic Design or Load and Resistance Factor Design Specification for Structural Steel Buildings."
 - 1. Camber structural-steel members where indicated.
 - 2. Identify high-strength structural steel according to ASTM A 6/ A 6M and maintain markings until structural steel has been erected.
 - 3. Mark and match-mark materials for field assembly.
 - 4. Complete structural-steel assemblies, including welding of units, before starting shop-priming operations.
- B. Architecturally Exposed Structural Steel: Comply with fabrication requirements, including tolerance limits, of AISC's "Code of Standard Practice for Steel Buildings and Bridges" for structural steel identified as architecturally exposed structural steel.
 - 1. Fabricate with exposed surfaces smooth, square, and free of surface blemishes including pitting, rust, scale, seam marks, roller marks, rolled trade names, and roughness.
 - 2. Remove blemishes by filling or grinding or by welding and grinding, before cleaning, treating, and shop priming.
- C. Thermal Cutting: Perform thermal cutting by machine to greatest extent possible.
 - 1. Plane thermally cut edges to be welded to comply with requirements in AWS D1.1.
- D. Bolt Holes: Cut, drill, mechanically thermal cut, or punch standard bolt holes perpendicular to metal surfaces.
- E. Finishing: Accurately finish ends of columns and other members transmitting bearing loads.
- F. Cleaning: Clean and prepare steel surfaces that are to remain unpainted.
- G. Shear Connectors: Prepare steel surfaces as recommended by manufacturer of shear connectors. Use automatic end welding of headed-stud shear connectors according to AWS D1.1 and manufacturer's written instructions.
- H. Steel Wall-Opening Framing: Select true and straight members for fabricating steel wall-opening framing to be attached to structural steel. Straighten as required to provide uniform, square, and true members in completed wall framing.
- I. Welded Door Frames: Build up welded door frames attached to structural steel. Weld exposed joints continuously and grind smooth. Plug-weld fixed steel bar stops to frames. Secure removable stops to frames with countersunk, cross-recessed head

machine screws, uniformly spaced not more than 10 inches o.c., unless otherwise indicated.

- J. Holes: Provide holes required for securing other work to structural steel and for passage of other work through steel framing members.
 - 1. Cut, drill, or punch holes perpendicular to steel surfaces. Do not thermally cut bolt holes or enlarge holes by burning.
 - 2. Base-Plate Holes: Cut, drill, mechanically thermal cut, or punch holes perpendicular to steel surfaces.
 - 3. Weld threaded nuts to framing and other specialty items indicated to receive other work.

2.6 SHOP CONNECTIONS

- A. High-Strength Bolts: Shop install high-strength bolts according to RCSC's "Specification for Structural Joints Using ASTM A 325 or A 490 Bolts" for type of bolt and type of joint specified.
 - 1. Joint Type: Snug tightened.
- B. Weld Connections: Comply with AWS D1.1 for welding procedure specifications, tolerances, appearance, and quality of welds and for methods used in correcting welding work.
 - 1. Remove backing bars or runoff tabs, back gouge, and grind steel smooth.
 - 2. Assemble and weld built-up sections by methods that will maintain true alignment of axes without exceeding tolerances of AISC's "Code of Standard Practice for Steel Buildings and Bridges" for mill material.
 - 3. Verify that weld sizes, fabrication sequence, and equipment used for architecturally exposed structural steel will limit distortions to allowable tolerances. Prevent weld show-through on exposed steel surfaces.
 - a. Grind butt welds flush.
 - b. Grind or fill exposed fillet welds to smooth profile. Dress exposed welds.

2.7 GALVANIZING

- A. Hot-Dip Galvanized Finish: Apply zinc coating by the hot-dip process to structural steel according to ASTM A 123/ A 123M.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Verify elevations of concrete- and masonry-bearing surfaces and locations of anchor rods, bearing plates, and other embedments, with steel erector present, for compliance with requirements.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Provide temporary shores, guys, braces, and other supports during erection to keep structural steel secure, plumb, and in alignment against temporary construction loads and loads equal in intensity to design loads. Remove temporary supports when permanent structural steel, connections, and bracing are in place, unless otherwise indicated.
 - 1. Do not remove temporary shoring supporting composite deck construction until cast-in-place concrete has attained its design compressive strength.

3.3 ERECTION

- A. Set structural steel accurately in locations and to elevations indicated and according to AISC's "Code of Standard Practice for Steel Buildings and Bridges" and "Specification for Structural Steel Buildings--Allowable Stress Design and Plastic Design or Load and Resistance Factor Design Specification for Structural Steel Buildings."
- B. Base and Bearing Plates: Clean concrete- and masonry-bearing surfaces of bond-reducing materials, and roughen surfaces prior to setting base and bearing plates. Clean bottom surface of base and bearing plates.
 - 1. Set base and bearing plates for structural members on wedges, shims, or setting nuts as required.
 - 2. Weld plate washers to top of base plate.
 - 3. Snug-tighten anchor rods after supported members have been positioned and plumbed. Do not remove wedges or shims but, if protruding, cut off flush with edge of base or bearing plate before packing with grout.
 - 4. Promptly pack grout solidly between bearing surfaces and base or bearing plates so no voids remain. Neatly finish exposed surfaces; protect grout and allow to cure. Comply with manufacturer's written installation instructions for shrinkage-resistant grouts.

- C. Maintain erection tolerances of structural steel and architecturally exposed structural steel within AISC's "Code of Standard Practice for Steel Buildings and Bridges."
- D. Align and adjust various members forming part of complete frame or structure before permanently fastening. Before assembly, clean bearing surfaces and other surfaces that will be in permanent contact with members. Perform necessary adjustments to compensate for discrepancies in elevations and alignment.
 - 1. Level and plumb individual members of structure.
 - 2. Make allowances for difference between temperature at time of erection and mean temperature when structure is completed and in service.
- E. Splice members only where indicated.
- F. Remove erection bolts on welded, architecturally exposed structural steel; fill holes with plug welds; and grind smooth at exposed surfaces.
- G. Do not use thermal cutting during erection.
- H. Do not enlarge unfair holes in members by burning or using drift pins. Ream holes that must be enlarged to admit bolts.
- I. Shear Connectors: Prepare steel surfaces as recommended by manufacturer of shear connectors. Use automatic end welding of headed-stud shear connectors according to AWS D1.1 and manufacturer's written instructions.

3.4 FIELD CONNECTIONS

- A. High-Strength Bolts: Install high-strength bolts according to RCSC's "Specification for Structural Joints Using ASTM A 325 or A 490 Bolts" for type of bolt and type of joint specified.
 - 1. Joint Type: Snug tightened.
- B. Weld Connections: Comply with AWS D1.1 for welding procedure specifications, tolerances, appearance, and quality of welds and for methods used in correcting welding work.
 - 1. Comply with AISC's "Code of Standard Practice for Steel Buildings and Bridges" and "Specification for Structural Steel Buildings--Allowable Stress Design and Plastic Design or Load and Resistance Factor Design Specification for Structural Steel Buildings" for bearing, adequacy of temporary connections, alignment, and removal of paint on surfaces adjacent to field welds.
 - 2. Remove backing bars or runoff tabs, back gouge, and grind steel smooth.
 - 3. Assemble and weld built-up sections by methods that will maintain true alignment of axes without exceeding tolerances of AISC's "Code of Standard Practice for Steel Buildings and Bridges" for mill material.

4. Verify that weld sizes, fabrication sequence, and equipment used for architecturally exposed structural steel will limit distortions to allowable tolerances. Prevent weld show-through on exposed steel surfaces.
 - a. Grind butt welds flush.
 - b. Grind or fill exposed fillet welds to smooth profile. Dress exposed welds.

3.5 FIELD QUALITY CONTROL

- A. Bolted Connections: Shop-bolted connections will be tested and inspected according to RCSC's "Specification for Structural Joints Using ASTM A 325 or A 490 Bolts."
- B. Welded Connections: Field welds will be visually inspected according to AWS D1.1.
 1. In addition to visual inspection, field welds will be tested according to AWS D1.1 and the following inspection procedures, at testing agency's option:
 - a. Liquid Penetrant Inspection: ASTM E 165.
 - b. Magnetic Particle Inspection: ASTM E 709; performed on root pass and on finished weld. Cracks or zones of incomplete fusion or penetration will not be accepted.
 - c. Ultrasonic Inspection: ASTM E 164.
 - d. Radiographic Inspection: ASTM E 94.
- C. In addition to visual inspection, test and inspect field-welded shear connectors according to requirements in AWS D1.1 for stud welding and as follows:
 1. Perform bend tests if visual inspections reveal either a less-than- continuous 360-degree flash or welding repairs to any shear connector.
 2. Conduct tests on additional shear connectors if weld fracture occurs on shear connectors already tested, according to requirements in AWS D1.1.
- D. Correct deficiencies in Work that inspections indicate does not comply with the Contract Documents.

3.6 REPAIRS AND PROTECTION

- A. Repair damaged galvanized coatings on galvanized items with galvanized repair paint according to ASTM A 780 and manufacturer's written instructions.

END OF DOCUMENT 05 12 00

SECTION 055133 FIXED METAL LADDERS

PART 1 - GENERAL

1.1 SUMMARY

- A. Section Includes:
 - 1. Fixed aluminum wall ladders.

1.2 REFERENCES

- A. ANSI A14.3 - American National Standard for Ladders -- Fixed -- Safety Requirements.
- B. ASTM B 209 - Standard Specification for Aluminum and Aluminum-Alloy Sheet and Plate.
- C. ASTM B 210 - Standard Specification for Aluminum and Aluminum-Alloy Drawn Seamless Tubes.
- D. ASTM B 221 - Standard Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes.
- E. ASTM B 308 - Standard Specification for Aluminum - Alloy T6061-T6 Standard Structural.
- F. OSHA 29 CFR Standard 1910.27 - Fixed ladders; Occupational Safety and Health Standards.

1.3 SUBMITTALS

- A. **Product Data:** Manufacturer's data sheets on each product to be used, including:
 - 1. Preparation instructions and recommendations.
 - 2. Storage and handling requirements and recommendations.
 - 3. Installation methods.
- B. **Shop Drawings:** Detailed drawings showing complete dimensions, all materials, mounting attachments, and fabrication details.

1.4 QUALITY ASSURANCE

- A. Manufacturer Qualifications: Company specializing in the engineering and manufacturing of metal ladders, with not less than fifty years of experience.

1.5 WARRANTY

- A. Provide manufacturer's standard limited five-year warranty against defects in materials and workmanship.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Basis of Design: Subject to compliance with requirements, provide product by one of the following:
 - 1. ALACO Ladder Co.
 - 2. FSI Industries
 - 3. Cotterman
- B. Requests for substitutions will be considered prior to bid only.

2.2 MATERIALS

- A. Extruded Aluminum Profiles: ASTM B 221/B 221M, ASTM B 210, ASTM B 308/B 308M, Alloy 6061-T6; standard mill finish.
- B. Aluminum Sheet and Plate: ASTM B 209/B 209M, Alloy 6061-T6; standard mill finish.
- C. Fasteners: Aluminum solid aircraft rivets rated at 300 lbs (1335 N) shear strength.
- D. Cast fittings, connectors and rung ends: Cast Aluminum alloy 356.

2.3 LADDERS

- A. Fixed Wall Ladders: Extruded aluminum; serrated rungs 1-1/8 inches in diameter, connected to 2-7/8 inch side rail channels with cast aluminum rung connectors, each secured to rails by means of four solid aircraft rivets.
 - 1. Walk-Through and Parapet Railings: Aluminum extrusions; extend not less than 42 inches above landing, 24 in between side rails at step through.
 - 2. Security Doors: Form from aluminum sheet 0.188 inch (4.8 mm) in thickness; secure with stainless steel piano hinges and hasps.

2.4 FINISHES

- A. Provide all aluminum in standard mill finish.

- B. Factory finish all aluminum surfaces with manufacturer's standard power coating system.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Do not begin installation until substrates have been properly prepared.

3.2 INSTALLATION

- A. Install in accordance with manufacturer's instructions and approved shop drawings, and in compliance with ANSI A14.3 and OSHA 1910.27.

3.3 PROTECTION

- A. Protect installed products until completion of project.
- B. Touch-up, repair or replace damaged products before Substantial Completion.

END OF SECTION 055133

DIVISION 7

Thermal and Moisture Protection



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SECTION 075550
MODIFIED BITUMEN MEMBRANE ROOFING

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Roofing Accessories into the Roofing System
 - a. NOTE : Included in the Bid, the roofing manufacturer shall furnish, for installation by the Roofing Contractor, products to complete the work as applicable or called for, such as Parapro 123 Flashing System and Paratread Panels, that when used with the manufacturer's systems, shall be covered under a manufacturer's specified guarantee.
 - b. The above items shall be guaranteed by the roofing manufacturer and shall be installed to manufacturer standards/recommendations..

1.2 SUBMITTALS

- A. Product Data: For each type of product indicated. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes for each manufactured product and accessory.

1.3 QUALITY ASSURANCE

- A. Accessory Products: Accessory products shall be supplied by the primary roof system manufacturer for coverage under the terms of the guarantee.

PART 2 PRODUCTS

2.1 ROOFING ACCESSORIES

- A. Parapro 123 Flashing System by Siplast, Irving, TX.
- B. Paratread Panels, by Siplast, Irving, TX.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates, areas, and conditions, with Installer present, to verify actual locations, dimensions and other conditions affecting performance of the Work.
 - 1. Verify compliance with requirements for installation tolerances of substrates.
 - 2. Verify that substrate is sound, dry, smooth, clean, sloped for drainage, and securely anchored.

END OF SECTION 075550

SECTION 076200 –

SHEET METAL FLASHING AND TRIM

PART 1 - GENERAL

1.1 SUMMARY

- A. Section Includes:
 - 1. Formed wall sheet metal fabrications.

1.2 ACTION SUBMITTALS

- A. Product Data: For each type of product.
- B. Shop Drawings: For sheet metal flashing and trim.
 - 1. Include plans, elevations, sections, and attachment details.
 - 2. Distinguish between shop- and field-assembled work.
 - 3. Include identification of finish for each item.
 - 4. Include pattern of seams and details of termination points, expansion joints and expansion-joint covers, direction of expansion, roof-penetration flashing, and connections to adjoining work.
- C. Samples: For each exposed product and for each color and texture specified.

1.3 INFORMATIONAL SUBMITTALS

- A. Product certificates.
- B. Product test reports.
- C. Sample warranty.

1.4 CLOSEOUT SUBMITTALS

- A. Maintenance data.

1.5 QUALITY ASSURANCE

- A. Fabricator Qualifications: Employs skilled workers who custom fabricate sheet metal flashing and trim similar to that required for this Project and whose products have a record of successful in-service performance.

1.6 WARRANTY

- A. Special Warranty on Finishes: Manufacturer agrees to repair finish or replace sheet metal flashing and trim that shows evidence of deterioration of factory-applied finishes within specified warranty period.
 - 1. Finish Warranty Period: 10 years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. General: Sheet metal flashing and trim assemblies shall withstand wind loads, structural movement, thermally induced movement, and exposure to weather without failure due to defective manufacture, fabrication, installation, or other defects in construction. Completed sheet metal flashing and trim shall not rattle, leak, or loosen, and shall remain watertight.
- B. Sheet Metal Standard for Flashing and Trim: Comply with SMACNA's "Architectural Sheet Metal Manual" requirements for dimensions and profiles shown unless more stringent requirements are indicated.
- C. Thermal Movements: Allow for thermal movements from ambient and surface temperature changes.
 - 1. Temperature Change: 120 deg F, ambient; 180 deg F, material surfaces.

2.2 SHEET METALS

- A. General: Protect mechanical and other finishes on exposed surfaces from damage by applying strippable, temporary protective film before shipping.
- B. Metallic-Coated Steel Sheet: Provide zinc-coated (galvanized) steel sheet according to ASTM A 653, G90 coating designation or aluminum-zinc alloy-coated steel sheet according to ASTM A 792, Class AZ50 coating designation, Grade 40; prepainted by coil-coating process to comply with ASTM A 755/A 755M.
 - 1. Exposed Coil-Coated Finish:
 - a. Two-Coat Fluoropolymer: AAMA 621. Fluoropolymer finish containing not less than 70 percent PVDF resin by weight in color coat. Prepare, pretreat, and apply coating to exposed metal surfaces to comply with coating and resin manufacturers' written instructions.
 - b. Three-Coat Fluoropolymer: AAMA 621. Fluoropolymer finish containing not less than 70 percent PVDF resin by weight in both color coat and clear topcoat. Prepare, pretreat, and apply coating to exposed metal surfaces to comply with coating and resin manufacturers' written instructions.

- c. Siliconized Polyester: Epoxy primer and silicone-modified, polyester-enamel topcoat; with dry film thickness of not less than 0.2 mil for primer and 0.8 mil for topcoat.

2. Color: Match existing

2.3 MISCELLANEOUS MATERIALS

- A. General: Provide materials and types of fasteners, solder, protective coatings, sealants, and other miscellaneous items as required for complete sheet metal flashing and trim installation and as recommended by manufacturer of primary sheet metal[**or manufactured item**] unless otherwise indicated.
- B. Fasteners: Wood screws, annular threaded nails, self-tapping screws, self-locking rivets and bolts, and other suitable fasteners designed to withstand design loads and recommended by manufacturer of primary sheet metal[**or manufactured item**].
 1. General: Blind fasteners or self-drilling screws, gasketed, with hex-washer head.
 - a. Exposed Fasteners: Heads matching color of sheet metal using plastic caps or factory-applied coating. Provide metal-backed EPDM or PVC sealing washers under heads of exposed fasteners bearing on weather side of metal.
 - b. Blind Fasteners: High-strength aluminum or stainless-steel rivets suitable for metal being fastened.
 - c. Spikes and Ferrules: Same material as gutter; with spike with ferrule matching internal gutter width.
 2. Fasteners for Steel Sheet: Series 300 stainless steel or hot-dip galvanized steel according to ASTM A 153 or ASTM F 2329.
- C. Sealant Tape: Pressure-sensitive, 100 percent solids, polyisobutylene compound sealant tape with release-paper backing. Provide permanently elastic, nonsag, nontoxic, nonstaining tape 1/2 inch wide and 1/8 inch thick.
- D. Elastomeric Sealant: ASTM C 920, elastomeric [**polyurethane**] [**polysulfide**] [**silicone**] polymer sealant; of type, grade, class, and use classifications required to seal joints in sheet metal flashing and trim and remain watertight.
- E. Butyl Sealant: ASTM C 1311, single-component, solvent-release butyl rubber sealant; polyisobutylene plasticized; heavy bodied for hooked-type expansion joints with limited movement.
- F. Epoxy Seam Sealer: Two-part, noncorrosive, aluminum seam-cementing compound, recommended by aluminum manufacturer for exterior nonmoving joints, including riveted joints.

2.4 FABRICATION, GENERAL

- A. General: Custom fabricate sheet metal flashing and trim to comply with details shown and recommendations in cited sheet metal standard that apply to design, dimensions, geometry, metal thickness, and other characteristics of item required. Fabricate sheet metal flashing and trim in shop to greatest extent possible.
 - 1. Obtain field measurements for accurate fit before shop fabrication.
 - 2. Form sheet metal flashing and trim to fit substrates without excessive oil canning, buckling, and tool marks; true to line, levels, and slopes; and with exposed edges folded back to form hems.
 - 3. Conceal fasteners and expansion provisions where possible. Do not use exposed fasteners on faces exposed to view.
- B. Expansion Provisions: Form metal for thermal expansion of exposed flashing and trim.
 - 1. Form expansion joints of intermeshing hooked flanges, not less than 1 inch deep, filled with butyl sealant concealed within joints.
 - 2. Use lapped expansion joints only where indicated on Drawings.
- C. Sealant Joints: Where movable, non-expansion-type joints are required, form metal to provide for proper installation of elastomeric sealant according to cited sheet metal standard.
- D. Fabricate cleats and attachment devices from same material as accessory being anchored or from compatible, noncorrosive metal.
- E. Fabricate cleats and attachment devices of sizes as recommended by cited sheet metal standard for application, but not less than thickness of metal being secured.
- F. Seams: Fabricate non-moving seams with flat-lock seams. Tin edges to be seamed, form seams, and solder.
- G. Seams: Fabricate nonmoving seams with flat-lock seams. Form seams and seal with elastomeric sealant unless otherwise recommended by sealant manufacturer for intended use. Rivet joints where necessary for strength.

2.5 WALL SHEET METAL FABRICATIONS

- A. Through-Wall Flashing: Fabricate continuous flashings in minimum 96-inch-long, but not exceeding 12-foot-long, sections, under copings, and at shelf angles. Fabricate discontinuous lintel, sill, and similar flashings to extend 6 inches (150 mm) beyond each side of wall openings; and form with 2-inch- (50-mm-) high, end dams. Fabricate from the following materials:
 - 1. Stainless Steel: 0.016 inch thick.
- B. Opening Flashings in Frame Construction: Fabricate head, sill, jamb, and similar flashings to extend 4 inches beyond wall openings. Form head and sill flashing with 2-inch-high, end dams. Fabricate from the following materials:

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BOYET JUNIOR HIGH SCHOOL
GYMNASIUM HVAC REPLACEMENT
SLIDELL, LA

1. Copper: 16 oz./sq. ft.
2. Aluminum: 0.032 inch thick.
3. Stainless Steel: 0.016 inch thick.
4. Galvanized Steel: 0.022 inch thick.
5. Aluminum-Zinc Alloy-Coated Steel: 0.022 inch thick.

C. Wall Expansion-Joint Cover: Fabricate from the following materials:

1. Copper: 16 oz./sq. ft..
2. Aluminum: 0.040 inch thick.
3. Stainless Steel: 0.019 inch thick.
4. Galvanized Steel: 0.028 inch thick.
5. Aluminum-Zinc Alloy-Coated Steel: 0.028 inch thick.

