PROJECT MANUAL

HOBBS MIDDLE SCHOOL
ENERGY UPGRADES – PHASE B
5317 GLOVER LN.
MILTON, FLORIDA 32570

SANTA ROSA COUNTY DISTRICT SCHOOLS

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SAM MARSHALL ARCHITECTS
AA C000293

Construction Documents
10/25/2021

SANTA ROSA COUNTY SCHOOL DISTRICT
HOBBS MIDDLE SCHOOL
ENERGY UPGRADES – PHASE B

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INVITATION TO BID

Sealed Bids Will Be Received From Pre-qualified General Contractors By The Santa Rosa County School Board, At The Office Of The Assistant Superintendent For Administrative Services, 6544 Firehouse Road, Upstairs Conference Room (Maintenance Building) (850) 983-5123, Milton, Florida, Until 2:00 PM, Local Time, TUESDAY, November 16, 2021, At Which Time And Place All Bids Will Be Publicly Opened And Read Aloud, For The Construction Of "HOBBS MIDDLE SCHOOL ENERGY UPGRADES PHASE B" For The School Board Of Santa Rosa County, Florida. Any Bids Received After Closing Will Be Returned Unopened.

All contractors for educational facilities are hereby notified that to be eligible to bid on school projects they must be pre-qualified. Contact the Board at the above address for information on pre-qualifying.

Contractors may obtain Sets of Printed Documents (drawings and specifications) at their cost from Bay Area Printing and Graphics Solution, 700 S. Pace Blvd., Pensacola, FL 32502 (850-433-6864) after registering with Mike Marshall at Sam Marshall Architects, 325 S. Palafox Street, Pensacola, Florida 32502 (to facilitate distribution of possible addendums and clarifications). Contractors may also obtain One Electronic Set of Reproducible Documents (drawings and specifications) from Sam Marshall Architects, 325 S. Palafox Street, Pensacola, FL 32502, 850-432-7842 mike@sammarshallarch.com

- This is not a mechanical prime contractor project
- Mechanical Contractor shall attend the Mandatory Pre-Bid meeting and attendance shall be recorded by A/E in order to bid the project under a General Contractor
- Refer to Specifications 230000 for Mechanical Contractor's Qualification Requirements and Project Schedule.

Bids shall be submitted on the form supplied by the Architect. Each bid must be accompanied by a Bid Bond in the amount of 5% of the base bid as guarantee that the successful bidder will enter into a written contract with the Owner and furnish a 100% "Performance Bond" and a 100% "Labor and Material Payment Bond" satisfactory to the Owner.

A **Mandatory** Pre-Bid Meeting Will Be Held Thursday, November 4, 2021 at 9:00 am. Check in at the front office of Hobbs Middle School. The Meeting will be held in the Media Center. The Purpose of This Meeting Is to Allow All Bidders Access to The Site in Order That They May Familiarize Themselves with All Existing Conditions That Relate to The Project.

The Owner Reserves the Right to Waive Informalities in Bidding and Reject Any and All Bids.

By Dr. Karen Barber, Superintendent of Schools

Run in Press Gazette October 27, Nov 3 & 10, 2021

SECTION 00050 – INSTRUCTIONS TO BIDDERS

1. GENERAL:

A. CONSIDERATION:
TO BE CONSIDERED, BIDS MUST BE MADE IN ACCORDANCE WITH THESE INSTRUCTIONS TO BIDDERS.

B. DEFINITIONS:

ALL DEFINITIONS AS SET FORTH IN THE AIA GENERAL CONDITIONS AND IN THE SECTION ENTITLED SUPPLEMENTARY GENERAL AND SPECIAL CONDITIONS APPLY TO THIS SECTION.

C. SECURING DOCUMENTS:

(1) COPIES OF THE CONTRACT DOCUMENTS MAY BE PURCHASED AT:

BAY AREA BLUEPRINT
700 S. PACE BLVD.
PENSACOLA, FLORIDA 32502
(PHONE) 850-433-6846

(2) COPIES OF THE CONTRACT DOCUMENTS MAY BE OBTAINED FOR BIDDING PURPOSES UPON THE CONDITIONS SET FORTH IN THE INVITATION TO BID.