PART 3 - EXECUTION

3.1 INSTALLATION, GENERAL

- A. General: Anchor sheet metal flashing and trim and other components of the Work securely in place, with provisions for thermal and structural movement. Use fasteners, solder, protective coatings, separators, sealants, and other miscellaneous items as required to complete sheet metal flashing and trim system.
1. Install sheet metal flashing and trim true to line, levels, and slopes. Provide uniform, neat seams with minimum exposure of solder, welds, and sealant.
 2. Install sheet metal flashing and trim to fit substrates and to result in watertight performance. Verify shapes and dimensions of surfaces to be covered before fabricating sheet metal.
 3. Space cleats not more than 12 inches apart. Attach each cleat with at least two fasteners. Bend tabs over fasteners.
 4. Install exposed sheet metal flashing and trim with limited oil canning, and free of buckling and tool marks.
 5. Torch cutting of sheet metal flashing and trim is not permitted.
- B. Metal Protection: Where dissimilar metals contact each other, or where metal contacts pressure-treated wood or other corrosive substrates, protect against galvanic action or corrosion by painting contact surfaces with bituminous coating or by other permanent separation as recommended by sheet metal manufacturer or cited sheet metal standard.
1. Coat concealed side of uncoated-aluminum and stainless-steel sheet metal flashing and trim with bituminous coating where flashing and trim contact wood, ferrous metal, or cementitious construction.
- C. Expansion Provisions: Provide for thermal expansion of exposed flashing and trim. Space movement joints at maximum of 10 feet with no joints within 24 inches of corner or intersection.

1. Form expansion joints of intermeshing hooked flanges, not less than 1 inch deep, filled with sealant concealed within joints.
 2. Use lapped expansion joints only where indicated on Drawings.
- D. Fasteners: Use fastener sizes that penetrate substrate not less than recommended by fastener manufacturer to achieve maximum pull-out resistance.
- E. Conceal fasteners and expansion provisions where possible in exposed work and locate to minimize possibility of leakage. Cover and seal fasteners and anchors as required for a tight installation.
- F. Seal joints as required for watertight construction.
- G. Rivets: Rivet joints in uncoated aluminum where necessary for strength.

3.2 WALL FLASHING INSTALLATION

- A. General: Install sheet metal wall flashing to intercept and exclude penetrating moisture according to cited sheet metal standard unless otherwise indicated. Coordinate installation of wall flashing with installation of wall-opening components such as windows, doors, and louvers.
- B. Through-Wall Flashing: Installation of through-wall flashing as specified.
- C. Opening Flashings in Frame Construction: Install continuous head, sill, jamb, and similar flashings to extend 4 inches beyond wall openings.

3.3 CLEANING AND PROTECTION

- A. Clean exposed metal surfaces of substances that interfere with uniform oxidation and weathering.
- B. Clean off excess sealants.
- C. Remove temporary protective coverings and strippable films as sheet metal flashing and trim are installed unless otherwise indicated in manufacturer's written installation instructions.

END OF SECTION 076200

DIVISION 9

FINISHES



DAMMON
ENGINEERING, INC.

DAMMON ENGINEERING, INC.
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SECTION 09 91 13
EXTERIOR PAINTING

PART 1 - GENERAL

1.1 SUMMARY

- A. Section includes surface preparation and the application of paint systems on exterior substrates.
 - 1. Concrete.
 - 2. Concrete masonry units (CMU).
 - 3. Steel.
 - 4. Galvanized metal.
 - 5. Aluminum (not anodized or otherwise coated).
 - 6. Stainless-steel flashing.
 - 7. Exterior portland cement plaster (stucco).
 - 8. Exterior gypsum board.

1.2 DEFINITIONS

- A. Gloss Level 1: Not more than 5 units at 60 degrees and 10 units at 85 degrees, according to ASTM D 523.
- B. Gloss Level 3: 10 to 25 units at 60 degrees and 10 to 35 units at 85 degrees, according to ASTM D 523.
- C. Gloss Level 4: 20 to 35 units at 60 degrees and not less than 35 units at 85 degrees, according to ASTM D 523.
- D. Gloss Level 5: 35 to 70 units at 60 degrees, according to ASTM D 523.
- E. Gloss Level 6: 70 to 85 units at 60 degrees, according to ASTM D 523.
- F. Gloss Level 7: More than 85 units at 60 degrees, according to ASTM D 523.

1.3 ACTION SUBMITTALS

- A. Product Data: For each type of product. Include preparation requirements and application instructions.
- B. Samples: For each type of paint system and each color and gloss of topcoat.
- C. Product List: For each product indicated. Include printout of current "MPI Approved Products List" for each product category specified, with the proposed product highlighted.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Products: Subject to compliance with requirements, provide paint by one of the following manufactures for items listed in other Part 2 articles for the paint category indicated.
- 1) Sherwin Williams
 - 2) PPG Industries
 - 3) Masco Corporation
 - 4) RPM International Inc.
 - 5) Benjamin Moore & Co.

2.2 PAINT, GENERAL

- A. MPI Standards: Provide products that comply with MPI standards indicated and that are listed in its "MPI Approved Products List."
- B. Material Compatibility:
1. Provide materials for use within each paint system that are compatible with one another and substrates indicated, under conditions of service and application as demonstrated by manufacturer, based on testing and field experience.
 2. For each coat in a paint system, provide products recommended in writing by manufacturers of topcoat for use in paint system and on substrate indicated.
- C. VOC Content: Provide materials that comply with VOC limits of authorities having jurisdiction.
- D. Colors: As selected by Architect from manufacturer's full range.

2.3 BLOCK FILLERS

- A. Block Filler, Latex, Interior/Exterior: MPI #4.

2.4 PRIMERS/SEALERS

- A. Primer, Alkali Resistant, Water Based: MPI #3.
- B. Primer, Bonding, Water Based: MPI #17.
- C. Primer, Bonding, Solvent Based: MPI #69.

2.5 METAL PRIMERS

- A. Primer, Alkyd, Anti-Corrosive for Metal: MPI #79.
- B. Primer, Alkyd, Quick Dry, for Metal: MPI #76.
- C. Primer, Galvanized, Water Based: MPI #134.
- D. Primer, Galvanized: As recommended in writing by topcoat manufacturer.
- E. Primer, Quick Dry, for Aluminum: MPI #95.

2.6 WATER-BASED PAINTS

- A. Latex, Exterior Flat (Gloss Level 1): MPI #10.
- B. Latex, Exterior Semi-Gloss (Gloss Level 5): MPI #11.
- C. Latex, Exterior, Gloss (Gloss Level 6): MPI #119.
- D. Light Industrial Coating, Exterior, Water Based (Gloss Level 3): MPI #161.
- E. Light Industrial Coating, Exterior, Water Based, Semi-Gloss (Gloss Level 5): MPI #163.
- F. Light Industrial Coating, Exterior, Water Based, Gloss (Gloss Level 6): MPI #164.

2.7 SOLVENT-BASED PAINTS

- A. Alkyd, Exterior Flat (Gloss Level 1): MPI #8.
- B. Alkyd, Exterior, Semi-Gloss (Gloss Level 5): MPI #94.
- C. Alkyd, Exterior Gloss (Gloss Level 6): MPI #9.
- D. Alkyd, Quick Dry, Semi-Gloss (Gloss Level 5): MPI #81.
- E. Alkyd, Quick Dry, Gloss (Gloss Level 7): MPI #96.

2.8 ALUMINUM PAINT

- A. Aluminum Paint: MPI #1.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates and conditions, with Applicator present, for compliance with requirements for maximum moisture content and other conditions affecting performance of the Work.
- B. Maximum Moisture Content of Substrates: When measured with an electronic moisture meter as follows:
 - 1. Concrete: 12 percent.
 - 2. Masonry (Clay and CMU): 12 percent.
 - 3. Wood: 15 percent.
 - 4. Portland Cement Plaster: 12 percent.

5. Gypsum Board: 12 percent.

- C. Verify suitability of substrates, including surface conditions and compatibility with existing finishes and primers.
- D. Proceed with coating application only after unsatisfactory conditions have been corrected.

1. Application of coating indicates acceptance of surfaces and conditions.

3.2 PREPARATION

- A. Comply with manufacturer's written instructions and recommendations in "MPI Manual" applicable to substrates and paint systems indicated.
- B. Clean substrates of substances that could impair bond of paints, including dust, dirt, oil, grease, and incompatible paints and encapsulants.
 - 1. Remove incompatible primers and reprime substrate with compatible primers or apply tie coat as required to produce paint systems indicated.

3.3 APPLICATION

- A. Apply paints according to manufacturer's written instructions and recommendations in "MPI Manual."
- B. Apply paints to produce surface films without cloudiness, spotting, holidays, laps, brush marks, roller tracking, runs, sags, ropiness, or other surface imperfections. Cut in sharp lines and color breaks.

3.4 CLEANING AND PROTECTION

- A. Protect work of other trades against damage from paint application. Correct damage to work of other trades by cleaning, repairing, replacing, and refinishing, as approved by Architect, and leave in an undamaged condition.
- B. At completion of construction activities of other trades, touch up and restore damaged or defaced painted surfaces.

3.5 EXTERIOR PAINTING SCHEDULE

- A. CMU Substrates:
 - 1. Latex System:

- a. Prime Coat: Block filler, latex, interior/exterior, MPI #4.
 - b. Intermediate Coat: Latex, exterior, matching topcoat.
 - c. Topcoat: Latex, exterior flat (Gloss Level 1), MPI #10.
 - d. Topcoat: Latex, exterior, low sheen (Gloss Level 3-4), MPI #15.
 - e. Topcoat: Latex, exterior semi-gloss (Gloss Level 5), MPI #11.
 - f. Topcoat: Latex, exterior gloss (Gloss Level 6), MPI #119.
2. Latex over Alkali-Resistant Primer System:
- a. Prime Coat: Primer, alkali resistant, water based, MPI #3.
 - b. Intermediate Coat: Latex, exterior, matching topcoat.
 - c. Topcoat: Latex, exterior flat (Gloss Level 1), MPI #10.
 - d. Topcoat: Latex, exterior, low sheen (Gloss Level 3-4), MPI #15.
 - e. Topcoat: Latex, exterior semi-gloss (Gloss Level 5), MPI #11.
 - f. Topcoat: Latex, exterior gloss (Gloss Level 6), MPI #119.
3. Latex Aggregate System:
- a. Prime Coat: As recommended in writing by topcoat manufacturer.
 - b. Intermediate Coat: As recommended in writing by topcoat manufacturer.
 - c. Topcoat: Textured coating, latex, flat, MPI #42.
- B. Steel Substrates:
1. Water-Based Light Industrial Coating System:
 - a. Prime Coat: Primer, alkyd, anti-corrosive for metal, MPI #79.
 - b. Prime Coat: Shop primer specified in Section where substrate is specified.
 - c. Intermediate Coat: Light industrial coating, exterior, water based, matching topcoat.
 - d. Topcoat: Light industrial coating, exterior, water based (Gloss Level 3), MPI #161.
 - e. Topcoat: Light industrial coating, exterior, water based, semi-gloss (Gloss Level 5), MPI #163.
 - f. Topcoat: Light industrial coating, exterior, water based, gloss (Gloss Level 6), MPI #164.
 2. Alkyd System:
 - a. Prime Coat: Primer, alkyd, anticorrosive for metal, MPI #79.
 - b. Prime Coat: Shop primer specified in Section where substrate is specified.
 - c. Intermediate Coat: Exterior alkyd enamel matching topcoat.
 - d. Topcoat: Alkyd, exterior, flat (Gloss Level 1), MPI #8.
 - e. Topcoat: Alkyd, exterior, semi-gloss (Gloss Level 5), MPI #94.
 - f. Topcoat: Alkyd, exterior, gloss (Gloss Level 6), MPI #9.
 3. Quick-Drying Enamel System:
 - a. Prime Coat: Primer, alkyd, quick dry, for metal, MPI #76.

- b. Intermediate Coat: Alkyd, quick dry, matching topcoat.
 - c. Topcoat: Alkyd, quick dry, semi-gloss (Gloss Level 5), MPI #81.
 - d. Topcoat: Alkyd, quick dry, gloss (Gloss Level 7), MPI #96.
 4. Aluminum Paint System:
 - a. Prime Coat: Primer, alkyd, anti-corrosive for metal, MPI #79.
 - b. Prime Coat: Shop primer specified in Section where substrate is specified.
 - c. Intermediate Coat: Aluminum paint, MPI #1.
 - d. Topcoat: Aluminum paint, MPI #1.
- C. Galvanized-Metal Substrates:
 1. Latex System:
 - a. Prime Coat: Primer, galvanized, water based, MPI #134.
 - b. Prime Coat: Primer, galvanized metal, as recommended in writing by topcoat manufacturer for exterior use on galvanized-metal substrates with topcoat indicated.
 - c. Intermediate Coat: Latex, exterior, matching topcoat.
 - d. Topcoat: Latex, exterior flat (Gloss Level 1), MPI #10.
 - e. Topcoat: Latex, exterior, low sheen (Gloss Level 3-4), MPI #15.
 - f. Topcoat: Latex, exterior semi-gloss (Gloss Level 5), MPI #11.
 - g. Topcoat: Latex, exterior gloss (Gloss Level 6), MPI #119.
 2. Water-Based Light Industrial Coating System:
 - a. Prime Coat: Primer, galvanized, water based, MPI #134.
 - b. Prime Coat: Primer, galvanized metal, as recommended in writing by topcoat manufacturer for exterior use on galvanized-metal substrates with topcoat indicated.
 - c. Intermediate Coat: Light industrial coating, exterior, water based, matching topcoat.
 - d. Topcoat: Light industrial coating, exterior, water based (Gloss Level 3), MPI #161.
 - e. Topcoat: Light industrial coating, exterior, water based, semi-gloss (Gloss Level 5), MPI #163.
 - f. Topcoat: Light industrial coating, exterior, water based, gloss (Gloss Level 6), MPI #164.
 3. Alkyd System:
 - a. Prime Coat: Primer, galvanized metal, as recommended in writing by topcoat manufacturer for exterior use on galvanized-metal substrates with topcoat indicated.
 - b. Intermediate Coat: Exterior alkyd enamel matching topcoat.
 - c. Topcoat: Alkyd, exterior, flat (Gloss Level 5), MPI #8.
 - d. Topcoat: Alkyd, exterior, semi-gloss (Gloss Level 5), MPI #94.
 - e. Topcoat: Alkyd, exterior, gloss (Gloss Level 5), MPI #9.

D. Aluminum Substrates:

1. Latex System:

- a. Prime Coat: Primer, quick dry, for aluminum, MPI #95.
- b. Intermediate Coat: Latex, exterior, matching topcoat.
- c. Topcoat: Latex, exterior flat (Gloss Level 1), MPI #10.
- d. Topcoat: Latex, exterior, low sheen (Gloss Level 3-4), MPI #15.
- e. Topcoat: Latex, exterior semi-gloss (Gloss Level 5), MPI #11.
- f. Topcoat: Latex, exterior gloss (Gloss Level 6), MPI #119.

2. Water-Based Light Industrial Coating System:

- a. Prime Coat: Primer, quick dry, for aluminum, MPI #95.
- b. Intermediate Coat: Light industrial coating, exterior, water based, matching topcoat.
- c. Topcoat: Light industrial coating, exterior, water based (Gloss Level 3), MPI #161.
- d. Topcoat: Light industrial coating, exterior, water based, semi-gloss (Gloss Level 5), MPI #163.
- e. Topcoat: Light industrial coating, exterior, water based, gloss (Gloss Level 6), MPI #164.

3. Alkyd System:

- a. Prime Coat: Primer, quick dry, for aluminum, MPI #95.
- b. Intermediate Coat: Exterior alkyd enamel matching topcoat.
- c. Topcoat: Alkyd, exterior, flat (Gloss Level 5), MPI #8.
- d. Topcoat: Alkyd, exterior, semi-gloss (Gloss Level 5), MPI #94.
- e. Topcoat: Alkyd, exterior, gloss (Gloss Level 5), MPI #9.

E. Stainless-Steel Substrates:

1. Latex System:

- a. Prime Coat: Primer, bonding, solvent based, MPI #69.
- b. Intermediate Coat: Latex, exterior, matching topcoat.
- c. Topcoat: Latex, exterior flat (Gloss Level 1), MPI #10.
- d. Topcoat: Latex, exterior, low sheen (Gloss Level 3-4), MPI #15.
- e. Topcoat: Latex, exterior semi-gloss (Gloss Level 5), MPI #11.
- f. Topcoat: Latex, exterior gloss (Gloss Level 6), MPI #119.

2. Water-Based Light Industrial Coating System:

- a. Prime Coat: Primer, quick dry, for aluminum, MPI #95.
- b. Intermediate Coat: Light industrial coating, exterior, water based, matching topcoat.
- c. Topcoat: Light industrial coating, exterior, water based (Gloss Level 3), MPI #161.

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- d. Topcoat: Light industrial coating, exterior, water based, semi-gloss (Gloss Level 5), MPI #163.
 - e. Topcoat: Light industrial coating, exterior, water based, gloss (Gloss Level 6), MPI #164.
- F. Exterior Gypsum Board Substrates:
- 1. Latex System:
 - a. Prime Coat: Latex, exterior, matching topcoat.
 - b. Intermediate Coat: Latex, exterior, matching topcoat.
 - c. Topcoat: Latex, exterior flat (Gloss Level 1), MPI #10.
 - d. Topcoat: Latex, exterior, low sheen (Gloss Level 3-4), MPI #15.
 - e. Topcoat: Latex, exterior semi-gloss (Gloss Level 5), MPI #11.
 - f. Topcoat: Latex, exterior gloss (Gloss Level 6), MPI #119.

END OF SECTION 09 91 13

SECTION 099123
INTERIOR PAINTING

PART 1 - GENERAL

1.1 SUMMARY

- A. Section includes surface preparation and the application of paint systems on interior substrates.

1.2 DEFINITIONS

- A. Gloss Level 1: Not more than 5 units at 60 degrees and 10 units at 85 degrees, according to ASTM D 523.
- B. Gloss Level 2: Not more than 10 units at 60 degrees and 10 to 35 units at 85 degrees, according to ASTM D 523.
- C. Gloss Level 3: 10 to 25 units at 60 degrees and 10 to 35 units at 85 degrees, according to ASTM D 523.
- D. Gloss Level 4: 20 to 35 units at 60 degrees and not less than 35 units at 85 degrees, according to ASTM D 523.
- E. Gloss Level 5: 35 to 70 units at 60 degrees, according to ASTM D 523.
- F. Gloss Level 6: 70 to 85 units at 60 degrees, according to ASTM D 523.
- G. Gloss Level 7: More than 85 units at 60 degrees, according to ASTM D 523.

1.3 ACTION SUBMITTALS

- A. Product Data: For each type of product. Include preparation requirements and application instructions.
- B. Samples: For each type of paint system and in each color and gloss of topcoat.
- C. Product List: For each product indicated. Include printout of current "MPI Approved Products List" for each product category specified in Part 2, with the proposed product highlighted.

1.4 QUALITY ASSURANCE

- A. MPI Standards:

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BOYET JUNIOR HIGH SCHOOL
GYMNASIUM HVAC REPLACEMENT
SLIDELL, LA

1. Products: Complying with MPI standards indicated and listed in "MPI Approved Products List."
2. Preparation and Workmanship: Comply with requirements in "MPI Architectural Painting Specification Manual" for products and paint systems indicated.

1.5 DELIVERY, STORAGE, AND HANDLING

- A. Store materials not in use in tightly covered containers in well-ventilated areas with ambient temperatures continuously maintained at not less than 45 deg F.
 1. Maintain containers in clean condition, free of foreign materials and residue.
 2. Remove rags and waste from storage areas daily.

1.6 PROJECT CONDITIONS

- A. Apply paints only when temperature of surfaces to be painted and ambient air temperatures are between 50 and 95 deg F.
- B. Do not apply paints when relative humidity exceeds 85 percent; at temperatures less than 5 deg F above the dew point; or to damp or wet surfaces.

1.7 MAINTENANCE MATERIAL SUBMITTALS

- A. Furnish extra materials that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.
 1. Paint: 5 percent, but not less than 1 gal. of each material and color applied.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
 1. Benjamin Moore & Co.
 2. Sherwin Williams
 3. Pittsburg

2.2 PAINT, GENERAL

- A. Material Compatibility:

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GYMNASIUM HVAC REPLACEMENT
SLIDELL, LA

1. Provide materials for use within each paint system that are compatible with one another and substrates indicated, under conditions of service and application as demonstrated by manufacturer, based on testing and field experience.
 2. For each coat in a paint system, provide products recommended in writing by manufacturers of topcoat for use in paint system and on substrate indicated.
- B. VOC Content: Products shall comply with VOC limits of authorities having jurisdiction and, for interior paints and coatings applied at Project site, the following VOC limits, exclusive of colorants added to a tint base, when calculated according to 40 CFR 59, Subpart D (EPA Method 24)].
1. Flat Paints and Coatings: 50 g/L.
 2. Nonflat Paints and Coatings: 150 g/L.
 3. Dry-Fog Coatings: 400 g/L.
 4. Primers, Sealers, and Undercoaters: 200 g/L.
 5. Anticorrosive and Antirust Paints Applied to Ferrous Metals: 250 g/L.
 6. Zinc-Rich Industrial Maintenance Primers: 340 g/L.
 7. Pretreatment Wash Primers: 420 g/L.
 8. Floor Coatings: 100 g/L.
 9. Shellacs, Clear: 730 g/L.
 10. Shellacs, Pigmented: 550 g/L.
- C. Colors: As selected by Engineer from manufacturer's full range.

2.3 PRIMERS/SEALERS

- A. Primer Sealer, Latex, Interior: MPI #50.
1. VOC Content: E Range of E2.
 2. Environmental Performance Rating: EPR 1.
- B. Interior Latex (Low Sheen): MPI #44 (Gloss Level 2).
1. VOC Content: E Range of E1.
 2. Environmental Performance Rating: EPR 1.
- C. Interior Latex (Eggshell): MPI #52 (Gloss Level 3).
1. VOC Content: E Range of E1.
 2. Environmental Performance Rating: EPR 1.
- D. Interior Latex (Satin): MPI #43 (Gloss Level 4).
1. VOC Content: E Range of E1.
 2. Environmental Performance Rating: EPR 1.5.
- E. Interior Latex (Semigloss): MPI #54 (Gloss Level 5).

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1. VOC Content: E Range of E1.
 2. Environmental Performance Rating: EPR 2.
- F. Interior Latex (Gloss): MPI #114 (Gloss Level 6, except minimum gloss of 65 units at 60 deg).
1. VOC Content: E Range of E1.
 2. Environmental Performance Rating: EPR 2.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates and conditions, with Applicator present, for compliance with requirements for maximum moisture content and other conditions affecting performance of the Work.
- B. Maximum Moisture Content of Substrates: When measured with an electronic moisture meter as follows:
 1. Concrete: 12 percent.
 2. Masonry (Clay and CMU): 12 percent.
 3. Wood: 15 percent.
 4. Gypsum Board: 12 percent.
 5. Plaster: 12 percent.
- C. Verify suitability of substrates, including surface conditions and compatibility with existing finishes and primers.
- D. Proceed with coating application only after unsatisfactory conditions have been corrected.
 1. Application of coating indicates acceptance of surfaces and conditions.

3.2 PREPARATION

- A. Comply with manufacturer's written instructions and recommendations in "MPI Manual" applicable to substrates indicated.
- B. Remove hardware, covers, plates, and similar items already in place that are removable and are not to be painted. If removal is impractical or impossible because of size or weight of item, provide surface-applied protection before surface preparation and painting.
 1. After completing painting operations, use workers skilled in the trades involved to reinstall items that were removed. Remove surface-applied protection if any.
- C. Clean substrates of substances that could impair bond of paints, including dust, dirt, oil, grease, and incompatible paints and encapsulants.

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1. Remove incompatible primers and re-prime substrate with compatible primers or apply tie coat as required to produce paint systems indicated.

3.3 APPLICATION

- A. Apply paints according to manufacturer's written instructions and to recommendations in "MPI Manual."
- B. Apply paints to produce surface films without cloudiness, spotting, holidays, laps, brush marks, roller tracking, runs, sags, ropiness, or other surface imperfections. Cut in sharp lines and color breaks.

3.4 CLEANING AND PROTECTION

- A. Protect work of other trades against damage from paint application. Correct damage to work of other trades by cleaning, repairing, replacing, and refinishing, as approved by Architect, and leave in an undamaged condition.
- B. At completion of construction activities of other trades, touch up and restore damaged or defaced painted surfaces.

3.5 INTERIOR PAINTING SCHEDULE

A. CMU Substrates:

1. Latex System:
 - a. Block Filler: Block filler, latex, interior/exterior, MPI #4.
 - b. Intermediate Coat: Latex, interior, matching topcoat.
 - c. Topcoat: Latex, interior, flat, (Gloss Level 1), MPI #53.
 - d. Topcoat: Latex, interior, (Gloss Level 2), MPI #44.
 - e. Topcoat: Latex, interior, (Gloss Level 3), MPI #52.
 - f. Topcoat: Latex, interior, (Gloss Level 4), MPI #43.
 - g. Topcoat: Latex, interior, semi-gloss, (Gloss Level 5), MPI #54.
 - h. Topcoat: Latex, interior, gloss, (Gloss Level 6, except minimum gloss of 65 units at 60 degrees), MPI #114.
2. Institutional Low-Odor/VOC Latex System:
 - a. Block Filler: Block filler, latex, interior/exterior, MPI #4.
 - b. Intermediate Coat: Latex, interior, institutional low odor/VOC, matching topcoat.
 - c. Topcoat: Latex, interior, institutional low odor/VOC, flat (Gloss Level 1), MPI #143.
 - d. Topcoat: Latex, interior, institutional low odor/VOC, (Gloss Level 2), MPI #144.
 - e. Topcoat: Latex, interior, institutional low odor/VOC, (Gloss Level 3), MPI #145.

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- f. Topcoat: Latex, interior, institutional low odor/VOC, semi-gloss (Gloss Level 5), MPI #147.
3. Water-Based Light Industrial Coating System:
 - a. Block Filler: Block filler, latex, interior/exterior, MPI #4.
 - b. Intermediate Coat: Light industrial coating, interior, water based, matching topcoat.
 - c. Topcoat: Light industrial coating, interior, water based (Gloss Level 3), MPI #151.
 - d. Topcoat: Light industrial coating, interior, water based, semi-gloss (Gloss Level 5), MPI #153.
 - e. Topcoat: Light industrial coating, interior, water based, gloss (Gloss Level 6), MPI #154.
- B. Gypsum Board Substrates:
1. Latex System:
 - a. Prime Coat: Primer sealer, latex, interior, MPI #50.
 - b. Prime Coat: Latex, interior, matching topcoat.
 - c. Intermediate Coat: Latex, interior, matching topcoat.
 - d. Topcoat: Latex, interior, flat, (Gloss Level 1), MPI #53.
 - e. Topcoat: Latex, interior, (Gloss Level 2), MPI #44.
 - f. Topcoat: Latex, interior, (Gloss Level 3), MPI #52.
 - g. Topcoat: Latex, interior, (Gloss Level 4), MPI #43.
 - h. Topcoat: Latex, interior, semi-gloss, (Gloss Level 5), MPI #54.
 - i. Topcoat: Latex, interior, gloss, (Gloss Level 6, except minimum gloss of 65 units at 60 degrees), MPI #114.
 2. Institutional Low-Odor/VOC Latex System:
 - a. Prime Coat: Primer sealer, interior, institutional low odor/VOC, MPI #149.
 - b. Intermediate Coat: Latex, interior, institutional low odor/VOC, matching topcoat.
 - c. Topcoat: Latex, interior, institutional low odor/VOC, flat (Gloss Level 1), MPI #143.
 - d. Topcoat: Latex, interior, institutional low odor/VOC, (Gloss Level 2), MPI #144.
 - e. Topcoat: Latex, interior, institutional low odor/VOC, (Gloss Level 3), MPI #145.
 - f. Topcoat: Latex, interior, institutional low odor/VOC, semi-gloss (Gloss Level 5), MPI #147.
 3. Water-Based Light Industrial Coating System:
 - a. Prime Coat: Primer sealer, latex, interior, MPI #50.
 - b. Intermediate Coat: Light industrial coating, interior, water based, matching topcoat.
 - c. Topcoat: Light industrial coating, interior, water based (Gloss Level 3), MPI #151.
 - d. Topcoat: Light industrial coating, interior, water based, semi-gloss (Gloss Level 5), MPI #153.

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- e. Topcoat: Light industrial coating, interior, water based, gloss (Gloss Level 6), MPI #154.
- C. Spray-Textured Ceiling Substrates:
- 1. Latex (Flat) System: Spray applied.
 - a. Prime Coat: Latex, interior, flat, (Gloss Level 1), MPI #53.
 - b. Topcoat: Latex, interior, flat, (Gloss Level 1), MPI #53.
 - 2. Latex System: Spray applied.
 - a. Prime Coat: Latex, interior, matching topcoat.
 - b. Intermediate Coat: Latex, interior, matching topcoat.
 - c. Topcoat: Latex, interior, flat, (Gloss Level 1), MPI #53.
 - d. Topcoat: Latex, interior, (Gloss Level 2), MPI #44.
 - e. Topcoat: Latex, interior, (Gloss Level 3), MPI #52.
 - f. Topcoat: Latex, interior, (Gloss Level 4), MPI #43.
 - g. Topcoat: Latex, interior, semi-gloss, (Gloss Level 5), MPI #54.
 - h. Topcoat: Latex, interior, gloss, (Gloss Level 6, except minimum gloss of 65 units at 60 degrees), MPI #114.
 - 3. Latex over Alkyd Primer System:
 - a. Prime Coat: Primer sealer, alkyd, interior, MPI #45.
 - b. Topcoat: Latex, interior, flat, (Gloss Level 1), MPI #53.
 - c. Topcoat: Latex, interior, (Gloss Level 2), MPI #44.
 - d. Topcoat: Latex, interior, (Gloss Level 3), MPI #52.
 - e. Topcoat: Latex, interior, (Gloss Level 4), MPI #43.
 - f. Topcoat: Latex, interior, semi-gloss, (Gloss Level 5), MPI #54.
 - g. Topcoat: Latex, interior, gloss, (Gloss Level 6, except minimum gloss of 65 units at 60 degrees), MPI #114.

END OF SECTION 09 91 23

DIVISION **23**

HEATING VENTILATING AND AIR CONDITIONING



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SECTION 230500
BASIC MECHANICAL MATERIALS AND METHODS

PART 1 - GENERAL

1.1 SUMMARY

- A. This Section includes the following:
 - 1. Mechanical demolition.
 - 2. Equipment installation requirements common to equipment sections.
 - 3. Supports and anchorages.
- B. All systems provided shall be complete and operational. Refer to complete specifications and drawings for additional detailed requirements. Manufacturers recommended installation guidelines shall be used if no other specific direction is given. Bidder shall be responsible to coordinate and include in his bid all necessary appurtenances and additional material to ensure proper installation and function. All bidders shall be responsible to review the complete set of specifications, drawings and addendums.

1.2 DEFINITIONS

- A. Finished Spaces: Spaces other than mechanical and electrical equipment rooms, furred spaces, pipe and duct shafts, unheated spaces immediately below roof, spaces above ceilings, unexcavated spaces, crawlspaces, and tunnels.
- B. Exposed, Interior Installations: Exposed to view indoors. Examples include finished occupied spaces and mechanical equipment rooms.
- C. Exposed, Exterior Installations: Exposed to view outdoors or subject to outdoor ambient temperatures and weather conditions. Examples include rooftop locations.
- D. Concealed, Interior Installations: Concealed from view and protected from physical contact by building occupants. Examples include above ceilings and in duct shafts.
- E. Concealed, Exterior Installations: Concealed from view and protected from weather conditions and physical contact by building occupants but subject to outdoor ambient temperatures. Examples include installations within unheated shelters.

1.3 QUALITY ASSURANCE

- A. Electrical Characteristics for Mechanical Equipment: Equipment of higher electrical characteristics may be furnished provided such proposed equipment is approved in writing and

connecting electrical services, circuit breakers, and conduit sizes are appropriately modified. If minimum energy ratings or efficiencies are specified, equipment shall comply with requirements.

PART 2 - PRODUCTS

2.1 JOINING MATERIALS

- A. Refer to individual sections for special joining materials not listed below.
- B. Plastic, Pipe-Flange Gasket, Bolts, and Nuts: Type and material recommended by piping system manufacturer, unless otherwise indicated.
- C. Solder Filler Metals: ASTM B 32, lead-free alloys. Include water-flushable flux according to ASTM B 813.
- D. Brazing Filler Metals: AWS A5.8, BCuP Series or BAg1, unless otherwise indicated.
- E. Solvent Cements for Joining Plastic Piping:
 - 1. PVC Piping: ASTM D 2564. Include primer according to ASTM F 656.
 - 2. PVC to ABS Piping Transition: ASTM D 3138.

2.2 SEALS

- A. Description: Modular sealing element unit, designed for field assembly, to fill annular space between pipe and sleeve.
- B. Sealing Elements: EPDM interlocking links shaped to fit surface of pipe. Include type and number required for pipe material and size of pipe.

2.3 SLEEVES

- A. Galvanized-Steel Sheet: 0.0239-inch minimum thickness; round tube closed with welded longitudinal joint.
- B. Molded PVC: Permanent, with nailing flange for attaching to wooden forms.
- C. PVC Pipe: ASTM D 1785, Schedule 40.

PART 3 - EXECUTION

3.1 MECHANICAL DEMOLITION

- A. Disconnect, demolish, and remove mechanical systems, equipment, and components indicated to be removed.
 - 1. Piping and tubing to be removed: Remove piping and tubing as required for demolition and installation of equipment. Temporarily cap or plug remaining piping and tubing with same or compatible piping material to prevent dirt or moisture migration.
 - 2. Ducts to Be Removed: Remove ducts indicated to be removed by limits of construction or demolition.
 - 3. Equipment to Be Removed: Disconnect and cap services and remove equipment.
- B. If pipe, tubing, insulation, or equipment to remain is damaged in appearance or is unserviceable, remove damaged or unserviceable portions and replace with new products of equal capacity and quality at no charge to contract.

3.2 PIPING AND TUBING SYSTEMS - COMMON REQUIREMENTS

- A. Install piping and tubing according to the following requirements and other applicable sections.
- B. Install piping in equipment rooms and service areas at right angles or parallel to building walls. Diagonal runs are prohibited unless specifically indicated otherwise.
- C. Install piping to permit valve servicing.
- D. Install piping with a slope to drain.
- E. Install piping free of sags and bends.
- F. Install fittings for changes in direction and branch connections.
- G. Install piping to allow application of insulation.
- H. Select system components with pressure rating equal to or greater than system operating pressure.
- I. Install escutcheons for penetrations of walls, ceilings, and floors.
- J. Install sleeves for pipes passing through concrete and masonry walls, gypsum-board partitions, and concrete floor and roof slabs.
- K. Aboveground, Exterior-Wall Pipe Penetrations: Seal penetrations using sleeves and mechanical sleeve seals. Select sleeve size to allow for 1-inch annular clear space between pipe and sleeve for installing mechanical sleeve seals.

1. Mechanical Sleeve Seal Installation: Select type and number of sealing elements required for pipe material and size. Position pipe in center of sleeve. Assemble mechanical sleeve seals and install in annular space between pipe and sleeve. Tighten bolts against pressure plates that cause sealing elements to expand and make watertight seal.
- L. Fire-Barrier Penetrations: Maintain indicated fire rating of walls, partitions, ceilings, and floors at pipe penetrations. Seal pipe penetrations with firestop materials.
- M. Verify final equipment locations for roughing-in.
- N. Refer to equipment specifications in other Sections of these Specifications for roughing-in requirements.

3.3 PIPE AND TUBING JOINT CONSTRUCTION

- A. Join pipe and fittings according to the following requirements and sections specifying piping systems.
- B. Ream ends of pipes and tubes and remove burrs. Bevel plain ends.
- C. Clean, dehydrate and remove scale, slag, dirt, and debris from inside and outside of pipe, tubing and fittings before assembly.
- D. Soldered Joints: Apply ASTM B 813, water-flushable flux, unless otherwise indicated, to tube end. Construct joints according to ASTM B 828 or CDA's "Copper Tube Handbook," using lead-free solder alloy complying with ASTM B 32.
- E. Brazed Joints: Construct joints according to AWS's "Brazing Handbook," "Pipe and Tube" Chapter, using copper-phosphorus brazing filler metal complying with AWS A5.8.
- F. Threaded Joints: Thread pipe with tapered pipe threads according to ASME B1.20.1. Cut threads full and clean using sharp dies. Ream threaded pipe ends to remove burrs and restore full ID. Join pipe fittings and valves as follows:
 1. Apply appropriate tape or thread compound to external pipe threads unless dry seal threading is specified.
 2. Damaged Threads: Do not use pipe or pipe fittings with threads that are corroded or damaged. Do not use pipe sections that have cracked or open welds.
- G. Welded Joints: Construct joints according to AWS D10.12, using qualified processes and welding operators according to Part 1 "Quality Assurance" Article.
- H. Flanged Joints: Select appropriate gasket material, size, type, and thickness for service application. Install gasket concentrically positioned. Use suitable lubricants on bolt threads.
- I. Plastic Piping Solvent-Cement Joints: Clean and dry joining surfaces. Join pipe and fittings according to the following:

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1. Comply with ASTM F 402, for safe-handling practice of cleaners, primers, and solvent cements.
2. PVC Pressure Piping: Join schedule number ASTM D 1785, PVC pipe and PVC socket fittings according to ASTM D 2672. Join other-than-schedule-number PVC pipe and socket fittings according to ASTM D 2855.
3. PVC Nonpressure Piping: Join according to ASTM D 2855.

J. Plastic Pressure Piping Gasketed Joints: Join according to ASTM D 3139.

K. Plastic Nonpressure Piping Gasketed Joints: Join according to ASTM D 3212.

3.4 PIPING CONNECTIONS

A. Make connections according to the following, unless otherwise indicated:

1. Install unions, in piping NPS 2 and smaller at final connection to each piece of equipment.

3.5 EQUIPMENT INSTALLATION - COMMON REQUIREMENTS

A. Install equipment to allow maximum possible headroom unless specific mounting heights are not indicated.

B. Install equipment level and plumb, parallel and perpendicular to other building systems and components in exposed interior spaces, unless otherwise indicated.

C. Install mechanical equipment to facilitate service, maintenance, and repair or replacement of components. Connect equipment for ease of disconnecting, with minimum interference to other installations. Extend grease fittings to accessible locations.

D. Install equipment to allow right of way for piping installed at required slope.

E. Install equipment to permit servicing of electrical panels per OSHA requirements.

F. Place grout under supports for equipment and make smooth bearing surface.

G. Install equipment in accordance with Manufacturer's recommendations.

3.6 ANCHORS

A. Anchor equipment to concrete slab according to equipment manufacturer's written instructions.

1. Remove existing anchors and repair slab prior to placing new equipment. Slab shall be flat and free of noticeable defects prior to placing equipment.
2. Install epoxy-coated anchor bolts for equipment and anchor into structural concrete floor.

3. Place and secure anchorage devices. Use supported equipment manufacturer's setting drawings, templates, diagrams, instructions, and directions furnished with items to be embedded.
4. Install anchor bolts to elevations required for proper attachment to supported equipment.
5. Install anchor bolts according to anchor-bolt manufacturer's written instructions.
6. Use 3000-psi, 28-day compressive-strength concrete.

3.7 ERECTION OF METAL SUPPORTS AND ANCHORAGES

- A. Cut, fit, and place miscellaneous metal supports accurately in location, alignment, and elevation to support and anchor mechanical materials and equipment or as required.
- B. Field Welding: Comply with AWS D1.1.

3.8 ERECTION OF WOOD SUPPORTS AND ANCHORAGES

- A. Cut, fit, and place wood grounds, nailers, blocking, and anchorages to support, and anchor mechanical materials and equipment.
- B. Select fastener sizes that will not penetrate members if opposite side will be exposed to view or will receive finish materials. Tighten connections between members. Install fasteners without splitting wood members.
- C. Attach to substrates as required to support applied loads.

END OF SECTION 230500

SECTION 230529
HANGERS AND SUPPORTS

PART 1 - GENERAL

1.1 SUMMARY

- A. This Section includes the following:
 - 1. Steel pipe hangers and supports.
 - 2. Trapeze pipe hangers.
 - 3. Metal framing systems.
 - 4. Thermal-hanger shield inserts.
 - 5. Fastener systems.
 - 6. Equipment supports.

1.2 DEFINITIONS

- A. Terminology: As defined in MSS SP-90, "Guidelines on Terminology for Pipe Hangers and Supports."
- B. Equipment: To include diffusers

1.3 PERFORMANCE REQUIREMENTS

- A. Design supports for multiple pipes capable of supporting combined weight of supported systems, system contents, and test water.
- B. Design equipment supports capable of supporting combined operating weight of supported equipment and connected systems and components.

1.4 SUBMITTALS

- A. Product Data: For the following:
 - 1. Steel pipe hangers and supports.
 - 2. Thermal-hanger shield inserts.
 - 3. Powder-actuated fastener systems.
- B. Welding certificates.

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1.5 QUALITY ASSURANCE

- A. Welding: Qualify procedures and personnel according to ASME Boiler and Pressure Vessel Code: Section IX.

PART 2 - PRODUCTS

2.1 STEEL PIPE HANGERS AND SUPPORTS

- A. Description: MSS SP-58, Types 1 through 58, factory-fabricated components. Refer to Part 3 "Hanger and Support Applications" Article for where to use specific hanger and support types.
- B. Manufacturers:
1. B-Line Systems, Inc.; a division of Cooper Industries.
 2. Unistrut Corp.; Tyco International, Ltd.
 3. Grinnell Corp.
- C. Galvanized, Metallic Coatings: Pre-galvanized or hot dipped.
- D. Nonmetallic Coatings: Plastic coating, jacket, or liner.
- E. Padded Hangers: Hanger with fiberglass or other pipe insulation pad or cushion for support of bearing surface of piping.

2.2 TRAPEZE PIPE HANGERS

- A. Description: MSS SP-69, Type 59, shop- or field-fabricated pipe-support assembly made from structural-steel shapes with MSS SP-58 hanger rods, nuts, saddles, and U-bolts.

2.3 METAL FRAMING SYSTEMS

- A. Description: MFMA-3, shop- or field-fabricated pipe-support assembly made of steel channels and other components.
- B. Manufacturers:
1. B-Line Systems, Inc.; a division of Cooper Industries.
 2. Unistrut Corp.; Tyco International, Ltd.
 3. Grinnell Corp.
- C. Coatings: Manufacturer's standard finish, unless bare metal surfaces are indicated.
- D. Nonmetallic Coatings: Plastic coating, jacket, or liner.

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2.4 THERMAL-HANGER SHIELD INSERTS

- A. Description: 100-psig minimum, compressive-strength insulation insert encased in sheet metal shield.
- B. Manufacturers:
 - 1. B-Line Systems, Inc.; a division of Cooper Industries.
 - 2. Unistrut Corp.; Tyco International, Ltd.
 - 3. Grinnell Corp.
- C. Insulation-Insert Material for Cold Piping: Water-repellent treated, ASTM C 533, Type I calcium silicate or ASTM C 552, Type II cellular glass with vapor barrier.
- D. Insulation-Insert Material for Hot Piping: Water-repellent treated, ASTM C 533, Type I calcium silicate or ASTM C 552, Type II cellular glass.
- E. For Trapeze or Clamped Systems: Insert and shield shall cover entire circumference of pipe.
- F. For Clevis or Band Hangers: Insert and shield shall cover lower 180 degrees of pipe.
- G. Insert Length: Extend 2 inches beyond sheet metal shield for piping operating below ambient air temperature.

2.5 FASTENER SYSTEMS

- A. Powder-Actuated Fasteners: Threaded-steel stud, for use in hardened portland cement concrete with pull-out, tension, and shear capacities appropriate for supported loads and building materials where used.
 - 1. Manufacturers:
 - a. Hilti, Inc.
 - b. B-Line Systems, Inc.; a division of Cooper Industries.
- B. Hilti, Inc. Mechanical-Expansion Anchors: Insert-wedge-type zinc-coated steel, for use in hardened portland cement concrete with pull-out, tension, and shear capacities appropriate for supported loads and building materials where used.
 - 1. Manufacturers:
 - a. Hilti, Inc.
 - b. B-Line Systems, Inc.; a division of Cooper Industries.

2.6 EQUIPMENT SUPPORTS

- A. Description: Welded, shop- or field-fabricated equipment support made from structural-steel shapes.