2. PREBID REQUIREMENTS AND INFORMATION:

A. EXAMINATION OF DRAWINGS, SPECIFICATIONS, AND SITE OF WORK:

BEFORE SUBMITTING A BID, EACH BIDDER SHALL CAREFULLY EXAMINE THE DRAWINGS, READ THE SPECIFICATIONS AND ALL OTHER CONTRACT DOCUMENTS, AND VISIT THE SITE OF THE WORK. EACH BIDDER SHALL FULLY INFORM HIMSELF PRIOR TO BIDDING AS TO ALL EXISTING CONDITIONS AND LIMITATIONS UNDER WHICH THE WORK IS TO BE PERFORMED AND HE SHALL INCLUDE IN HIS BID A SUM TO COVER ALL COSTS OF ALL ITEMS NECESSARY TO PERFORM THE WORK AS SET FORTH IN THE CONTRACT DOCUMENTS. NO ALLOWANCE WILL BE MADE TO ANY BIDDER BECAUSE OF LACK OF SUCH EXAMINATION OR KNOWLEDGE. THE SUBMISSION OF A BID SHALL BE CONSTRUED AS CONCLUSIVE EVIDENCE THAT THE BIDDER HAS MADE SUCH EXAMINATION.

B. MANDATORY PRE-BID MEETING:

A MANDATORY PRE-BID MEETING WILL BE HELD AT HOBBS MIDDLE SCHOOL ON NOV 18, 2020 (9AM). THE PURPOSE OF THIS MEETING IS TO ALLOW ALL BIDDERS THE OPPORTUNITY TO ASK QUESTIONS RELATING TO THE PROJECT. ALL CONTRACTORS WILL BE REQUIRED TO VISIT THE SITE PRIOR TO THIS MEETING IN ORDER THAT THEY MAY FAMILIARIZE THEMSELVES WITH ALL EXISTING CONDITIONS THAT RELATE TO THE PROJECT. THE BIDDER SHALL INCLUDE IN HIS BID A SUM TO COVER ALL COSTS OF ALL ITEMS NECESSARY TO PERFORM THE WORK AS SET FORTH IN THE CONTRACT DOCUMENTS. NO ALLOWANCE WILL BE MADE TO ANY BIDDER BECAUSE OF LACK OF SUCH EXAMINATION OR KNOWLEDGE. THE SUBMISSION OF A BID SHALL BE CONSTRUED AS CONCLUSIVE

EVIDENCE THAT THE BIDDER HAS MADE SUCH EXAMINATION. OTHER INTERRESTED PARTIES ARE ENCOURAGED TO ATTEND.

C. PROOF OF COMPETENCY OF BIDDER:

ANY BIDDER MAY BE REQUIRED TO FURNISH EVIDENCE SATISFACTORY TO THE OWNER THAT HE AND HIS PROPOSED SUBCONTRACTORS HAVE SUFFICIENT MEANS AND EXPERIENCE IN THE TYPES OF WORK CALLED FOR ASSURE COMPLETION OF THE CONTRACT IN A SATISFACTORY MANNER.

D. INTERPRETATION OF CONTRACT DOCUMENTS PRIOR TO BIDDING:

IF ANY PERSON CONTEMPLATING SUBMITTING A BID FOR CONSTRUCTION OF THE WORK IS IN DOUBT AS TO THE TRUE MEANING OF ANY PART OF THE CONTRACT DOCUMENTS, OR FINDS DISCREPANCIES IN OR OMISSIONS FROM ANY PART OF THE CONTRACT DOCUMENTS, HE MAY SUBMIT TO THE ARCHITECT A WRITTEN REQUEST FOR INTERPRETATION THEREOF NOT LATER THAN JULY 16, SEVEN (7) DAYS BEFORE BIDS WILL BE OPENED. THE PERSON SUBMITTING THE REQUEST SHALL BE RESPONSIBLE FOR ITS PROMPT DELIVERY. ANY INTERPRETATION OR CORRECTION OF THE CONTRACT DOCUMENTS WILL BE MADE ONLY BY ADDENDUM AND WILL BE EMAILED OR DELIVERED TO EACH BIDDER OF RECORD. THE OWNER WILL NOT BE RESPONSIBLE FOR ANY OTHER EXPLANATIONS OR INTERPRETATIONS OF THE CONTRACT DOCUMENTS.