2.7 MISCELLANEOUS MATERIALS

- A. Structural Steel: ASTM A 36/A 36M, steel plates, shapes, and bars; black and galvanized.
- B. Grout: ASTM C 1107, factory-mixed and -packaged, dry, hydraulic-cement, non-shrink and nonmetallic grout; suitable for interior and exterior applications.
 - 1. Properties: Non-staining, noncorrosive, and nongaseous.
 - 2. Design Mix: 5000-psi, 28-day compressive strength.

PART 3 - EXECUTION

3.1 HANGER AND SUPPORT APPLICATIONS

- A. Specific hanger and support requirements are specified in sections specifying piping systems and equipment.
- B. Comply with MSS SP-69 for pipe hanger selections and applications that are not specified in piping system Sections.
- C. Existing hangers and supports may not be reused without prior approval by Dammon Engineering.
- D. Use hangers and supports with galvanized, metallic coatings for piping and equipment that will not have field-applied finish.
- E. Use nonmetallic coatings on attachments for electrolytic protection where attachments are in direct contact with copper tubing.
- F. Use padded hangers for piping that is subject to scratching.
- G. Horizontal-Piping Hangers and Supports: Unless otherwise indicated and except as specified in piping system sections, install the following types:
 - 1. Adjustable, Steel Clevis Hangers (MSS Type 1): For suspension of non-insulated or insulated stationary pipes, NPS 1/2 to NPS 4.
 - 2. Carbon- or Alloy-Steel, Double-Bolt Pipe Clamps (MSS Type 3): For suspension of pipes, NPS 3/4 to NPS 4, requiring clamp flexibility and up to 4 inches of insulation.
 - 3. Adjustable, Steel Band Hangers (MSS Type 7): For suspension of non-insulated stationary pipes, NPS 1/2 to NPS 4.
 - 4. U-Bolts (MSS Type 24): For support of heavy pipes, NPS 1/2 to NPS 4.
 - 5. Single Pipe Rolls (MSS Type 41): For suspension of pipes, NPS 1 to NPS 4, from 2 rods if longitudinal movement caused by expansion and contraction might occur.
- H. Vertical-Piping Clamps: Unless otherwise indicated and except as specified in piping system sections, install the following types:

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1. Extension Pipe or Riser Clamps (MSS Type 8): For support of pipe risers, NPS 3/4 to NPS 4.
 2. Carbon- or Alloy-Steel Riser Clamps (MSS Type 42): For support of pipe risers, NPS 3/4 to NPS 4, if longer ends are required for riser clamps.
- I. Hanger-Rod Attachments: Unless otherwise indicated and except as specified in piping system Sections, install the following types:
1. Steel Turnbuckles (MSS Type 13): For adjustment up to 6 inches for heavy loads.
 2. Steel Clevises (MSS Type 14): For 120 to 450 deg F piping installations.
- J. Building Attachments: Unless otherwise indicated and except as specified in piping system sections, install the following types:
1. Steel or Malleable Concrete Inserts (MSS Type 18): For upper attachment to suspend pipe hangers from concrete ceiling.
 2. Top-Beam C-Clamps (MSS Type 19): For use under roof installations with bar-joint construction to attach to top flange of structural shape.
 3. Side-Beam or Channel Clamps (MSS Type 20): For attaching to bottom flange of beams, channels, or angles.
 4. Center-Beam Clamps (MSS Type 21): For attaching to center of bottom flange of beams.
 5. Welded Beam Attachments (MSS Type 22): For attaching to bottom of beams if loads are considerable and rod sizes are large.
 6. C-Clamps (MSS Type 23): For structural shapes.
 7. Welded-Steel Brackets: For support of pipes from below, or for suspending from above by using clip and rod. Use one of the following for indicated loads:
 - a. Light (MSS Type 31): 750 lb.
 - b. Medium (MSS Type 32): 1500 lb.
 - c. Heavy (MSS Type 33): 3000 lb.
 8. Side-Beam Brackets (MSS Type 34): For sides of steel or wooden beams.
 9. Plate Lugs (MSS Type 57): For attaching to steel beams if flexibility at beam is required.
- K. Saddles and Shields: Unless otherwise indicated and except as specified in piping system Sections, install the following types:
1. Steel Pipe-Covering Protection Saddles (MSS Type 39): To fill interior voids with insulation that matches adjoining insulation.
 2. Protection Shields (MSS Type 40): Of length recommended in writing by manufacturer to prevent crushing insulation.
 3. Thermal-Hanger Shield Inserts: For supporting insulated pipe.
- L. Comply with MSS SP-69 for trapeze pipe hanger selections and applications that are not specified in piping system Sections.
- M. Comply with MFMA-102 for metal framing system selections and applications that are not specified in piping system Sections.

- N. Use powder-actuated fasteners or mechanical-expansion anchors instead of building attachments where required in concrete construction.

3.2 HANGER AND SUPPORT INSTALLATION

- A. Steel Pipe Hanger Installation: Comply with MSS SP-69 and MSS SP-89. Install hangers, supports, clamps, and attachments as required to properly support piping from building structure.
- B. Trapeze Pipe Hanger Installation: Comply with MSS SP-69 and MSS SP-89. Arrange for grouping of parallel runs of horizontal piping and support together on field-fabricated trapeze pipe hangers.
 - 1. Pipes of Various Sizes: Support together and space trapezes for smallest pipe size or install intermediate supports for smaller diameter pipes as specified above for individual pipe hangers.
 - 2. Field fabricate from ASTM A 36/A 36M, steel shapes selected for loads being supported. Weld steel according to AWS D1.1.
- C. Metal Framing System Installation: Arrange for grouping of parallel runs of piping and support together on field-assembled metal framing systems.
- D. Thermal-Hanger Shield Installation: Install in pipe hanger or shield for insulated piping.
- E. Fastener System Installation:
 - 1. Install powder-actuated fasteners in concrete after concrete is placed and completely cured. Use operators that are licensed by powder-actuated tool manufacturer. Install fasteners according to powder-actuated tool manufacturer's operating manual.
 - 2. Install mechanical-expansion anchors in concrete after concrete is placed and completely cured. Install fasteners according to manufacturer's written instructions.
- F. Install hangers and supports complete with necessary inserts, bolts, rods, nuts, washers, and other accessories.
- G. Equipment Support Installation: Fabricate from welded-structural-steel shapes.
- H. Install hangers and supports to allow controlled thermal and seismic movement of piping systems, to permit freedom of movement between pipe anchors, and to facilitate action of expansion joints, expansion loops, expansion bends, and similar units.
- I. Install lateral bracing with pipe hangers and supports to prevent swaying.
- J. Install building attachments within concrete slabs or attach to structural steel. Install additional attachments at changes in direction of piping. Install concrete inserts before concrete is placed; fasten inserts to forms and install reinforcing bars through openings at top of inserts.

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- K. Load Distribution: Install hangers and supports so piping live and dead loads and stresses from movement will not be transmitted to connected equipment.
- L. Pipe Slopes: Install hangers and supports to provide indicated pipe slopes and so maximum pipe deflections allowed by ASME B31.1 (for power piping) and ASME B31.9 (for building services piping) are not exceeded.
- M. Insulated Piping: Comply with the following:
 - 1. Attach clamps and spacers to piping.
 - a. Piping Operating above Ambient Air Temperature: Clamp may project through insulation.
 - b. Piping Operating below Ambient Air Temperature: Use thermal-hanger shield insert with clamp sized to match OD of insert.
 - c. Do not exceed pipe stress limits according to ASME B31.1 for power piping and ASME B31.9 for building services piping.
 - 2. Install MSS SP-58, Type 39, protection saddles if insulation without vapor barrier is indicated. Fill interior voids with insulation that matches adjoining insulation.
 - 3. Install MSS SP-58, Type 40, protective shields on cold piping with vapor barrier. Shields shall span an arc of 180 degrees.
 - 4. Shield Dimensions for Pipe: Not less than the following:
 - a. NPS 1/4 to NPS 4: 12 inches long and 0.048 inch thick.
 - 5. Insert Material: Length at least as long as protective shield.
 - 6. Thermal-Hanger Shields: Install with insulation same thickness as piping insulation.

3.3 EQUIPMENT SUPPORTS

- A. Fabricate structural-steel stands to suspend equipment from structure overhead.
- B. Grouting: As applicable, place grout under supports for equipment and make smooth bearing surface.
- C. Provide lateral bracing, to prevent swaying, for equipment supports.

3.4 METAL FABRICATIONS

- A. Cut, drill, and fit miscellaneous metal fabrications for trapeze pipe hangers and equipment supports.
- B. Fit exposed connections together to form hairline joints. Field weld connections that cannot be shop welded because of shipping size limitations.

- C. Field Welding: Comply with AWS D1.1 procedures for shielded metal arc welding, appearance and quality of welds, and methods used in correcting welding work, and with the following:
 - 1. Use materials and methods that minimize distortion and develop strength and corrosion resistance of base metals.
 - 2. Obtain fusion without undercut or overlap.
 - 3. Remove welding flux immediately.
 - 4. Finish welds at exposed connections so no roughness shows after finishing and contours of welded surfaces match adjacent contours.

3.5 ADJUSTING

- A. Pipe Hanger Adjustments: Adjust hangers to distribute loads equally on attachments and to achieve indicated slope.
- B. Equipment Hanger Adjustments: Adjust hangers to distribute loads equally on attachments and to achieve horizontal and uniform support.

3.6 PAINTING

- A. Touch Up: Clean field welds and abraded areas of shop paint. Paint exposed areas immediately after erecting hangers and supports. Use same materials as used for shop painting. Comply with SSPC-PA 1 requirements for touching up field-painted surfaces.
 - 1. Apply paint by brush or spray to provide minimum dry film thickness of 2.0 mils.
- B. Galvanized Surfaces: Clean welds, bolted connections, and abraded areas and apply galvanizing-repair paint to comply with ASTM A 780.

END OF SECTION 15060

SECTION 230593
TESTING, ADJUSTING, AND BALANCING

PART 1 - GENERAL

1.1 SUMMARY

- A. This Section includes TAB to produce design objectives for the following:
 - 1. HVAC equipment performance settings.
 - 2. Verifying that automatic control devices are functioning properly.
 - 3. Reporting results of activities and procedures specified in this Section.
- B. The TAB (Testing and Balancing) contract shall be between the contractor and the TAB firm. Coordination between the TAB firm and the contractor shall be left strictly to those parties.
- C. All TAB deficiencies shall be corrected when found. Any deficiencies that are (for whatever reason) not corrected immediately shall be shown in the TAB report and listed on a summary sheet in the front of the TAB report. The TAB report should be submitted and reviewed by the Mechanical Engineer as part of the process to determine substantial completion. All items on the summary sheet shall become punch list items with dollar values assigned to them.
- D. Architect reserves the right to hire a second TAB firm to review the TAB report of the first. Architect also reserves the right to hire a second TAB firm to check the work of the first TAB firm.

1.2 SUBMITTALS

- A. Strategies and Procedures Plan: Within 30 days from Contractor's "Notice to Proceed", submit two copies of TAB strategies and step-by-step procedures as specified in Part 3 "Preparation" Article. Include a complete set of report forms intended for use on this Project.
- B. Shop drawings must be submitted to the TAB firm no later than 30 days after the final, approved shop drawings have been returned by the designer to the contractor.
- C. Certified TAB Reports: Submit two copies of reports prepared, as specified in this Section, on approved forms certified by TAB firm.
- D. Warranties specified in this Section.

1.3 QUALITY ASSURANCE

- A. TAB Firm Qualifications: Engage a TAB firm certified by either AABC or NEBB.

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- B. Certification of TAB Reports: Certify TAB field data reports. This certification includes the following:
 - 1. Review field data reports to validate accuracy of data and to prepare certified TAB reports.
 - 2. Certify that TAB team complied with approved TAB plan and the procedures specified and referenced in this Specification.
- C. TAB Report Forms: Use TAB firm's forms approved by Architect.
- D. TAB firms must be certified by either the AABC (Associated Air Balance Council) or the NEBB (National Environmental Balancing Bureau), or other Owner approved organization, to perform work on state projects. Falsification of a TAB report will not be allowed and will lead to the reporting of that firm to the respective national certification agency. Verification of TAB firm certification may be confirmed by contacting the certification agencies.
- E. At the time of final inspection, the TAB agency may be required to recheck, in the presence of the owner's representative, specific and random selections of data, air quantities, and air motion recorded in the certified report. Points and areas for recheck shall be selected by the owner's representative. Measurements and test procedures shall be the same as approved for the initial work for the certified report. Selections for recheck, specific plus random, shall not exceed 10% of the total number tabulated in the report.”

1.4 PROJECT CONDITIONS

- A. Partial Owner Occupancy: Owner may occupy completed areas of building before Substantial Completion. Cooperate with Owner during TAB operations to minimize conflicts with Owner's operations.

1.5 COORDINATION

- A. Coordinate the efforts of factory-authorized service representatives for systems and equipment, HVAC controls installers, and other mechanics to operate HVAC systems and equipment to support and assist TAB activities.
- B. Perform TAB after leakage and pressure tests on air distribution systems have been completed.

1.6 WARRANTY

- A. National Project Performance Guarantee: Provide a guarantee on AABC's "National Standards for Testing and Balancing Heating, Ventilating, and Air Conditioning Systems" forms stating that AABC will assist in completing requirements of the Contract Documents if TAB firm fails to comply with the Contract Documents. Guarantee shall include the following provisions:
 - 1. The certified TAB firm has tested and balanced systems according to the Contract Documents.

2. Systems are balanced to optimum performance capabilities within design and installation limits.

PART 2 - PRODUCTS (Not Applicable)

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine the Contract Documents to become familiar with Project requirements and to discover conditions in systems' designs that may preclude proper TAB of systems and equipment.
 1. Verify that quantities and locations of balancing devices are accessible and appropriate for effective balancing and for efficient system and equipment operation.
- B. Examine approved submittal data of HVAC systems and equipment.
- C. Examine equipment performance data. Relate performance data to Project conditions and requirements, including system effects that can create undesired or unpredicted conditions that cause reduced capacities in all or part of a system.
- D. Examine system and equipment installations to verify that they are complete and that testing, cleaning, adjusting, and commissioning specified in individual Sections have been performed.
- E. Examine system and equipment test reports.
- F. Examine HVAC system and equipment installations to verify that indicated balancing devices are properly installed.
- G. Examine HVAC equipment to ensure that clean filters have been installed, bearings are greased, belts are aligned and tight, and equipment with functioning controls is ready for operation.
- H. Examine heat-transfer coils for correct tubing configurations. Verify connections and verify coils have clean, undamaged and straight fins.
- I. Examine equipment for installation and for properly operating safety interlocks and controls.
- J. Examine automatic temperature system components to verify the following:
 1. Air handling units, condensers and other controlled devices are operated by the controller.
 2. Thermostats are fully functional and are located to avoid adverse effects of sunlight, drafts, and cold walls.
 3. Sensors are located to sense only the intended conditions.
 4. Controller set points are set per design parameters.
 5. Interlocked systems are operating.

- 6. Changeover from heating to cooling mode occurs per design parameters.
- K. Observe and record system reactions to changes in conditions. Record default set points if different from indicated values.
- L. Verify operation of fire dampers as applicable. Fire damper testing shall be executed by the Contractor and witnessed by the TAB firm.

3.2 PREPARATION

- A. Prepare a TAB plan that includes strategies and step-by-step procedures.
- B. Complete system readiness checks and prepare system readiness reports. Verify the following:
 - 1. Permanent electrical power wiring is complete.
 - 2. Refrigerated systems are appropriately charged and free of air and moisture.
 - 3. Automatic temperature-control systems are operational.
 - 4. Equipment and duct access doors are securely closed.
 - 5. Fire dampers are open.
 - 6. Interlocks are installed and functional.
 - 7. Ceilings are installed in critical areas where air-pattern adjustments are required and access to balancing devices is provided.

3.3 GENERAL PROCEDURES FOR TESTING AND BALANCING

- A. Perform testing and balancing procedures on each system according to the procedures contained in SMACNA's "HVAC Systems - Testing, Adjusting, and Balancing" and this Section.
- B. Cut insulation, ducts, pipes, and equipment cabinets for installation of test probes to the minimum extent necessary to allow adequate performance of procedures. After testing and balancing, close probe holes and patch insulation with new materials identical to those removed. Restore vapor barrier and finish according to insulation Specifications for this Project.
- C. Mark equipment and balancing device settings with paint or other suitable, permanent identification material to show final settings.

3.4 GENERAL PROCEDURES FOR BALANCING AIR SYSTEMS

- A. Prepare test reports for both fans and outlets.
- B. Prepare schematic diagrams of systems' "as-built" duct layouts.
- C. Determine the best locations in main and branch ducts for accurate duct airflow measurements.
- D. Locate start-stop and disconnect switches, electrical interlocks, and motor starters.
- E. Verify that motor starters are equipped with properly sized thermal protection.
- F. Check dampers for proper position to achieve desired airflow path.

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- G. Check for airflow blockages.
- H. Check drains for proper connections and functioning. Verify safety pans drain adequately without excessive standing water.
- I. Check for proper sealing of air-handling unit components.
- J. Check for proper sealing of air duct system. Duct leakage testing shall be the responsibility of the mechanical contractor or his subcontractor.

3.5 PROCEDURES

- A. Constant Volume Systems: After the fan systems have been verified, adjust airflow as follows:
 - 1. Open all dampers 100%
 - 2. Energize and set supply fan at full-flow condition.
 - 3. Per TAB procedures, adjust dampers serving each diffuser or register to proportion airflows. Verify and record initial airflow proportions.
 - 4. Verify total airflow at fan discharge. Replace or adjust fan sheaves as required to obtain total design airflow.
 - 5. Per TAB procedures, adjust dampers serving each diffuser or register to obtain design airflow - verify and record final airflows.
 - 6. Set, measure and record the return airflow and fresh air flow.
 - 7. Measure operating differential static pressure across fan.
 - 8. Measure and record fan motor running amperage and voltage.
 - 9. Note any unusual vibrations, noises or operating conditions.

3.6 PROCEDURES FOR MOTORS

- A. Motors, 1/2 HP and Larger: Test at final balanced conditions and record the following data:
 - 1. Manufacturer, model, and serial numbers.
 - 2. Motor horsepower rating.
 - 3. Motor rpm.
 - 4. Efficiency rating.
 - 5. Nameplate and measured voltage, each phase.
 - 6. Nameplate and measured amperage, each phase.
 - 7. Starter thermal-protection-element rating.
- B. Motors Driven by Variable-Frequency Controllers: Test for proper operation at speeds varying from minimum to maximum. Test the controller to prove proper operation. Record observations, including controller manufacturer, model and serial numbers, and nameplate data.

3.7 PROCEDURES FOR REFRIGERATED COILS

- A. DX Coils: Measure and record the following data for each coil:
 - 1. Liquid and suction temperature
 - 2. Liquid and suction pressure

3. Ambient (outdoor) temperature
4. Dry-bulb temperature of entering and leaving air.
5. Wet-bulb temperature of entering and leaving air.
6. Airflow (CFM)
7. Airside pressure drop (inches WC)

3.8 CONTROL VERIFICATION

- A. Check controller locations and note conditions that would adversely affect control functions.
- B. Record controller settings and note variances between set points and actual measurements.
- C. Check the operation of limiting controllers (i.e., high- and low-temperature controllers).
- D. Check free travel and proper operation of control devices.
- E. Check the sequence of operation of control devices.
- F. Check the interaction of interlock and lockout systems.
- G. Record voltages of power supply and controller output.
- H. Note operation of actuators using spring return for proper fail-safe operations.

3.9 TOLERANCES

- A. Set HVAC system airflow and water flow rates within the following tolerances:
 1. Fan airflow: Minus 5 to plus 10 percent.
 2. Air Outlets and Inlets: Minus 5 to minus 10 percent.

3.10 FINAL REPORT

- A. General: Typewritten, or computer printout in letter-quality font, on standard bond paper, in three-ring binder, tabulated and divided into sections by tested and balanced systems.
- B. Include a certification sheet in front of binder signed and sealed by the certified testing and balancing engineer.
 1. Include a list of instruments used for procedures, along with proof of calibration.
- C. Final Report Contents: In addition to certified field report data, include the following:
 1. Flow rates
 2. Fan curves
 3. Duct pressures
 4. Manufacturers' test data.
 5. Field test reports prepared by system and equipment installers.

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6. Other information relative to equipment performance, include Shop Drawings and Product Data.
- D. General Report Data: In addition to form titles and entries, include the following data in the final report, as applicable:
1. Title page.
 2. Name and address of TAB firm.
 3. Project name.
 4. Project location.
 5. Architect's name and address.
 6. Engineer's name and address.
 7. Contractor's name and address.
 8. Report date.
 9. Signature of TAB firm who certifies the report.
 10. Table of Contents with the total number of pages defined for each section of the report. Number each page in the report.
 11. Summary of contents including the following:
 - a. Indicated versus final performance.
 - b. Notable characteristics of systems.
 - c. Description of system operation sequence
 12. Nomenclature sheets for each item of equipment.
 13. Data for terminal units, including manufacturer, type size, and fittings.
 14. Test conditions for fans and pump performance forms including the following:
 - a. Settings for dampers.
 - b. Conditions of filters.
 - c. Coil, wet- and dry-bulb conditions.
 - d. Fan drive settings including settings and percentage of maximum pitch diameter.
 - e. Settings for supply-air, static-pressure controller.
 - f. Other system operating conditions that affect performance.
- E. System Diagrams: Include schematic layouts of air and hydronic distribution systems. Present each system with single-line diagram and include the following:
1. Quantities of airflows.
 2. Diffuser and register locations.
 3. Balancing stations.
 4. Position of balancing devices.

END OF SECTION 230593

SECTION 230719
MECHANICAL INSULATION

PART 1 - GENERAL

1.1 SUMMARY

- A. This Section includes insulation, insulating cements, field-applied jackets, accessories and attachments, and sealing compounds.
- B. Insulate Refrigerant suction tubing and air unit supply and return ducting in accordance with drawings and these specifications.
- C. All systems provided shall be complete and operational. Refer to complete specifications and drawings for additional detailed requirements. Manufacturers recommended installation guidelines shall be used if no other specific direction is given. Bidder shall be responsible to coordinate and include in his bid all necessary appurtenances and additional material to ensure proper installation and function. All bidders shall be responsible to review the complete set of specifications, drawings and addendums.

1.2 SUBMITTALS

Product Data: Thermal conductivity, thickness, and jackets (both factory and field applied, if any), for each type of product indicated.

1.3 QUALITY ASSURANCE

Fire-Test-Response Characteristics: Provide products with flame-spread and smoke-developed indices of 25 and 50, respectively, according to ASTM E 84 by a testing agency acceptable to authorities having jurisdiction.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
- B. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - 1. Duct Liner:
 - a. CertainTeed Manson.

- b. Knauf Fiber Glass
- c. Owens-Corning Fiberglas Corp.
- 2. Duct Wrap
 - a. CertainTeed Manson.
 - b. Knauf Fiber Glass
 - c. Owens-Corning Fiberglas Corp.
- 3. Flexible Elastomeric Thermal Insulation:
 - a. Armacell, LLC
 - b. Armstrong World Industries, Inc.
 - c. Rubatex Corp.

2.2 INSULATION MATERIALS

- A. Duct Liner (Internal): Glass fibers bonded with a thermosetting resin complying with the following:
 - 1. Duct Liner Insulation: ASTM C 1071 - Standard Specification for Duct Lining Insulation (Thermal and Sound Absorbing Material)
 - 2. Fire-Resistant Adhesive: ASTM C 916 - Standard Specification for Adhesives for Duct Liner Insulation
 - 3. Mineral-Fiber Insulating Cements: Comply with ASTM C 195.
 - 4. Expanded or Exfoliated Vermiculite Insulating Cements: Comply with ASTM C 196.
 - 5. Mineral-Fiber, Hydraulic-Setting Insulating and Finishing Cement: Comply with ASTM C 449/C 449M.
- B. Duct Wrap (External): Mineral or glass fibers bonded with a thermosetting resin complying with the following:
 - 1. Duct Wrap: ASTM C 1290 - Standard Specification for Flexible Fibrous Glass Blanket Insulation Used to Externally Insulate HVAC Ducts.
 - 2. Vapor Barrier: ASJ all-purpose facing with white Kraft paper finish, or equal.
- C. Flexible Elastomeric Thermal Insulation: Closed-cell, sponge- or expanded-rubber materials. Comply with ASTM C 534, Type I for tubular materials and Type II for sheet materials.

PART 3 - EXECUTION

3.1 GENERAL APPLICATION REQUIREMENTS

- A. Surface Preparation: Clean and dry surfaces to receive insulation. Remove materials that will adversely affect insulation application.

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- B. Apply insulation materials, accessories, and finishes according to the manufacturer's written instructions; with smooth, straight, and even surfaces; and free of voids throughout the length of ducts and fittings.
- C. Use accessories compatible with insulation materials and suitable for the service. Use accessories that do not corrode, soften, or otherwise attack insulation in either wet or dry state.
- D. Seal joints and seams with vapor-retarder mastic.
- E. Lap joints and seams of duct wrap a minimum of 3 inches, and sealed with ASJ jacket tape.
- F. Apply insulation with tight longitudinal seams and end joints. Secure with welded stick pins and bond seams and joints with adhesive recommended by the insulation material manufacturer.
- G. Apply insulation with the least number of joints practical.
- H. Duct Securement: Insulation to be secured per SMACNA standards with weld type stickpins and zinc plated speed washers.
- I. Any insulation that becomes damaged, water soaked, or stained shall be replaced at no additional cost to the Contract.
- J. Exterior insulation for refrigerant tubing insulation shall be painted with two coats of latex paint in accordance with the manufacturer's instructions or encase in metal jacket (0.020-inch-thick aluminum, minimum).
- K. Exterior insulation for duct wrap to be sealed for weather protection with aluminum jacketing per Manufacturer's recommendations (.020-inch-thick aluminum, minimum).

3.2 INSULATION APPLICATION SCHEDULE

- A. Service: Refrigerant Tubing
 - 1. Operating Temperature: 30 to 140 deg F.
 - 2. Insulation Material: Flexible elastomeric.
- B. Service: Supply and Return Air Ducts
 - 1. Duct Liner:
 - a. Maximum Temperature Rating: 250 deg F.
 - b. Insulation Material: Fiberglass Duct Liner
 - c. Insulation Thickness: 1.0" thickness, minimum
 - d. K Factor 0.28 per inch maximum K-factor at 75°F mean temperature
 - 2. Duct Wrap:
 - a. Maximum Temperature Rating: 250 deg F.
 - b. Insulation Material: Mineral Fiber with ASJ jacket
 - c. Insulation Thickness: 1.5" thickness, minimum
 - d. K Factor 0.27 per inch maximum K-factor at 75°F mean temperature
 - e. Exterior insulation encased in aluminum jacket.

END OF SECTION 230719

SECTION 230900
INSTRUMENTATION AND CONTROL FOR HVAC

PART 1 - GENERAL

1.1 WORK INCLUDED

All systems provided shall be complete and operational. Refer to complete specifications and drawings for additional detailed requirements. Manufacturers recommended installation guidelines shall be used if no other specific direction is given. Bidder shall be responsible to coordinate and include in his bid all necessary appurtenances and additional material to ensure proper installation and function. All bidders shall be responsible to review the complete set of specifications, drawings and addendums.

1.2 DESCRIPTION

Provide all control components as required to provide a complete and functional system.

1.3 SUBMITTALS

Product Data: For each product provided include data sheets indicating function, calibration, engineering data sheets and manufacturer make/model.

PART 1 - PRODUCTS

2.1 Thermostats

- A. All thermostats will have LCD that shows the current room temperature.
- B. All thermostats shall display mode of operation.
- C. All thermostats shall be able to be over-ridden in unoccupied periods.
- D. All thermostats shall be able to display current setpoints.
- E. All thermostats shall have the optional ability to lock out the front panel of the thermostat to prevent tampering by area occupants.

2.2 Smoke Detectors

Smoke Detectors shall be addressable photoelectric smoke detectors compatible with the existing control panel. It shall be possible to electronically measure and/or adjust the sensitivity of each individual addressable detector.

2.3 Wiring

- A. General. All wiring shall be copper in accordance with NEC and applicable codes and standards.
- B. Insulated wire shall use copper conductors and shall be UL listed for 90°C (200°F) minimum service.
- C. Control Contractor will be responsible for providing interlock/power wiring for AHUs, condensers and accessories. The Fire Alarm Contractor will be responsible for shutdown relays at the AHU panel and the installation of smoke detectors.

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PART 3: EXECUTION

3.1 Protection

- A. Controls Contractor shall protect against and be liable for any damage to work and to material caused by Contractor's work or employees.
- B. Controls Contractor shall be responsible for all work and equipment either stored or installed on-site. Protect material not immediately installed. Close open ends of work with temporary covers or plugs during storage and construction to prevent entry of foreign objects or danger to personnel in the area.
- C. Controls Contractor shall replace damaged or inoperable control components as required for a complete and functional system.

3.2 Coordination

- A. Site.
 - 1. Coordinate and schedule work with other trades in the same area with work dependent upon other work to facilitate mutual progress.
- B. Test and Balance
 - 1. Provide a certified technician to assist with testing and balancing of each AHU.

3.3 General Workmanship

- A. Install equipment and wiring or raceways horizontally, vertically, and parallel to walls wherever possible.
- B. Provide sufficient slack and flexible connections to allow for equipment vibration isolation.
- C. Install equipment in readily accessible locations as defined by National Electrical Code (NEC) Chapter 1 Article 100 Part A.
- D. Verify wiring integrity to ensure continuity and freedom from shorts and ground faults.
- E. Equipment, installation, and wiring shall comply with industry specifications, standards, and local codes for performance, reliability, and compatibility.

3.4 Wiring

- A. Control and interlock wiring and installation shall comply with national and local electrical codes, and manufacturer's recommendations.
- B. Install wiring in raceway subject to mechanical damage and in mechanical, electrical, or service rooms.
- C. Use structural members to support or anchor plenum cables without raceway. Do not use ductwork, electrical raceways, piping, or ceiling suspension systems to support or anchor cables.
- D. Terminate control wiring related to the work of this section. Maintain at the job site updated (as-built) wiring diagrams that identify terminations.
- E. Flexible metal raceways and liquid-tight flexible metal raceways shall not exceed 3 feet in length and shall be supported at each end. Do not use flexible metal raceway less than ½ in. electrical trade size.
- F. Label communication wiring to indicate origination and function.

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3.5 Installation of Control Components

- A. Install thermostats and related components according to manufacturer's recommendations as required for proper system operation.
- B. Freeze-stats, smoke detectors, high-pressure cut-offs, and other safety switches shall be hard-wired to de-energize equipment per code or as described in the sequence of operation. Switches shall require manual reset.

3.6 Checkout and Testing

- A. Startup Testing. Complete startup testing to verify operational control of the system before notifying Owner of system demonstration. Provide Owner with schedule for startup testing. Owner may have a representative present during any or all startup testing.
 - 1. Calibrate and prepare for service each instrument, control, and accessory furnished.
 - 2. Verify that control wiring is properly connected and free of shorts and ground faults. Verify that all terminations are tight.
 - 3. Calibrate each device according to manufacturer's recommendations.
 - 4. Verify that each device operates properly and that normal positions are correct.
 - 5. Prepare a log documenting startup testing of each input and output device, with technician's initials certifying each device has been tested and calibrated.
 - 6. Verify that system operates according to sequences of operation. Simulate and observe each operational mode by overriding and varying inputs and schedules.
 - 7. Verify operation of smoke detectors.

3.7 Sequence of Operation

A. Air Handling Units (AHU)

Run Conditions: The air handling unit and condenser(s) shall run whenever cooling is called for by the thermostat or manually energized by the building occupants. Condensers shall energize sequentially as required to maintain the temperature set point. Interlock from the fire alarm relays to the AHU starter shall be by the Fire Alarm Contractor.

Smoke Detection: The unit shall shut down and generate an alarm upon receiving a smoke detector alarm from the smoke detectors. Smoke detectors shall be interfaced with the existing fire alarm panel by the fire alarm contractor.

Supply Fan: The supply fan shall run anytime the unit is commanded to run unless shutdown on safeties.

Thermostats: The thermostat shall monitor the space temperature and maintain an air temperature setpoint based on zone cooling and heating requirements and manual setting of the thermostat

Heating: When in HEAT mode, the thermostat shall measure the space temperature and energize the heater to maintain set point as required.

END OF SECTION 230900

SECTION 232300
REFRIGERANT TUBING

PART 1 - GENERAL

1.1 SUMMARY

- A. This Section includes refrigerant tubing and specialties for direct expansion (DX) cooling applications.
- B. All systems provided shall be complete and operational. Refer to complete specifications and drawings for additional detailed requirements. Manufacturers recommended installation guidelines shall be used if no other specific direction is given. Bidder shall be responsible to coordinate and include in his bid all necessary appurtenances and additional material to ensure proper installation and function. All bidders shall be responsible to review the complete set of specifications, drawings and addendums.

1.2 SUBMITTALS

- A. Product Data: Include tubing material, valves, driers, moisture indicators and accessories.
- B. Refrigerant line set testing and cleaning results.
- C. Start-up refrigerant pressures and superheat.

1.3 QUALITY ASSURANCE

- A. ASME Compliance: Comply with ASME 16.22, "Standard for Wrought Copper and Copper Alloy Solder Joint Pressure Fittings".
- B. ASTM Compliance: Comply with ASTM B280, "Standard Specification for Seamless Copper Tube for Air Conditioning and Refrigeration Field Service"

1.4 COORDINATION

- A. Coordinate installations with all trades and equipment installation.

PART 2 - PRODUCTS

2.1 Tubes and fittings

Copper tubing shall be soft annealed where bending is required and hard drawn where no bending is required. Soft annealed copper tubing shall not be used in sizes larger than 1-3/8 inches. Joints shall be brazed, and fittings shall be wrought copper. Brass or bronze adapters for brazed tubing may be used for connecting tubing to flanges and to threaded ends of valves and equipment.

2.2 Solder

Solder shall be grade Sb5, tin-antimony alloy for service pressures up to 150 PSIG. Solder flux shall be liquid or paste form, non-corrosive.

2.3 Brazing filler metal

Filler metal shall be Type BAg-5 with AWS Type 3 flux, except Type BCuP-5 or BCuP-6 may be used for brazing copper-to-copper joints.

2.4 Stop Valves

Stop valves shall be of the globe or full-port ball type with a back-seating stem especially packed for refrigerant service. Valve packing shall be replaceable under line pressure. Valve shall be provided with a wrench operator and a seal cap. Valve shall be the straight or angle pattern design.

2.5 Filter driers

Filter driers sizes 5/8 inch and larger shall be the full flow, replaceable core type. Sizes 1/2 inch and smaller shall be the sealed type. Cores shall be of suitable desiccant that will not plug, cake, dust, channel, or break down, and shall remove water, acid, and foreign material from the refrigerants. Filter driers shall be constructed so that none of the desiccant will pass into the refrigerant lines. Minimum bursting pressure shall be 1,500 psi. Filter driers shall be sized to match tubing.

2.6 Sight glass

Sight glasses shall be bull's-eye type. Inline sight glass reflex lens shall be provided for dead-end liquid service.

2.7 Moisture indicator

Indicator shall be a self-reversible action, moisture reactive, color changing media. Indicator shall be furnished with full-color-printing tag containing color, moisture and temperature criteria. Unless otherwise indicated, the moisture indicator shall be an integral part of each corresponding sight glass.

2.8 Flexible connectors

Flexible connectors shall be a composite of interior corrugated phosphor bronze or Type 300 Series stainless steel, as required for fluid service, with exterior reinforcement of bronze, stainless steel or Monel wire braid. Assembly shall be constructed with a safety factor of not less than 4 at 300 degrees F. Unless otherwise indicated, the length of a flexible connector shall be as recommended by the manufacturer for the service intended.

PART 3 - EXECUTION

3.1 Installation

Tubing shall be installed 1/2 inch/10 feet in the direction of flow to ensure adequate oil drainage. Open ends of refrigerant lines or equipment shall be properly capped or plugged during installation to keep moisture, dirt, or other foreign material out of the system. Tubing shall remain capped until installation. Equipment tubing shall be in accordance with the equipment manufacturer's recommendations and the contract drawings. Equipment and piping arrangements shall fit into space allotted and allow adequate acceptable clearances for installation and replacement.

3.2 Brazed Connections

During brazing, tube and fittings shall be filled with a pressure regulated inert gas, such as nitrogen, to prevent the formation of scale. Before brazing copper joints, both the outside of the tube and the inside of the fitting shall be cleaned with a wire fitting brush until the entire joint surface is bright and clean. Brazing flux shall not be used. Surplus brazing material shall be removed at all joints. Tubing shall be protected against oxidation during brazing by continuous purging of the inside of the piping using nitrogen. Piping shall be supported prior to brazing and not be sprung or forced.

3.3 Stop Valves

Refrigerant stop valves shall be installed on each side of each piece of equipment to provide partial system isolation as required for maintenance or repair. Filter dryers having access ports may be considered a point of isolation. Valves shall be furnished to match line size, unless otherwise indicated or approved.

3.4 Filter Dryer

A liquid line filter dryer shall be provided on each refrigerant circuit located such that all liquid refrigerant passes through a filter dryer. Dryers shall be sized in accordance with the manufacturer's recommendations for the system in which it is installed. Dryers shall be installed such that it can be isolated from the system, the isolated portion of the system evacuated, and the filter dryer replaced. Dryers shall be installed in the horizontal position except replaceable core filter dryers may be installed in the vertical position with the access on the bottom.

3.5 Sight Glass

A moisture indicating sight glass shall be installed in all refrigerant circuits down stream of all filter dryers and where indicated. Site glasses shall be full line size.

3.6 Flexible Pipe Connectors

Flexible connectors shall be installed in accordance with manufacturer's instructions. Piping guides and restraints related to flexible connectors shall be provided as required.

3.7 Field Applied Insulation

Reinsulate suction lines before return the system to service. Reference Section 23 07 19 (Mechanical Insulation).

3.8 Cleaning

Before returning the system to service, Contractor shall clean, flush and evacuate the refrigerant line sets. Before cleaning, Contractor shall inspect each line set for damage or defects and replace or repair as required in accordance with these specifications. Service includes disassembly, flushing with a dichloroethane agent and purging with dry nitrogen. Replacing damaged components shall be at no additional cost to Contract.

3.9 Refrigerant line testing

After all components of the refrigerant system have been installed and connected, subject the entire refrigeration system to pneumatic, evacuation, and startup tests as described herein.

3.9.1 Pneumatic Test

Equipment stop valves shall be closed or equipment shall be disconnected from the line set prior to performing the pneumatic test. Test gas shall be dry nitrogen. Test pressure shall be applied in two stages before any refrigerant pipe is insulated or covered. First stage test shall be at 10 psi with every joint being tested with a thick soap or color indicating solution. Pressure shall then be raised in 10 percent increments. to the normal operating pressure of the refrigerant. Final test pressure shall be maintained for a minimum of 8 hours. At the end of the test period, if the corrected system pressure is not equal to the initial system test pressure (allowing for thermal expansion / contraction), then the system shall be investigated for leaking joints. To repair leaks, the joint shall be taken apart, thoroughly cleaned, and reconstructed as a new joint. Joints repaired by caulking, remelting, or back-welding/brazing will not be acceptable. Following repair, the entire system shall be retested using the pneumatic tests described herein. The entire system shall be reassembled once the pneumatic tests are satisfactorily completed.

3.9.2 Evacuation Test

Following satisfactory completion of the pneumatic tests, test pressure shall be relieved, and the entire system shall be evacuated to an absolute pressure of 300 micrometers. During evacuation of the system, the ambient temperature shall be higher than 35 degrees F. No more than one sys-

tem shall be evacuated at one time by one vacuum pump. Once the desired vacuum has been reached, the vacuum line shall be closed, and the system shall stand for 1 hour. If the pressure rises over 500 micrometers after the 1-hour period, then the system shall be evacuated again down to 300 micrometers and let set for another 1-hour period. The system shall not be charged until a vacuum of at least 500 micrometers is maintained for a period of 1 hour without the assistance of a vacuum pump. If during the testing the pressure continues to rise, check the system for leaks, repair as required, and repeat the evacuation procedure.

3.9.3 System Charging and Startup Test

Following satisfactory completion of the evacuation tests, the system shall be charged by weight with the required amount of refrigerant. Following charging, the system shall operate with high-side and low-side pressures and temperatures per Manufacturer's recommendations. Inspect system for leaks. Record line set pressures (hi & low) superheat and ambient temperature.

3.9.4 Refrigerant Leakage

If a refrigerant leak is discovered after the system has been charged, the leaking portion of the system shall immediately be isolated from the remainder of the system and the refrigerant pumped into the system receiver or other suitable container. Under no circumstances shall the refrigerant be discharged into the atmosphere.

END OF SECTION 232300

SECTION 233113
METAL DUCTS

PART 1 - GENERAL

1.1 SUMMARY

- A. This Section includes metal, rectangular ducts and fittings for supply, return, outside, and exhaust air-distribution systems in pressure classes from minus 1 to plus 3-inch WC
- B. See section "Duct Accessories" for terminals and registers.
- C. All systems provided shall be complete and operational. Refer to complete specifications and drawings for additional detailed requirements. Manufacturers recommended installation guidelines shall be used if no other specific direction is given. Bidder shall be responsible to coordinate and include in his bid all necessary appurtenances and additional material to ensure proper installation and function. All bidders shall be responsible to review the complete set of specifications, drawings and addendums.

1.2 SUBMITTALS

- A. Shop Drawings: Show fabrication and installation details for metal ducts.
 - 1. Penetrations through fire-rated and other partitions.
 - 2. Duct accessories, including access doors and panels.

1.3 QUALITY ASSURANCE

- A. NFPA Compliance:
 - 1. NFPA 90A, "Installation of Air Conditioning and Ventilating Systems."
 - 2. NFPA 90B, "Installation of Warm Air Heating and Air Conditioning Systems."

PART 2 - PRODUCTS

2.1 SHEET METAL MATERIALS

- A. Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible" for acceptable materials, material thicknesses, and duct construction methods, unless otherwise indicated. Sheet metal materials shall be free of pitting, seam marks, roller marks, stains, discolorations, and other imperfections.

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- B. Sheet Steel: Lock-forming quality; complying with ASTM A-653; ducts shall have mill-phosphatized finish for surfaces exposed to view.

2.2 SEALANT MATERIALS

- A. Joint and Seam Tape: 2 inches wide; glass-fiber-reinforced fabric.
- B. Tape Sealing System: Woven-fiber tape impregnated with gypsum mineral compound and modified acrylic/silicone activator to react exothermically with tape to form hard, durable, airtight seal.
- C. Water-Based Joint and Seam Sealant: Flexible, adhesive sealant, resistant to UV light when cured, UL 723 listed, and complying with NFPA requirements for Class 1 ducts.
- D. Solvent-Based Joint and Seam Sealant: One-part, non-sag, solvent-release-curing, polymerized butyl sealant.
- E. Flanged Joint Mastic: One-part, acid-curing, silicone, elastomeric joint sealant complying with ASTM C 920.
- F. Flange Gaskets: Butyl rubber or EPDM polymer.

2.3 HANGERS AND SUPPORTS

- A. Building Attachments: Concrete inserts, powder-actuated fasteners, or structural-steel fasteners appropriate for construction materials to which hangers are being attached.
 - 1. Use powder-actuated concrete fasteners for standard-weight aggregate concretes or for slabs more than 4 inches thick.
 - 2. Exception: Do not use powder-actuated concrete fasteners for lightweight-aggregate concretes or for slabs less than 4 inches thick.
- B. Hanger Materials: Sheet steel or threaded steel rod.
 - 1. Strap and Rod Sizes: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible" for steel sheet width and thickness and for steel rod diameters.
- C. Duct Attachments: Sheet metal screws, blind rivets, or self-tapping metal screws; compatible with duct materials.
- D. Trapeze and Riser Supports: Steel shapes and plates complying with ASTM A-36.

2.4 RECTANGULAR DUCT FABRICATION

- A. Fabricate ducts, elbows, transitions, offsets, branch connections, and other construction according to SMACNA's "HVAC Duct Construction Standards - Metal and Flexible" and

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complying with requirements for metal thickness, reinforcing types and intervals, tie-rod applications, and joint types and intervals.