E. SUBSTITUTIONS:

(1) EACH BIDDER REPRESENTS THAT HIS BID IS BASED UPON MATERIALS AND EQUIPMENT DESCRIBED IN BIDDING DOCUMENTS.

(2) NO SUBSTITUTION WILL BE CONSIDERED UNLESS WRITTEN REQUEST HAS BEEN SUBMITTED TO THE ARCHITECT FOR APPROVAL AT LEAST FOURTEEN (14) DAYS PRIOR TO DATE FOR RECEIPT OF BIDS AND IS ENTERED ON SUBSTITUTION SHEET. EACH REQUEST SHALL INCLUDE A COMPLETE DESCRIPTION OF THE PROPOSED SUBSTITUTE AND NECESSARY DATA FOR A COMPLETE EVALUATION.

(3) IF PROPOSED SUBSTITUTION IS ACCEPTED IT WILL BE INCORPORATED IN AN ADDENDUM.

(4) SUBSTITUTIONS SHALL NOT AFFECT DETERMINING OF LOWEST BID.

3. <u>BID REQUIREMENTS:</u>

A. BID FORM:

IN ORDER TO RECEIVE CONSIDERATION, MAKE ALL BIDS IN STRICT ACCORDANCE WITH THE FOLLOWING:

(1) MAKE BIDS UPON THE FORMS PROVIDED THEREFORE, PROPERLY EXECUTED AND WITH ALL ITEMS FILLED OUT. DO NOT CHANGE THE WORDING OF THE BID FORM. UNAUTHORIZED CONDITIONS, LIMITATIONS, OR PROVISIONS ATTACHED TO THE PROPOSAL SHALL SHOW CAUSE FOR REJECTION OF THE PROPOSAL. ALTERATIONS BY ERASURE OR INTERLINEATION MUST BE EXPLAINED OR NOTED IN THE BID OVER THE SIGNATURE OF THE BIDDER.

(2) NO TELEGRAPHIC BID OR TELEGRAPHIC MODIFICATION OF A BID WILL BE CONSIDERED.

NO BIDS RECEIVED AFTER THE TIME FIXED FOR RECEIVING THEM WILL BE CONSIDERED. LATE BIDS WILL BE RETURNED TO THE BIDDER UNOPENED.

(3) EACH BID SHALL BE ADDRESSED TO THE OWNER AND SHALL BE DELIVERED TO THE OWNER AT THE ADDRESS GIVEN IN THE INVITATION TO BID ON OR BEFORE THE DAY AND HOUR SET FOR OPENING OF BIDS. EACH BID SHALL BE ENCLOSED IN A SEALED ENVELOPE BEARING THE TITLE OF THE WORK, THE NAME OF THE BIDDER, AND THE DATE AND HOUR OF THE OPENING. IT IS THE SOLE RESPONSIBILITY OF THE BIDDER TO SEE THAT HIS BID IS RECEIVED ON TIME.

(4) STATEMENT AND PRICE FOR TRENCH WORK DESIGNED "ATTACHMENT NUMBER 1", IS INCLUDED HEREWITH, FOLLOWING THIS SPECIFICATION SECTION, MUST BE PROPERLY COMPLETED AND SIGNED AND INCLUDED AND MADE PART OF THE BID PROPOSAL. FAILURE TO INCLUDE THIS ATTACHMENT SHALL BE CAUSE FOR REJECTION OF THE PROPOSAL.

(5) OTHER ITEMS TO BE INCLUDED WITH THE PROPOSAL ARE AS FOLLOWS:

- TRENCH SAFETY ADDENDUM
- PUBLIC ENTITY CRIMES STATEMENT
- DRUG FREE WORKPLACE FORM
- CERTIFICATION REGARDING DEBARMENT
- BID BOND
- ACKNOWLEDGEMENT OF ADDENDUMS AND CLARIFICATIONS IF ANY

B. WITHDRAWAL OF BIDS:

(1) ANY BIDDER MAY WITHDRAW HIS BID, EITHER PERSONALLY OR BY WRITTEN REQUEST, AT ANY TIME PRIOR TO SCHEDULED TIME FOR OPENING OF BIDS.