1. Lengths: Fabricate rectangular ducts in lengths appropriate to reinforcement and rigidity class required for pressure class.
 2. Deflection: Duct systems shall not exceed deflection limits according to SMACNA's "HVAC Duct Construction Standards - Metal and Flexible."
- B. Transverse Joints: Prefabricated slide-on joints and components constructed using manufacturer's guidelines for material thickness, reinforcement size and spacing, and joint reinforcement.
1. Manufacturers:
 - a. Ductmate Industries, Inc.
 - b. Nexus Inc.
 - c. Ward Industries, Inc.
- C. Formed-On Flanges: Construct according to SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 1-4, using corner, bolt, cleat, and gasket details.
1. Manufacturers:
 - a. Ductmate Industries, Inc.
 - b. Lockformer
 2. Duct Size: Maximum 36 inches wide and up to 2-inch wg pressure class.
 3. Longitudinal Seams: Pittsburgh lock sealed with non-curing polymer sealant.
- D. Cross Breaking or Cross Beading: Cross break or cross bead duct sides 19 inches and larger and 0.0359 inch thick or less, with more than 10 sq. ft. of non-braced panel area unless ducts are lined.

2.5 ROUND DUCT FABRICATION

Prefabricated by United McGill or equivalent, rated for the application and working class specified.

PART 3 - EXECUTION

3.1 DUCT APPLICATIONS

- A. Static-Pressure Working Classes: Unless otherwise indicated, furnish/construct ducts according to the following:
1. Supply Ducts: 2-inch WC
 2. Return Ducts: (-)1-inch WC

3.2 DUCT INSTALLATION

- A. Construct and install ducts according to SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," unless otherwise indicated.
- B. Install ducts with fewest possible joints and seams.
- C. Install fabricated fittings for changes in directions, size, and shape and for connections.
- D. Install couplings tight to duct wall surface with a minimum of projections into duct. Secure couplings with sheet metal screws. Install screws at intervals of 12 inches, with a minimum of three screws in each coupling.
- E. Install ducts, unless otherwise indicated, vertically and horizontally and parallel and perpendicular to building lines; avoid diagonal runs.
- F. Install ducts close to walls, overhead construction, columns, and other structural and permanent enclosure elements of building.
- G. Install ducts with a clearance of 2 inches, plus allowance for insulation thickness.
- H. Conceal ducts from view in finished spaces. Do not encase horizontal runs in solid partitions unless specifically indicated.
- I. Coordinate layout with suspended ceiling, fire- and smoke-control dampers, lighting layouts, and similar finished work.
- J. Seal all joints and seams. Apply sealant to male end connectors before insertion, and afterward to cover entire joint and sheet metal screws.
- K. Electrical Equipment Spaces: Route ducts to avoid passing through transformer vaults and electrical equipment spaces and enclosures.
- L. Fire-Rated Partition Penetrations: Where ducts pass through fire rated interior partitions and exterior walls, install appropriately rated fire dampers, sleeves, and fire-stopping sealant.
- M. Protect duct interiors from the elements and foreign materials until building is enclosed.

3.3 SEAM AND JOINT SEALING

- A. Operate system blower and examine ductwork for leakage. Seal duct seams and joints according to SMACNA's "HVAC Duct Construction Standards -Metal and Flexible" for duct pressure class indicated.

3.4 HANGING AND SUPPORTING

- A. Support horizontal ducts within 24 inches of each elbow and within 48 inches of each branch intersection.

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- B. Support vertical ducts at maximum intervals of 16 feet and at each floor.
- C. Install upper attachments to structures with an allowable load not exceeding one-fourth of failure (proof-test) load.
- D. Install concrete inserts before placing concrete.
- E. Install powder-actuated concrete fasteners after concrete is placed and completely cured.
 - 1. Do not use powder-actuated concrete fasteners for lightweight-aggregate concretes or for slabs less than 4 inches thick.

3.5 CONNECTIONS

- A. Comply with SMACNA's "HVAC Duct Construction Standards--Metal and Flexible" for branch, outlet and inlet, and terminal unit connections.

END OF SECTION 233113

SECTION 233300
DUCT ACCESSORIES

PART 1 - GENERAL

1.1 SUMMARY

- A. This Section includes the following:
1. Volume dampers
 2. Turning vanes
 3. Duct-mounting access doors
 4. Flexible connectors
 5. Flexible ducts
 6. Duct accessory hardware

1.2 SUBMITTALS

- A. Product Data: For the following:
1. Volume dampers
 2. Turning vanes
 3. Duct-mounting access doors
 4. Flexible connectors
 5. Flexible ducts

1.3 QUALITY ASSURANCE

- A. Comply with NFPA 90A, "Installation of Air Conditioning and Ventilating Systems," and NFPA 90B, "Installation of Warm Air Heating and Air Conditioning Systems."

PART 2 - PRODUCTS

2.1 SHEET METAL MATERIALS

- A. Comply with SMACNA's "HVAC Duct Construction Standards--Metal and Flexible" for acceptable materials, material thicknesses, and duct construction methods, unless otherwise indicated.
- B. Sheet Steel: Lock-forming quality; complying with ASTM A-653; ducts shall have mill-phosphatized finish for surfaces exposed to view.

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- C. Reinforcement Shapes and Plates: Steel reinforcement where installed on sheet metal ducts.
- D. Tie Rods: Steel, 1/4-inch minimum diameter for lengths 36 inches or less, 3/8-inch minimum diameter for lengths longer than 36 inches.

2.2 VOLUME DAMPERS

- A. Manufacturers:
 - 1. Air Balance, Inc.
 - 2. American Warming and Ventilating.
 - 3. Flexmaster U.S.A., Inc.
 - 4. McGill AirFlow Corporation.
 - 5. METALAIRE, Inc.
 - 6. Nailor Industries Inc.
 - 7. Penn Ventilation Company, Inc.
 - 8. Ruskin Company.
- B. General Description: Factory fabricated, with required hardware and accessories. Stiffen damper blades for stability. Include locking device to hold single-blade dampers in a fixed position without vibration. Close duct penetrations for damper components to seal duct consistent with pressure class.
- C. Standard Volume Dampers: Multiple- or single-blade, parallel- or opposed-blade design as indicated, standard leakage rating, and suitable for horizontal or vertical applications.
 - 1. Steel Frames: Hat-shaped, galvanized sheet steel channels, minimum of 0.064 inch thick, with mitered and welded corners; frames with flanges where indicated for attaching to walls and flangeless frames where indicated for installing in ducts.
 - 2. Roll-Formed Steel Blades: 0.064-inch thick, galvanized sheet steel.
 - 3. Blade Axles: Galvanized steel.
 - 4. Bearings: Oil-impregnated bronze.
- D. Damper Hardware: Zinc-plated, die-cast core with dial and handle made of 3/32-inch thick zinc-plated steel, and a 3/4-inch hexagon-locking nut. Include center hole to suit damper operating-rod size.

2.3 TURNING VANES

- A. Fabricate to comply with SMACNA's "HVAC Duct Construction Standards--Metal and Flexible" for vanes and vane runners. Vane runners shall automatically align vanes.
- B. Manufactured Turning Vanes: Fabricate 1-1/2-inch wide, single vane, curved blades of galvanized sheet steel set 3/4 inch o.c.; support with bars perpendicular to blades set 2 inches o.c.; and set into vane runners suitable for duct mounting.
 - 1. Manufacturers:
 - a. Ductmate Industries, Inc.

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- b. Duro Dyne Corp.
- c. METALAIRE, Inc.

2.4 DUCT-MOUNTING ACCESS DOORS

- A. General Description: Fabricate doors airtight and suitable for duct pressure class.
- B. Door: Double wall, duct mounting, and rectangular; fabricated of galvanized sheet metal with insulation fill and thickness as indicated for duct pressure class. Include 1-by-1-inch butt or piano hinge and cam latches.
 - 1. Manufacturers:
 - a. American Warming and Ventilating.
 - b. Ductmate Industries, Inc.
 - c. Flexmaster U.S.A., Inc.
 - d. Greenheck.
 - 2. Frame: Galvanized sheet steel, with bend-over tabs and foam gaskets.
 - 3. Provide number of hinges and locks as follows:
 - a. Less than 12 Inches Square: Secure with two sash locks.
 - b. Up to 18 Inches Square: Two hinges and two sash locks.
- C. Door: Double wall, duct mounting, and round; fabricated of galvanized sheet metal with insulation fill and 1-inch thickness. Include cam latches.
 - 1. Manufacturers:
 - a. Ductmate Industries, Inc.
 - b. Flexmaster U.S.A., Inc.
 - 2. Frame: Galvanized sheet steel, with spin-in notched frame.
- D. Seal around frame attachment to duct and door to frame with neoprene or foam rubber.
- E. Insulation: 1-inch thick, fibrous-glass or polystyrene-foam board.

2.5 FLEXIBLE CONNECTORS

- A. Manufacturers:
 - 1. Ductmate Industries, Inc.
 - 2. Duro Dyne Corp.
 - 3. Ventfabrics, Inc.
- B. General Description: Flame-retardant or noncombustible fabrics, coatings, and adhesives complying with UL 181, Class 1.

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- C. Flexible Connector Fabric: Glass fabric double coated with neoprene.
 - 1. Minimum Weight: 26 oz./sq. yd.
 - 2. Tensile Strength: 480 lbf./inch in the warp and 360 lbf./inch in the filling.
 - 3. Service Temperature: Minus 40 to plus 200 degree F.

2.6 FLEXIBLE DUCTS

- A.]Manufacturers:
 - 1. Flexmaster U.S.A., Inc.
 - 2. Hart & Cooley, Inc.
 - 3. McGill AirFlow Corporation.
- B. Non-insulated-Duct Connectors: UL 181, Class 1, multiple layers of aluminum laminate supported by helically wound, spring-steel wire.
 - 1. Pressure Rating: 10-inch wg positive and 1.0-inch wg negative.
 - 2. Maximum Air Velocity: 4000 fpm
- C. Insulated-Duct Connectors: UL 181, Class 1, 2-ply vinyl film supported by helically wound, spring-steel wire; fibrous-glass insulation; polyethylene vapor barrier film.
 - 1. Pressure Rating: 10-inch wg positive and 1.0-inch wg negative.
 - 2. Maximum Air Velocity: 4000 fpm.
- D. Flexible Duct Clamps: Nylon strap, in sizes 3 through 18 inches to suit duct size.

2.7 DUCT ACCESSORY HARDWARE

- A. Instrument Test Holes: Cast iron or cast aluminum to suit duct material, including screw cap and gasket. Size to allow insertion of pitot tube and other testing instruments and of length to suit duct insulation thickness.
- B. Adhesives: High strength, quick setting, neoprene based, waterproof, and resistant to gasoline and grease.

PART 3 - EXECUTION

3.1 APPLICATION AND INSTALLATION

- A. The final installation shall include all controls and appurtenances as required for a complete and functional system.
- B. Install duct accessories per drawings, manufacture's recommendations, applicable details in SMACNA's "HVAC Duct Construction Standards-Metal and Flexible" and ASHRAE standards.

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- C. Install volume dampers in ducts with liner; avoid damage to and erosion of duct liner.
- D. Provide balancing dampers at points on supply and return systems where branches lead from larger ducts as required for air balancing.
- E. Provide test holes at fan inlets and outlets and elsewhere as indicated or required.
- F. Install duct access doors to allow for inspecting, adjusting, and maintaining accessories and terminal units as follows:
 - 1. As required for interior of ducts for cleaning; before and after each change in direction and at a maximum 50-foot spacing.
- G. Install the following sizes for duct-mounting, rectangular access doors:
 - 1. One-Hand or Inspection Access: 8 by 5 inches.
 - 2. Two-Hand Access: 12 by 6 inches.
 - 3. Head and Hand Access: 18 by 10 inches.
- H. Install the following sizes for duct-mounting, round access doors:
 - 1. One-Hand or Inspection Access: 8 inches in diameter.
 - 2. Two-Hand Access: 10 inches in diameter.
 - 3. Head and Hand Access: 12 inches in diameter.
- I. Install flexible connectors immediately adjacent to equipment in ducts associated with fans and motorized equipment supported by vibration isolators.
- J. Connect diffusers to ducts with maximum 96-inch lengths of flexible duct clamped or strapped in place. Where diffusers are noted to be replaced, replace existing flexible duct.
- K. Connect flexible ducts to metal ducts with draw bands.
- L. Install duct test holes as indicated and as required for testing and balancing purposes.

END OF SECTION 233300

SECTION 233713
DIFFUSERS

PART 1 - GENERAL

1.1 SUMMARY

- A. This Section includes duct-mounted registers and duct mounted return air grilles.
- B. All systems provided shall be complete and operational. Refer to complete specifications and drawings for additional detailed requirements. Manufacturers recommended installation guidelines shall be used if no other specific direction is given. Bidder shall be responsible to coordinate and include in his bid all necessary appurtenances and additional material to ensure proper installation and function. All bidders shall be responsible to review the complete set of specifications, drawings and addendums.

1.2 SUBMITTALS

- A. Product Data: For each product indicated, include the following:
 - 1. Data Sheet: Indicate materials of construction, finish, and mounting details; and performance data including throw and drop, static pressure drop, and noise ratings.
 - 2. Register and Grille Schedule: Indicate Drawing designation, room location, quantity, model number, size, and accessories furnished.

PART 2 - PRODUCTS

2.1 DIFFUSERS

- A. Registers:
 - 1. Products:
 - a. Titus
 - b. Price
 - c. Hart and Cooley
 - d. Metal Aire
 - 2. Material: Steel
 - 3. Finish: White
 - 4. Face Arrangement: Louvered, Adjustable Double Deflection
 - 5. Damper: Opposed Blade w/ Manual Quadrant

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PART 3 - EXECUTION

3.1 INSTALLATION

- A. Install registers and grilles in accordance with Manufacturer's recommendations, level and plumb.
- B. Locations: Air outlet and inlet locations have been indicated to achieve design requirements for air volume, noise criteria, airflow pattern, throw, and pressure drop. Make final locations where indicated, as practicable. Where architectural features or other items conflict with installation, notify Architect for a determination of final location.

3.2 ADJUSTING

- A. After installation, adjust registers and grilles to air patterns indicated, or as directed, before starting air balancing.
- B. After final adjustment and approval, mark register and grille damper quadrant settings with indelible marker.

END OF SECTION 233713

SECTION 237315
SPLIT SYSTEM DX UNITS

PART 1 – GENERAL

1.01 SCOPE

- A. Furnish and install split system direct expansion (DX) units and accessories as shown on the plans and as specified herein.
- B. All systems provided shall be complete and operational. Manufacturers recommended installation guidelines shall be used if no other specific direction is given. Bidder shall be responsible to coordinate and include in his bid all necessary appurtenances and additional material to ensure proper installation and function. All bidders shall be responsible to review the complete set of specifications, drawings and addendums.

1.02 REFERENCE PUBLICATIONS

- A. The following publications are incorporated by reference, and shall be the current issue at the time of bid:
 - 1. Air Conditioning, Heating and Refrigeration Institute (AHRI):
 - AHRI-210/240Performance Rating of Unitary Air Conditioning & Air-Source Heat Pump Equipment
 - AHRI-410Forced-Circulation Air-Cooling and Air-Heating Coils
 - AHRI-440Performance Rating of Fan-Coil Units
 - 2. American Society for Testing and Materials (ASTM):
 - ASTM C 1071Thermal and Acoustical Insulation (Glass Fiber, Duct Lining Material)
 - 3. American Society of Heating, Refrigerating and Air Conditioning Engineers:
 - ASHRAE 52.1Gravimetric and Dust-Spot Procedures for Testing Air Cleaning Devices Used in General Ventilation for Removing Particulate Matter
 - 4. National Fire Protection Association (NFPA):
 - NFPA 70National Electrical Code
 - NFPA 90AInstallation of Air Conditioning and Ventilating Systems
 - 5. Underwriters Laboratories (UL):
 - UL 900Test Performance of Air Filter Units

1.03 SUBMITTALS

A. Product Data:

Manufacturer's data to include the following:

1. Air Handling Units and Condensers
2. Product, operation and maintenance data
3. Duct Smoke Detectors
4. Accessories

B. Performance Data

1. Coil and fan Performance Data
2. Electrical requirements for power and control circuits.
3. Overall unit dimensions
4. Operating Weight

PART 2 – PRODUCTS

2.01 SPLIT SYSTEM DX UNITS

A. Configuration:

Units shall be of the horizontal, single zone configuration as described on the drawings. Units shall be draw-through type with direct expansion (DX) cooling, electric heat and a pleated filter section or filter box. Units shall include a constant volume fan, evaporator coil, insulated casing, filters, access panels and condensate pan and emergency condensate pan as required for standalone operation. Each air handling unit shall have physical dimensions suitable to fit space allotted to the unit and shall have the capacity indicated on the drawings. Air handling units shall have published ratings based on tests performed according to AHRI 410. Units will be configured with a 24 VAC heat/cool thermostat. Units shall be configured for 208 VAC three phase power as noted on the drawings.

B. Casing:

Each casing section shall be insulated with not less than 1-1/2-pound density coated fibrous glass material (or equivalent) having a thermal conductivity not greater than 0.23 Btu/hr.-SF-F. Unit wall shall be insulated and shall not sweat with interior air temperature of 50°F and exterior air at 95/78 FDB/FWB.

C. Refrigerant Circuit:

Units shall be configured with a fully hermetic scroll compressor. Compressors shall be protected from an over-temperature and over-ampere condition by an internal, motor overload device. Provide temperature and current sensitive current overloads. Compressor shall be factory mounted on rubber grommets.

Refrigerant circuit shall include the following control, safety, and maintenance features:

- Thermostatic Expansion Valve (TXV)
- Refrigerant filter drier - Solid core design.
- Service gauge connections on suction and liquid lines

D. Coils:

Evaporator and condenser coils shall be AHRI-440 rated copper tube mechanically bonded to aluminum plate fin. Coils shall be leak tested to ensure the pressure integrity. The evaporator coil and condenser coil shall be leak tested to 225 PSIG and pressure tested to 450 PSIG. Furnish refrigerant and oil.

F. Air Filters:

Filters shall be as described on the drawings. Air filters shall be listed according to requirements of UL 900. The filter section shall be constructed in a manner identical to the remainder of the unit casing with a side access door.

G. Evaporator Fan:

Evaporator fan shall be fixed speed centrifugal air foil (AF) type. Fan and shaft shall be statically and dynamically balanced by the Manufacturer. Evaporator fan motor sheaves shall be variable pitch. Variable pitch sheaves shall be selected to drive the fan at a speed that will produce the specified capacity when set at the approximate midpoint of the sheave adjustment. Unit fan shall be selected to produce the required capacity at the specified fan static pressure.

H. Condenser:

Condensers shall be AHRI 210/240 rated air cooled assemblies that with fan, motor, drive, refrigerant condensing coil, controls, and wiring ready for terminal field connections and fully automatic standalone operation. Provide condenser coil and receiver with an excess capacity of not less than 20 percent for storage of pumped-down refrigerant. Condensing coil and circuit shall be cleaned and factory charged with refrigerant. Condenser fans shall be fixed speed axial with riveted or welded blades. Fan and shaft shall be statically and dynamically balanced by the Manufacturer.

Unit shall be suitable for startup and operation in ambient temperatures as low as 45 degrees F.

I. Accessories:

- a) Duct Smoke Detectors: Provide addressable smoke detectors in accordance with the drawings, NFPA 90A and UL 268A.

Furnish duct smoke detector(s) with the following minimum features:

- Integral Addressable Module: Arranged to communicate detector status (normal, alarm, or trouble) to fire-alarm control unit.

- Base Mounting: Detector and associated electronic components shall be mounted in a twist-lock module that connects to a fixed base. Provide terminals in the fixed base for connection to building wiring.
 - Self-Restoring: Detectors shall not require resetting or readjustment after actuation to restore for normal operation.
 - Integral Visual-Indicating Light: LED type, indicating detector with power-on status.
 - Relay Fan Shutdown: Fully programmable relay rated to interrupt fan motor-control circuit.
- b.) Provide a compatible 24 VAC heat/cool thermostat with lockable cover.

PART 3 – EXECUTION

3.01 INSTALLATION

A. INSTALLATION

1. Install equipment per drawings, industry standards, applicable codes, and manufacturer's instructions.
2. Do not use units for temporary heating, cooling or ventilation prior to complete inspection and startup performed per this specification.
3. Install units with manufacturer's recommended clearances for access, coil pull, and fan removal.
4. Provide one complete set of filters for testing, balancing, and commissioning. Provide second complete set of filters at time of transfer to owner.
5. Install unit plumb, level and square. Connect piping and ductwork according to manufacturer's instructions.
6. Insulate plumbing associated with drain pan drains and refrigerant connections.
7. Install insulation on all staggered coil tubing/piping connections.
8. Controls: Furnish 24 VAC thermostat with lockable cover, compatible with unit.
9. Duct Smoke Detector(s): Smoke detectors shall be interfaced and configured with the existing fire alarm panel.
10. All damaged surfaces of installed units shall be touched up to original factory finish.

B. OPERATION AND MAINTENANCE

Submit four (4) copies of the Operation and Maintenance Manuals seven (7) calendar days prior to testing the air-handling units.

END OF SECTION 237313

SECTION 237416
ROOFTOP AIR HANDLING UNITS

PART 1 - GENERAL

1.01 WORK INCLUDED

- A. Furnish and install rooftop air handling units and accessories as shown on the plans and as specified herein.
- B. All systems provided shall be complete and operational. Refer to complete specifications and drawings for additional detailed requirements. Manufacturers recommended installation guidelines shall be used if no other specific direction is given. Bidder shall be responsible to coordinate and include in his bid all necessary appurtenances and additional material to ensure proper installation and function. All bidders shall be responsible to review the complete set of specifications, drawings and addendums.

1.02 REFERENCE PUBLICATIONS

- A. The following publications are incorporated by reference, and shall be the current issue at the time of bid:
 - 1. Air Conditioning, Heating and Refrigeration Institute (AHRI):
 - AHRI-210/240Performance Rating of Unitary Air Conditioning & Air-Source Heat Pump Equipment
 - AHRI-410Forced-Circulation Air-Cooling and Air-Heating Coils
 - AHRI-440Performance Rating of Fan-Coil Units
 - 2. Air Movement and Control Association (AMCA):
 - AMCA 300.....Reverberant Room Method for Sound Testing of Fans
 - 3. American Bearing Manufacturer's Association (AFBMA):
 - AFMBA Std 9Load Ratings and Fatigue Life for Ball Bearings
 - AFMBA Std 11Load Rating and Fatigue Life for Roller Bearings
 - 4. American Society for Testing and Materials (ASTM):
 - ASTM C 1071Thermal and Acoustical Insulation (Glass Fiber, Duct Lining Material)
 - ASTM F 872Filter Units, Air Conditioning: Viscous-Impingement Type, Cleanable

- 5. American Society of Heating, Refrigerating and Air Conditioning Engineers (ASHRAE):
 - ASHRAE 52.1.....Gravimetric and Dust-Spot Procedures for Testing Air Cleaning Devices Used in General Ventilation for Removing Particulate Matter
 - ASHRAE 68.....Laboratory Method of Testing In-Duct Sound Power Measurement Procedures for Fans
- 6. National Fire Protection Association (NFPA):
 - NFPA 70National Electrical Code
 - NFPA 90AInstallation of Air Conditioning and Ventilating Systems
- 7. Underwriters Laboratories (UL):
 - UL 586High Efficiency, Particulate, Air Filter Units
 - UL 900Test Performance of Air Filter Units

1.03 SUBMITTALS

A. Product Data: Manufacturer's data to include the following:

- 1. Air Handling Units
- 2. Operation and maintenance data, including spare parts lists, and wiring diagrams.
- 3. Product data for filter media, filter performance data, filter assembly, and filter frames.
- 4. Duct Smoke Detectors
- 5. Accessories

B. Performance Data

- 1. Coil Performance Data
- 2. Fan performance data and fan curves.
- 3. Filter media data including filter performance data and filter frames.
- 4. Electrical requirements for power supply including wiring diagrams for interlock and control wiring. Clearly indicate factory-installed and field-installed wiring.
- 5. Overall unit dimensions
- 6. Operating Weight

PART 2 - PRODUCTS

2.01 ROOFTOP AIR HANDLING UNITS

A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

- 1. Daikin DBC-180
- 2. Trane Series YSD-180
- 3. Carrier 50HC

B. Configuration:

Units shall be of the unitary horizontal rooftop configuration as described on the drawings. Units shall be single-zone, draw-through type with direct expansion (DX) cooling, electric heat and a pleated filter section. Units shall include a base rail, constant volume fan, refrigerated coil, 2 compressor/2-stage cooling, airtight insulated casing, filters, access panels, condensate pan, vibration-isolators, and appurtenances as required for standalone operation. Each air handling unit shall have physical dimensions suitable to fit space allotted to the unit and shall have the capacity indicated on the drawings. Air handling units shall have published ratings based on tests performed according to ARI 430. Units will be configured for compatibility with a 24 VAC heat/cool thermostat. Units shall be configured for 208 VAC three phase power as noted on the drawings.

C. Casings:

Casing sections shall be double wall type, constructed of a minimum 18-gauge galvanized steel, or 18-gauge steel outer casing protected with a corrosion resistant paint finish. Inner casing of double-wall units shall be minimum 24-gauge galvanized steel. Casing shall be designed and constructed with an integral structural steel frame such that exterior panels are non-load bearing. Exterior panels shall be individually removable. Removal shall not affect the structural integrity of the unit. Casings shall be provided with inspection doors allowing field service for all components. Inspection and access doors shall be insulated, fully gasketed, double-wall type, of minimum 18-gauge outer and 24-gauge inner panels. Drain pans shall be double-bottom type constructed of 16 gauge-galvanized steel, double pitched to the drain connection. Drain pans shall be constructed watertight, treated to prevent corrosion, and designed for positive condensate drainage. Each casing section handling conditioned air shall be insulated with not less than 1" thick, 1-1/2-pound density coated fibrous glass material (or equivalent) having a thermal conductivity not greater than 0.23 Btu/hr.-SF-F. Factory applied fibrous glass insulation shall conform to ASTM C 1071, except that the minimum thickness and density requirements do not apply and shall meet the requirements of NFPA 90A. Unit wall shall be insulated and shall not sweat with interior air temperature of 50°F and exterior air at 95/78 FDB/FWB.

D. Refrigerant Circuits:

Units shall be configured with two (2) fully hermetic independent scroll compressors with dedicated refrigeration circuits. Compressors shall be protected from an over-temperature and over-amperage condition by an internal, motor overload device. Compressor motors shall have internal line break thermal, current overload and high-pressure differential protection. Compressor shall be factory mounted on rubber grommets.

Refrigerant circuit shall include the following control, safety, and maintenance features:

- a. Thermostatic Expansion Valve (TXV) with removable power element to allow change out of power element and bulb without removing the valve body.
- b. Refrigerant filter drier - Solid core design.
- c. Service gage connections on suction and discharge lines.

E. Coils:

Evaporator and condenser coils shall be AHRI-440 rated copper tube mechanically bonded to aluminum plate fin. Coils shall be leak tested to ensure the pressure integrity. The evaporator coil and condenser coil shall be leak tested to 225 PSIG and pressure tested to 450 PSIG. Furnish refrigerant and oil.

F. Air Filters:

Filters shall be as described on the drawings. Air filters shall be listed according to requirements of UL 900. Air filters shall be provided with slide out filter racks. Filter holding frames shall be gasketed and fabricated from not lighter than 16-gauge sheet steel with rust-inhibitor coating. All joints shall be airtight. The filter section shall be constructed in a manner identical to the remainder of the unit casing with a side access door.

G. Fans:

Evaporator fan shall be fixed speed centrifugal air foil (AF) type. Condenser and evaporator fans and shafts shall be statically and dynamically balanced by the Manufacturer. Fans shall be mounted on steel shafts accurately ground and finished. Fan bearings shall be sealed against dust and dirt and shall be precision self-aligning ball or roller type. Bearings shall be permanently lubricated or lubricated type with lubrication fittings readily accessible. Fans shall be furnished with a corrosion resistant factory coating. Belt guards shall be the three-sided enclosed type with solid or expanded metal face. All belt drives shall be designed for not less than a 1.2 service factor based on motor nameplate rating. Evaporator fan motor sheaves shall be variable pitch. Variable pitch sheaves shall be selected to drive the fan at a speed that will produce the specified capacity when set at the approximate midpoint of the sheave adjustment. Motors for V-belt drives shall be provided with adjustable bases. Unit fan or fans shall be selected to produce the required capacity at the specified fan static pressure. Condenser fans shall be fixed speed axial with riveted or welded blades.

H. Accessories:

- a. Duct Smoke Detectors: Provide addressable smoke detectors in accordance with the drawings, NFPA 90A and UL 268A.

Furnish duct smoke detector(s) with the following minimum features:

- Integral Addressable Module: Arranged to communicate detector status (normal, alarm, or trouble) to fire-alarm control unit.
- Base Mounting: Detector and associated electronic components shall be mounted in a twist-lock module that connects to a fixed base. Provide terminals in the fixed base for connection to building wiring.
- Self-Restoring: Detectors shall not require resetting or readjustment after actuation to restore for normal operation.
- Integral Visual-Indicating Light: LED type, indicating detector with power-on status.

- Relay Fan Shutdown: Fully programmable relay rated to interrupt fan motor-control circuit.
- b. Provide a UL rated factory mounted switch type disconnect with 120 VAC GFI convenience outlet. Utility connections will be through-the-base.
- c. Provide a compatible 24 VAC heat/cool thermostat with lockable cover.

PART 3 – EXECUTION

3.01 INSTALLATION

A. INSTALLATION

1. Install equipment per drawings, industry standards, applicable codes, and manufacturer's instructions.
2. Do not use units for temporary heating, cooling or ventilation prior to complete inspection and startup performed per this specification.
3. Install units with manufacturer's recommended clearances for access, coil pull, and fan removal.
4. Provide one complete set of filters for testing, balancing, and commissioning. Provide second complete set of filters at time of transfer to owner.
5. Install unit plumb, level and square. Connect piping and ductwork according to manufacturer's instructions.
6. Insulate plumbing associated with drain pan drains and refrigerant connections.
7. Install insulation on all staggered coil tubing/piping connections.
8. Controls: Furnish 24 VAC thermostat with lockable cover, compatible with unit.
9. Duct Smoke Detector(s): Smoke detectors shall be interfaced and configured with the existing fire alarm panel.
10. All damaged surfaces of installed units shall be touched up to original factory finish.

B. START-UP

A Manufacturer's factory-trained and factory-employed service technician shall startup the AHU's

Technician shall perform the following steps as a minimum:

1. Energize the unit disconnect switch.
2. Verify correct voltage.
3. Energize fan motor briefly ("bump") and verify correct direction of rotation.
4. Energize fan motors and verify that motor FLA is within manufacturer's tolerance of nameplate FLA for each phase.

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C. OPERATION AND MAINTENANCE

Submit four (4) copies of the Operation and Maintenance Manuals seven (7) calendar days prior to testing the air-handling units.

END OF SECTION 237313

***DIVISION* 26**

ELECTRICAL



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ENGINEERING, INC.

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SECTION 260519

LOW-VOLTAGE ELECTRICAL POWER CONDUCTORS AND CABLES

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Building wires and cables rated 600 V and less.
2. Connectors, splices, and terminations rated 600 V and less.

1.2 ACTION SUBMITTALS

- A. Product Data: For each type of product.

1.3 INFORMATIONAL SUBMITTALS

- A. Field quality-control reports.

PART 2 - PRODUCTS

2.1 CONDUCTORS AND CABLES

- A. Copper Conductors: Comply with NEMA WC 70/ICEA S-95-658.
- B. Conductor Insulation: Comply with NEMA WC 70/ICEA S-95-658 for Type THW-2, Type THHN-2-THWN-2, Type XHHW-2, Type UF, Type USE and Type SO.
- C. Multiconductor Cable: Comply with NEMA WC 70/ICEA S-95-658 for armored cable, Type AC, metal-clad cable, Type MC, nonmetallic-sheathed cable, Type NM, Type SO and Type USE with ground wire.
- D. VFC Cable:
1. Comply with UL 1277, UL 1685, and NFPA 70 for Type TC-ER cable.
 2. Type TC-ER with oversized crosslinked polyethylene insulation, spiral-wrapped foil plus 85 percent coverage braided shields and insulated full-size ground wire, dual spirally wrapped copper tape shields and three bare symmetrically applied ground wires, and sunlight- and oil-resistant outer PVC jacket.
 3. Comply with UL requirements for cables in direct burial, Classes I and II, Division 2 hazardous location applications.

2.2 CONNECTORS AND SPLICES

- A. Description: Factory-fabricated connectors and splices of size, ampacity rating, material, type, and class for application and service indicated.

2.3 SYSTEM DESCRIPTION

- A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.
- B. Comply with NFPA 70.

PART 3 - EXECUTION

3.1 CONDUCTOR MATERIAL APPLICATIONS

- A. Feeders: Copper. Solid for No. 10 AWG and smaller; stranded for No. 8 AWG and larger.
- B. Branch Circuits: Copper. Solid for No. 10 AWG and smaller; stranded for No. 8 AWG and larger, except VFC cable, which shall be extra flexible stranded.

3.2 CONDUCTOR INSULATION AND MULTICONDUCTOR CABLE APPLICATIONS AND WIRING METHODS

- A. Branch Circuits Concealed in Ceilings, Walls, and Partitions: Type THHN-2-THWN-2, single conductors in raceway.
- B. Cord Drops and Portable Appliance Connections: Type SO, hard service cord with stainless-steel, wire-mesh, strain relief device at terminations to suit application.
- C. VFC Output Circuits: Type TC-ER cable with braided shield.

3.3 INSTALLATION OF CONDUCTORS AND CABLES

- A. Conceal cables in finished walls, ceilings, and floors unless otherwise indicated.
- B. Complete raceway installation between conductor and cable termination points according to Section 260533 "Raceways and Boxes for Electrical Systems" prior to pulling conductors and cables.
- C. Use manufacturer-approved pulling compound or lubricant where necessary; compound used must not deteriorate conductor or insulation. Do not exceed manufacturer's recommended maximum pulling tensions and sidewall pressure values.

- D. Use pulling means, including fish tape, cable, rope, and basket-weave wire/cable grips, that will not damage cables or raceway.
- E. Install exposed cables parallel and perpendicular to surfaces of exposed structural members, and follow surface contours where possible.
- F. Support cables according to Section 260529 "Hangers and Supports for Electrical Systems."

3.4 CONNECTIONS

- A. Tighten electrical connectors and terminals according to manufacturer's published torque-tightening values. If manufacturer's torque values are not indicated, use those specified in UL 486A-486B.
- B. Make splices, terminations, and taps that are compatible with conductor material and that possess equivalent or better mechanical strength and insulation ratings than unspliced conductors.
- C. Wiring at Outlets: Install conductor at each outlet, with at least 6 inches of slack.

3.5 SLEEVE AND SLEEVE-SEAL INSTALLATION FOR ELECTRICAL PENETRATIONS

- A. Install sleeves and sleeve seals at penetrations of exterior floor and wall assemblies. Comply with requirements in Section 260544 "Sleeves and Sleeve Seals for Electrical Raceways and Cabling."

3.6 FIRESTOPPING

- A. Apply firestopping to electrical penetrations of fire-rated floor and wall assemblies to restore original fire-resistance rating of assembly according to Section 078413 "Penetration Firestopping."

3.7 FIELD QUALITY CONTROL

- A. Perform the following tests and inspections:
 - 1. Perform each visual and mechanical inspection and electrical test stated in NETA Acceptance Testing Specification. Certify compliance with test parameters.
- B. Cables will be considered defective if they do not pass tests and inspections.

END OF SECTION 260519

SECTION 260523
CONTROL-VOLTAGE ELECTRICAL POWER CABLES

PART 1 - GENERAL

1.1 SUMMARY

- A. Section Includes:
1. Low-voltage control cabling.
 2. Control-circuit conductors.

1.2 ACTION SUBMITTALS

- A. Product Data: For each type of product.

PART 2 - PRODUCTS

2.1 SYSTEM DESCRIPTION

- A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

2.2 PERFORMANCE REQUIREMENTS

- A. Flame Travel and Smoke Density in Plenums: As determined by testing identical products according to NFPA 262 by a qualified testing agency. Identify products for installation in plenums with appropriate markings of applicable testing agency.
1. Flame Travel Distance: 60 inches or less.
 2. Peak Optical Smoke Density: 0.5 or less.
 3. Average Optical Smoke Density: 0.15 or less.
- B. Flame Travel and Smoke Density for Riser Cables in Non-Plenum Building Spaces: As determined by testing identical products according to UL 1666.
- C. Flame Travel and Smoke Density for Cables in Non-Riser Applications and Non-Plenum Building Spaces: As determined by testing identical products according to UL 1685.

2.3 LOW-VOLTAGE CONTROL CABLE

- A. Plenum-Rated, Paired Cable: NFPA 70, Type CMP.

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1. Multi-pair, twisted, No. 16 AWG, stranded (19x29) tinned-copper conductors.
2. PVC insulation.
3. PVC jacket.
4. Flame Resistance: Comply with NFPA 262.

2.4 CONTROL-CIRCUIT CONDUCTORS

- A. Class 1 Control Circuits: Stranded copper, Type THHN-2-THWN-2, in raceway, complying with UL 83.
- B. Class 2 Control Circuits: Stranded copper, Type THHN-2-THWN-2, in raceway, complying with UL 83.
- C. Class 3 Remote-Control and Signal Circuits: Stranded copper, Type THHN-2-THWN-2, in raceway, complying with UL 83.

PART 3 - EXECUTION

3.1 EXAMINATION

3.2 INSTALLATION OF RACEWAYS AND BOXES

- A. Comply with requirements in Section 260533 "Raceways and Boxes for Electrical Systems" for raceway selection and installation requirements for boxes, conduits, and wireways as supplemented or modified in this Section.
 1. Outlet boxes shall be no smaller than 2 inches wide, 3 inches high, and 2-1/2 inches deep.
- B. Comply with TIA-569-B for pull-box sizing and length of conduit and number of bends between pull points.
- C. Install manufactured conduit sweeps and long-radius elbows if possible.
- D. Raceway Installation in Equipment Rooms:
 1. Position conduit ends adjacent to a corner on backboard if a single piece of plywood is installed, or in the corner of the room if multiple sheets of plywood are installed around perimeter walls of the room.
 2. Install cable trays to route cables if conduits cannot be located in these positions.
 3. Install metal conduits with grounding bushings and connect with grounding conductor to grounding system.

3.3 INSTALLATION OF CONDUCTORS AND CABLES

- A. Comply with NECA 1 and NFPA 70.

B. General Requirements for Cabling:

1. Terminate all conductors and optical fibers; no cable shall contain unterminated elements. Make terminations only at indicated outlets, terminals, and patch panels.
2. Cables may not be spliced.
3. Secure and support cables at intervals not exceeding 30 inches and not more than 6 inches from cabinets, boxes, fittings, outlets, racks, frames, and terminals.
4. Bundle, lace, and train conductors to terminal points without exceeding manufacturer's limitations on bending radii, but not less than radii specified in BICSI ITSIMM, Ch. 5, "Copper Structured Cabling Systems" and Ch. 6, "Optical Fiber Structured Cabling Systems." Install lacing bars and distribution spools.
5. Do not install bruised, kinked, scored, deformed, or abraded cable. Do not splice cable between termination, tap, or junction points. Remove and discard cable if damaged during installation and replace it with new cable.
6. Cold-Weather Installation: Bring cable to room temperature before dereeling. Do not use heat lamps for heating.
7. Pulling Cable: Comply with BICSI ITSIMM, Ch. 5, "Copper Structured Cabling Systems" and Ch. 6, "Optical Fiber Structured Cabling Systems." Monitor cable pull tensions.
8. Support: Do not allow cables to lie on removable ceiling tiles.
9. Secure: Fasten securely in place with hardware specifically designed and installed so as to not damage cables.

3.4 REMOVAL OF CONDUCTORS AND CABLES

- A. Remove abandoned conductors and cables. Abandoned conductors and cables are those installed that are not terminated at equipment and are not identified for future use with a tag.

3.5 CONTROL-CIRCUIT CONDUCTORS

A. Minimum Conductor Sizes:

1. Class 1 remote-control and signal circuits; No 14 AWG.
2. Class 2 low-energy, remote-control, and signal circuits; No. 16 AWG.
3. Class 3 low-energy, remote-control, alarm, and signal circuits; No 12 AWG.

3.6 FIRESTOPPING

- A. Comply with requirements in Section 078413 "Penetration Firestopping."
- B. Comply with TIA-569-B, Annex A, "Firestopping."
- C. Comply with BICSI TDMM, "Firestopping" Chapter.

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3.7 GROUNDING

- A. For data communication wiring, comply with ANSI-J-STD-607-A and with BICSI TDMM, "Bonding and Grounding (Earthing)" Chapter.
- B. For low-voltage control wiring and cabling, comply with requirements in Section 260526 "Grounding and Bonding for Electrical Systems."

END OF SECTION 260523

SECTION 260526
GROUNDING AND BONDING FOR ELECTRICAL SYSTEMS

PART 1 - GENERAL

1.1 SUMMARY

- A. Section includes grounding and bonding systems and equipment.

1.2 ACTION SUBMITTALS

- A. Product Data: For each type of product indicated.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Manufacturers: Available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
 - 1. Burndy; Part of Hubbell Electrical Systems.
 - 2. Dossert; AFL Telecommunications LLC.
 - 3. ERICO International Corporation.
 - 4. Fushi Copperweld Inc.
 - 5. Galvan Industries, Inc.; Electrical Products Division, LLC.
 - 6. Harger Lightning and Grounding.
 - 7. ILSCO.
 - 8. O-Z/Gedney; A Brand of the EGS Electrical Group.
 - 9. Robbins Lightning, Inc.
 - 10. Siemens Power Transmission & Distribution, Inc.

2.2 SYSTEM DESCRIPTION

- A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.
- B. Comply with UL 467 for grounding and bonding materials and equipment.

2.3 CONDUCTORS

- A. Insulated Conductors: Copper or tinned-copper wire or cable insulated for 600 V unless otherwise required by applicable Code or authorities having jurisdiction.
- B. Bare Copper Conductors:
 - 1. Solid Conductors: ASTM B 3.
 - 2. Stranded Conductors: ASTM B 8.
 - 3. Tinned Conductors: ASTM B 33.
 - 4. Bonding Cable: 28 kcmil, 14 strands of No. 17 AWG conductor, 1/4 inch in diameter.
 - 5. Bonding Conductor: No. 4 or No. 6 AWG, stranded conductor.
 - 6. Bonding Jumper: Copper tape, braided conductors terminated with copper ferrules; 1-5/8 inches wide and 1/16 inch thick.
 - 7. Tinned Bonding Jumper: Tinned-copper tape, braided conductors terminated with copper ferrules; 1-5/8 inches wide and 1/16 inch thick.

2.4 CONNECTORS

- A. Listed and labeled by an NRTL acceptable to authorities having jurisdiction for applications in which used and for specific types, sizes, and combinations of conductors and other items connected.
- B. Bolted Connectors for Conductors and Pipes: Copper or copper alloy.
- C. Welded Connectors: Exothermic-welding kits of types recommended by kit manufacturer for materials being joined and installation conditions.
- D. Bus-Bar Connectors: Mechanical type, cast silicon bronze, solderless compression or exothermic-type wire terminals, and long-barrel, two-bolt connection to ground bus bar.

2.5 GROUNDING ELECTRODES

- A. Ground Rods: Copper-clad steel 5/8 by 96 inches.

PART 3 - EXECUTION

3.1 APPLICATIONS

- A. Conductors: Install solid conductor for No. 8 AWG and smaller, and stranded conductors for No. 6 AWG and larger unless otherwise indicated.
- B. Conductor Terminations and Connections:
 - 1. Pipe and Equipment Grounding Conductor Terminations: Bolted connectors.

2. Underground Connections: Welded connectors except at test wells and as otherwise indicated.
3. Connections to Ground Rods at Test Wells: Bolted connectors.
4. Connections to Structural Steel: Welded connectors.

3.2 GROUNDING AT THE SERVICE

- A. Equipment grounding conductors and grounding electrode conductors shall be connected to the ground bus. Install a main bonding jumper between the neutral and ground buses.

3.3 EQUIPMENT GROUNDING

- A. Install insulated equipment grounding conductors with all feeders and branch circuits.
- B. Install insulated equipment grounding conductors with the following items, in addition to those required by NFPA 70:
 1. Feeders and branch circuits.
 2. Lighting circuits.
 3. Receptacle circuits.
 4. Single-phase motor and appliance branch circuits.
 5. Three-phase motor and appliance branch circuits.
 6. Flexible raceway runs.
 7. Armored and metal-clad cable runs.
 8. Busway Supply Circuits: Install insulated equipment grounding conductor from grounding bus in the switchgear, switchboard, or distribution panel to equipment grounding bar terminal on busway.
 9. X-Ray Equipment Circuits: Install insulated equipment grounding conductor in circuits supplying x-ray equipment.
- C. Air-Duct Equipment Circuits: Install insulated equipment grounding conductor to duct-mounted electrical devices operating at 120 V and more, including air cleaners, heaters, dampers, humidifiers, and other duct electrical equipment. Bond conductor to each unit and to air duct and connected metallic piping.

3.4 INSTALLATION

- A. Grounding Conductors: Route along shortest and straightest paths possible unless otherwise indicated or required by Code. Avoid obstructing access or placing conductors where they may be subjected to strain, impact, or damage.
- B. Ground Bonding Common with Lightning Protection System: Comply with NFPA 780 and UL 96 when interconnecting with lightning protection system. Bond electrical power system ground directly to lightning protection system grounding conductor at closest point to electrical service grounding electrode. Use bonding conductor sized same as system grounding electrode conductor, and install in conduit.

- C. Bonding Straps and Jumpers: Install in locations accessible for inspection and maintenance except where routed through short lengths of conduit.
 - 1. Bonding to Structure: Bond straps directly to basic structure, taking care not to penetrate any adjacent parts.
 - 2. Bonding to Equipment Mounted on Vibration Isolation Hangers and Supports: Install bonding so vibration is not transmitted to rigidly mounted equipment.
 - 3. Use exothermic-welded connectors for outdoor locations; if a disconnect-type connection is required, use a bolted clamp.

3.5 FIELD QUALITY CONTROL

- A. Perform tests and inspections. Inspect physical and mechanical condition. Verify tightness of accessible, bolted, electrical connections with a calibrated torque wrench according to manufacturer's written instructions.

END OF SECTION 260526

SECTION 260529

HANGERS AND SUPPORTS FOR ELECTRICAL SYSTEMS

PART 1 - GENERAL

1.1 SUMMARY

- A. Section includes:
 - 1. Hangers and supports for electrical equipment and systems.
 - 2. Construction requirements for concrete bases.

1.2 PERFORMANCE REQUIREMENTS

- A. Delegated Design: Design supports for multiple raceways, including comprehensive engineering analysis by a qualified professional engineer, using performance requirements and design criteria indicated.
- B. Design supports for multiple raceways capable of supporting combined weight of supported systems and its contents.
- C. Design equipment supports capable of supporting combined operating weight of supported equipment and connected systems and components.
- D. Rated Strength: Adequate in tension, shear, and pullout force to resist maximum loads calculated or imposed for this Project, with a minimum structural safety factor of five times the applied force.

1.3 QUALITY ASSURANCE

- A. Comply with NFPA 70.

PART 2 - PRODUCTS

2.1 SUPPORT, ANCHORAGE, AND ATTACHMENT COMPONENTS

- A. Steel Slotted Support Systems: Comply with MFMA-4, factory-fabricated components for field assembly.
 - 1. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

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- a. Allied Tube & Conduit.
 - b. Cooper B-Line, Inc.
 - c. ERICO International Corporation.
 - d. GS Metals Corp.
 - e. Thomas & Betts Corporation.
 - f. Unistrut; Atkore International.
 - g. Wesanco, Inc.
2. Metallic Coatings: Hot-dip galvanized after fabrication and applied according to MFMA-4.
 3. Nonmetallic Coatings: Manufacturer's standard PVC, polyurethane, or polyester coating applied according to MFMA-4.
 4. Painted Coatings: Manufacturer's standard painted coating applied according to MFMA-4.
 5. Channel Dimensions: Selected for applicable load criteria.
- B. Raceway and Cable Supports: As described in NECA 1 and NECA 101.
- C. Conduit and Cable Support Devices: Steel and malleable-iron hangers, clamps, and associated fittings, designed for types and sizes of raceway or cable to be supported.
- D. Support for Conductors in Vertical Conduit: Factory-fabricated assembly consisting of threaded body and insulating wedging plug or plugs for non-armored electrical conductors or cables in riser conduits. Plugs shall have number, size, and shape of conductor gripping pieces as required to suit individual conductors or cables supported. Body shall be malleable iron.
- E. Structural Steel for Fabricated Supports and Restraints: ASTM A 36/A 36M, steel plates, shapes, and bars; black and galvanized.
- F. Mounting, Anchoring, and Attachment Components: Items for fastening electrical items or their supports to building surfaces include the following:
1. Powder-Actuated Fasteners: Threaded-steel stud, for use in hardened portland cement concrete, steel, or wood, with tension, shear, and pullout capacities appropriate for supported loads and building materials where used.
 - a. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
 - 1) Hilti, Inc.
 - 2) ITW Ramset/Red Head; Illinois Tool Works, Inc.
 - 3) MKT Fastening, LLC.
 - 4) Simpson Strong-Tie Co., Inc.
 2. Mechanical-Expansion Anchors: Insert-wedge-type, zinc-coated steel, for use in hardened portland cement concrete with tension, shear, and pullout capacities appropriate for supported loads and building materials in which used.

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- a. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
 - 1) Cooper B-Line, Inc.
 - 2) Empire Tool and Manufacturing Co., Inc.
 - 3) Hilti, Inc.
 - 4) ITW Ramset/Red Head; Illinois Tool Works, Inc.
 - 5) MKT Fastening, LLC.
3. Concrete Inserts: Steel or malleable-iron, slotted support system units similar to MSS Type 18; complying with MFMA-4 or MSS SP-58.
4. Clamps for Attachment to Steel Structural Elements: MSS SP-58, type suitable for attached structural element.
5. Through Bolts: Structural type, hex head, and high strength. Comply with ASTM A 325.
6. Toggle Bolts: All-steel springhead type.
7. Hanger Rods: Threaded steel.

PART 3 - EXECUTION

3.1 APPLICATION

- A. Comply with NECA 1 and NECA 101 for application of hangers and supports for electrical equipment and systems except if requirements in this Section are stricter.
- B. Maximum Support Spacing and Minimum Hanger Rod Size for Raceway: Space supports for EMT, IMC, and RMC as required by NFPA 70. Minimum rod size shall be 1/4 inch in diameter.
- C. Spring-steel clamps designed for supporting single conduits without bolts may be used for 1-1/2-inch and smaller raceways serving branch circuits and communication systems above suspended ceilings and for fastening raceways to trapeze supports.

3.2 SUPPORT INSTALLATION

- A. Comply with NECA 1 and NECA 101 for installation requirements except as specified in this Article.
- B. Strength of Support Assemblies: Where not indicated, select sizes of components so strength will be adequate to carry present and future static loads within specified loading limits.
- C. Mounting and Anchorage of Surface-Mounted Equipment and Components: Anchor and fasten electrical items and their supports to building structural elements by the following methods unless otherwise indicated by code:
 1. To Wood: Fasten with lag screws or through bolts.

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2. To New Concrete: Bolt to concrete inserts.
 3. To Masonry: Approved toggle-type bolts on hollow masonry units and expansion anchor fasteners on solid masonry units.
 4. To Existing Concrete: Expansion anchor fasteners.
 5. Instead of expansion anchors, powder-actuated driven threaded studs provided with lock washers and nuts may be used in existing standard-weight concrete 4 inches thick or greater. Do not use for anchorage to lightweight-aggregate concrete or for slabs less than 4 inches thick.
 6. To Light Steel: Sheet metal screws.
 7. Items Mounted on Hollow Walls and Nonstructural Building Surfaces: Mount cabinets, panelboards, disconnect switches, control enclosures, pull and junction boxes, transformers, and other devices on slotted-channel racks attached to substrate.
- D. Drill holes for expansion anchors in concrete at locations and to depths that avoid reinforcing bars.

3.3 PAINTING

- A. Touchup: Comply with requirements in Section 099123 "Interior Painting" for cleaning and touchup painting of field welds, bolted connections, and abraded areas of shop paint on miscellaneous metal.
- B. Galvanized Surfaces: Clean welds, bolted connections, and abraded areas and apply galvanizing-repair paint to comply with ASTM A 780.

END OF SECTION 260529

SECTION 260533
RACEWAYS AND BOXES FOR ELECTRICAL SYSTEMS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Metal conduits, tubing, and fittings.
2. Boxes, enclosures, and cabinets.

PART 2 - PRODUCTS

2.1 METAL CONDUITS, TUBING, AND FITTINGS

- A. Listing and Labeling: Metal conduits, tubing, and fittings shall be listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.
- B. GRC: Comply with ANSI C80.1 and UL 6.
- C. ARC: Comply with ANSI C80.5 and UL 6A.
- D. IMC: Comply with ANSI C80.6 and UL 1242.
- E. EMT: Comply with ANSI C80.3 and UL 797.
- F. LFMC: Flexible steel conduit with PVC jacket and complying with UL 360.
- G. Fittings for Metal Conduit: Comply with NEMA FB 1 and UL 514B.
 1. Conduit Fittings for Hazardous (Classified) Locations: Comply with UL 886 and NFPA 70.
 2. Fittings for EMT:
 - a. Material: Steel or die cast.
 - b. Type: Setscrew or compression.
 3. Expansion Fittings: PVC or steel to match conduit type, complying with UL 651, rated for environmental conditions where installed, and including flexible external bonding jumper.
 4. Coating for Fittings for PVC-Coated Conduit: Minimum thickness of 0.040 inch, with overlapping sleeves protecting threaded joints.

- H. Joint Compound for IMC, GRC, or ARC: Approved, as defined in NFPA 70, by authorities having jurisdiction for use in conduit assemblies, and compounded for use to lubricate and protect threaded conduit joints from corrosion and to enhance their conductivity.

PART 3 - EXECUTION

3.1 RACEWAY APPLICATION

- A. Indoors: Apply raceway products as specified below unless otherwise indicated.
 - 1. Exposed, Not Subject to Physical Damage: EMT.
 - 2. Exposed, Not Subject to Severe Physical Damage: EMT.
 - 3. Exposed and Subject to Severe Physical Damage: GRC. Raceway locations include the following:
 - a. Loading dock.
 - b. Corridors used for traffic of mechanized carts, forklifts, and pallet-handling units.
 - c. Mechanical rooms.
 - d. Gymnasiums.
 - 4. Concealed in Ceilings and Interior Walls and Partitions: EMT.
 - 5. Connection to Vibrating Equipment (Including Transformers and Hydraulic, Pneumatic, Electric Solenoid, or Motor-Driven Equipment): FMC, except use LFMC in damp or wet locations.
 - 6. Damp or Wet Locations: GRC.
 - 7. Boxes and Enclosures: NEMA 250, Type 1, except use NEMA 250, Type 4 nonmetallic in institutional and commercial kitchens and damp or wet locations.
- B. Minimum Raceway Size: 1/2-inch trade size.
- C. Raceway Fittings: Compatible with raceways and suitable for use and location.
 - 1. Rigid and Intermediate Steel Conduit: Use threaded rigid steel conduit fittings unless otherwise indicated. Comply with NEMA FB 2.10.
 - 2. PVC Externally Coated, Rigid Steel Conduits: Use only fittings listed for use with this type of conduit. Patch and seal all joints, nicks, and scrapes in PVC coating after installing conduits and fittings. Use sealant recommended by fitting manufacturer and apply in thickness and number of coats recommended by manufacturer.
 - 3. EMT: Use setscrew or compression, steel or cast-metal fittings. Comply with NEMA FB 2.10.
 - 4. Flexible Conduit: Use only fittings listed for use with flexible conduit. Comply with NEMA FB 2.20.
- D. Do not install aluminum conduits, boxes, or fittings in contact with concrete or earth.

3.2 INSTALLATION

- A. Comply with NECA 1 and NECA 101 for installation requirements except where requirements on Drawings or in this article are stricter. Comply with NECA 102 for aluminum conduits. Comply with NFPA 70 limitations for types of raceways allowed in specific occupancies and number of floors.
- B. Keep raceways at least 6 inches away from parallel runs of flues and steam or hot-water pipes. Install horizontal raceway runs above water and steam piping.
- C. Comply with requirements in Section 260529 "Hangers and Supports for Electrical Systems" for hangers and supports.
- D. Arrange stub-ups so curved portions of bends are not visible above finished slab.
- E. Install no more than the equivalent of three 90-degree bends in any conduit run except for control wiring conduits, for which fewer bends are allowed. Support within 12 inches of changes in direction.
- F. Conceal conduit and EMT within finished walls, ceilings, and floors unless otherwise indicated. Install conduits parallel or perpendicular to building lines.
- G. Support conduit within 12 inches of enclosures to which attached.
- H. Threaded Conduit Joints, Exposed to Wet, Damp, Corrosive, or Outdoor Conditions: Apply listed compound to threads of raceway and fittings before making up joints. Follow compound manufacturer's written instructions.
- I. Raceway Terminations at Locations Subject to Moisture or Vibration: Use insulating bushings to protect conductors including conductors smaller than No. 4 AWG.
- J. Terminate threaded conduits into threaded hubs or with locknuts on inside and outside of boxes or cabinets. Install bushings on conduits up to 1-1/4-inch trade size and insulated throat metal bushings on 1-1/2-inch trade size and larger conduits terminated with locknuts. Install insulated throat metal grounding bushings on service conduits.
- K. Install pull wires in empty raceways. Use polypropylene or monofilament plastic line with not less than 200-lb tensile strength. Leave at least 12 inches of slack at each end of pull wire. Cap underground raceways designated as spare above grade alongside raceways in use.
- L. Install raceway sealing fittings at accessible locations according to NFPA 70 and fill them with listed sealing compound. For concealed raceways, install each fitting in a flush steel box with a blank cover plate having a finish similar to that of adjacent plates or surfaces.
- M. Install devices to seal raceway interiors at accessible locations. Locate seals so no fittings or boxes are between the seal and the following changes of environments. Seal the interior of all raceways at the following points:

1. Where conduits pass from warm to cold locations, such as boundaries of refrigerated spaces.
2. Where an underground service raceway enters a building or structure.
3. Where otherwise required by NFPA 70.

N. Expansion-Joint Fittings:

1. Install type and quantity of fittings that accommodate temperature change listed for each of the following locations:
 - a. Attics: 135 deg F temperature change.
2. Install expansion fittings at all locations where conduits cross building or structure expansion joints.
3. Install each expansion-joint fitting with position, mounting, and piston setting selected according to manufacturer's written instructions for conditions at specific location at time of installation. Install conduit supports to allow for expansion movement.

O. Flexible Conduit Connections: Comply with NEMA RV 3. Use a maximum of 72 inches of flexible conduit for recessed and semirecessed luminaires, equipment subject to vibration, noise transmission, or movement; and for transformers and motors.

1. Use LFMC in damp or wet locations subject to severe physical damage.
2. Use LFMC or LFNC in damp or wet locations not subject to severe physical damage.

P. Fasten junction and pull boxes to or support from building structure. Do not support boxes by conduits.

3.3 SLEEVE AND SLEEVE-SEAL INSTALLATION FOR ELECTRICAL PENETRATIONS

- A. Install sleeves and sleeve seals at penetrations of exterior floor and wall assemblies. Comply with requirements in Section 260544 "Sleeves and Sleeve Seals for Electrical Raceways and Cabling."

3.4 FIRESTOPPING

- A. Install firestopping at penetrations of fire-rated floor and wall assemblies. Comply with requirements in Section 078413 "Penetration Firestopping."

3.5 PROTECTION

- A. Protect coatings, finishes, and cabinets from damage and deterioration.
1. Repair damage to galvanized finishes with zinc-rich paint recommended by manufacturer.
 2. Repair damage to PVC coatings or paint finishes with matching touchup coating recommended by manufacturer.

END OF SECTION 260533

SECTION 260544

SLEEVES AND SLEEVE SEALS FOR ELECTRICAL RACEWAYS AND CABLING

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Sleeves for raceway and cable penetration of non-fire-rated construction walls and floors.
2. Sleeve-seal systems.
3. Sleeve-seal fittings.
4. Grout.
5. Silicone sealants.

B. Related Requirements:

1. Section 078413 "Penetration Firestopping" for penetration firestopping installed in fire-resistance-rated walls, horizontal assemblies, and smoke barriers, with and without penetrating items.

1.2 PRODUCTS

1.2 SLEEVES

A. Wall Sleeves:

1. Steel Pipe Sleeves: ASTM A 53/A 53M, Type E, Grade B, Schedule 40, zinc coated, plain ends.
2. Cast-Iron Pipe Sleeves: Cast or fabricated "wall pipe," equivalent to ductile-iron pressure pipe, with plain ends and integral waterstop unless otherwise indicated.

B. Sleeves for Conduits Penetrating Non-Fire-Rated Gypsum Board Assemblies: Galvanized-steel sheet; 0.0239-inch minimum thickness; round tube closed with welded longitudinal joint, with tabs for screw-fastening the sleeve to the board.

C. Sleeves for Rectangular Openings:

1. Material: Galvanized sheet steel.
2. Minimum Metal Thickness:
 - a. For sleeve cross-section rectangle perimeter less than 50 inches and with no side larger than 16 inches, thickness shall be 0.052 inch .
 - b. For sleeve cross-section rectangle perimeter 50 inches or more and one or more sides larger than 16 inches, thickness shall be 0.138 inch.

1.3 SLEEVE-SEAL SYSTEMS

- A. Description: Modular sealing device, designed for field assembly, to fill annular space between sleeve and raceway or cable.
1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
 - a. Advance Products & Systems, Inc.
 - b. CALPICO, Inc.
 - c. Metraflex Company (The).
 - d. Pipeline Seal and Insulator, Inc.
 - e. Proco Products, Inc.
 2. Sealing Elements: EPDM or Nitrile (Buna N) rubber interlocking links shaped to fit surface of pipe. Include type and number required for pipe material and size of pipe.
 3. Pressure Plates: Carbon steel or Plastic.
 4. Connecting Bolts and Nuts: Carbon steel, with corrosion-resistant coating, of length required to secure pressure plates to sealing elements.

1.4 GROUT

- A. Description: Nonshrink; recommended for interior and exterior sealing openings in non-fire-rated walls or floors.
- B. Standard: ASTM C 1107/C 1107M, Grade B, post-hardening and volume-adjusting, dry, hydraulic-cement grout.
- C. Design Mix: 5000-psi, 28-day compressive strength.
- D. Packaging: Premixed and factory packaged.

1.5 SILICONE SEALANTS

- A. Silicone Sealants: Single-component, silicone-based, neutral-curing elastomeric sealants of grade indicated below.
1. Grade: Pourable (self-leveling) formulation for openings in floors and other horizontal surfaces that are not fire rated.
- B. Silicone Foams: Multicomponent, silicone-based liquid elastomers that, when mixed, expand and cure in place to produce a flexible, nonshrinking foam.

PART 2 - EXECUTION

2.1 SLEEVE INSTALLATION FOR NON-FIRE-RATED ELECTRICAL PENETRATIONS

- A. Comply with NECA 1.
- B. Comply with NEMA VE 2 for cable tray and cable penetrations.
- C. Sleeves for Conduits Penetrating Above-Grade Non-Fire-Rated Concrete and Masonry-Unit Floors and Walls:
 - 1. Interior Penetrations of Non-Fire-Rated Walls and Floors:
 - a. Seal annular space between sleeve and raceway or cable, using joint sealant appropriate for size, depth, and location of joint. Comply with requirements in Section 079200 "Joint Sealants."
 - b. Seal space outside of sleeves with mortar or grout. Pack sealing material solidly between sleeve and wall so no voids remain. Tool exposed surfaces smooth; protect material while curing.
 - 2. Use pipe sleeves unless penetration arrangement requires rectangular sleeved opening.
 - 3. Size pipe sleeves to provide 1/4-inch annular clear space between sleeve and raceway or cable unless sleeve seal is to be installed.
 - 4. Install sleeves for wall penetrations unless core-drilled holes or formed openings are used. Install sleeves during erection of walls. Cut sleeves to length for mounting flush with both surfaces of walls. Deburr after cutting.
- D. Sleeves for Conduits Penetrating Non-Fire-Rated Gypsum Board Assemblies:
 - 1. Use circular metal sleeves unless penetration arrangement requires rectangular sleeved opening.
 - 2. Seal space outside of sleeves with approved joint compound for gypsum board assemblies.

2.2 SLEEVE-SEAL-SYSTEM INSTALLATION

- A. Install sleeve-seal systems in sleeves in exterior concrete walls and slabs-on-grade at raceway entries into building.
- B. Install type and number of sealing elements recommended by manufacturer for raceway or cable material and size. Position raceway or cable in center of sleeve. Assemble mechanical sleeve seals and install in annular space between raceway or cable and sleeve. Tighten bolts against pressure plates that cause sealing elements to expand and make watertight seal.

2.3 SLEEVE-SEAL-FITTING INSTALLATION

- A. Install sleeve-seal fittings in new walls and slabs as they are constructed.

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- B. Assemble fitting components of length to be flush with both surfaces of concrete slabs and walls. Position waterstop flange to be centered in concrete slab or wall.
- C. Secure nailing flanges to concrete forms.
- D. Using grout, seal the space around outside of sleeve-seal fittings.

END OF SECTION 260544

SECTION 262813

FUSES

PART 1 - GENERAL

1.1 SUMMARY

- A. Section Includes: Cartridge fuses rated 600-V ac and less for use in enclosed switches, panelboards, and switchboards.

1.2 ACTION SUBMITTALS

- A. Product Data: For each type of product indicated.

1.3 CLOSEOUT SUBMITTALS

- A. Operation and maintenance data.

1.4 QUALITY ASSURANCE

- A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.
- B. Comply with NEMA FU 1 for cartridge fuses.
- C. Comply with NFPA 70.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
 - 1. Cooper Bussmann, Inc.
 - 2. Edison Fuse, Inc.
 - 3. Ferraz Shawmut, Inc.
 - 4. Littelfuse, Inc.

2.2 CARTRIDGE FUSES

- A. Characteristics: NEMA FU 1, non-renewable cartridge fuses with voltage ratings consistent with circuit voltages.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Install fuses in fusible devices. Arrange fuses so rating information is readable without removing fuse.

END OF SECTION 262813