(2) NO BIDDER MAY WITHDRAW HIS BID FOR A PERIOD OF 60 DAYS AFTER THE DATE SET FOR OPENING THEREOF, AND ALL BIDS SHALL BE SUBJECT TO ACCEPTANCE BY THE OWNER DURING THIS PERIOD.

C. AWARD OR REJECTION OF BIDS:

THE CONTRACT, IF AWARDED, WILL BE AWARDED TO THE RESPONSIBLE BIDDER WHO HAS PROPOSED THE LOWEST CONTRACT SUM, SUBJECT TO THE OWNER'S RIGHT TO REJECT ANY OR ALL BIDS AND TO WAIVE INFORMALITY AND IRREGULARITY IN THE BIDS AND IN THE BIDDING.

D. POSTING OF BID TABULATIONS AND PROTESTS:

THE TABULATION OF BIDS WILL BE POSTED AT THE LOCATION WHERE THE BIDS WERE OPENED ON OR ABOUT THE DAY THE BIDS WERE OPENED. THE AWARD OF THE BID WILL BE POSTED IN THE SAME LOCATION THE DATE OF THE SCHOOL BOARD MEETING AND WILL REMAIN POSTED FOR A PERIOD OF AT LEAST 72 HOURS. FAILURE TO FILE A PROTEST WITHIN THE TIME PRESCRIBED IN SECTION 120.53(5) 120.57(3), FLORIDA STATUTES, SHALL CONSTITUTE A WAIVER PROCEEDING UNDER CHAPTER 120, FLORIDA STATUTES. ALL PROTESTS SHALL BE

IN COMPLIANCE WITH THE SCHOOL BOARD'S POLICY 6.10(S) a. PROTESTS SHALL BE IN THE FORM OF A WRITTEN LETTER, NO FACSIMILE'S OR TELEGRAPHIC PROTESTS WILL BE ALLOWED, AND A BOND, MADE PAYABLE TO THE BOARD, IN THE AMOUNT EQUAL TO 5% OF THE CONTRACT AMOUNT OR $2,000.00, WHICHEVER IS GREATER, NOT TO EXCEED $5,000.00 SHALL ACCOMPANY THE PROTEST.

E. QUALIFICATION OF BIDDERS:

(1) OWNER MAY MAKE SUCH INVESTIGATIONS AS HE DEEMS NECESSARY TO DETERMINE ABILITY OF BIDDER TO PERFORM WORK, AND BIDDER SHALL FURNISH TO OWNER SUCH INFORMATION INCLUDING A FINANCIAL AND EXPERIENCE STATEMENT AND OTHER DATA, INCLUDING QUALIFICATION DATA FOR PROPOSED SUBCONTRACTORS FOR THIS PURPOSE AS OWNER MAY REQUEST.

F. BONDS:

(1) A BID BOND IN THE AMOUNT OF 5% OF THE PROPOSED BASE BID CONTRACT AMOUNT MUST ACCOMPANY EACH PROPOSAL (A CHECK IS NOT ACCEPTABLE). ALL BID BONDS SHALL BE ON THE FORM INCLUDED IN THE PROJECT MANUAL (AIA FORM A310). THE SUCCESSFUL BIDDER'S SECURITY WILL BE RETAINED UNTIL HE HAS SIGNED THE CONTRACT AND FURNISHED THE REQUIRED LABOR AND MATERIALS PAYMENT BOND AND PERFORMANCE BOND. THE OWNER RESERVES THE RIGHT TO RETAIN THE SECURITY OF THE NEXT LOWEST BIDDER UNTIL THE LOWEST BIDDER ENTERS INTO CONTRACT OR UNTIL 60 DAYS AFTER BID OPENING, WHICHEVER IS SHORTER.

ALL OTHER BID SECURITY WILL BE RETURNED AS SOON AS PRACTICABLE. IF ANY BIDDER REFUSES TO ENTER INTO A CONTRACT, THE OWNER WILL RETAIN HIS BID BOND AS LIQUIDATED DAMAGES BUT NOT AS A PENALTY.

(2) PRIOR TO SIGNING THE CONTRACT, THE OWNER WILL REQUIRE THE SELECTED CONTRACTOR TO SECURE AND POST A LABOR AND MATERIALS PAYMENT BOND AND A PERFORMANCE BOND, EACH IN THE AMOUNT OF 100% OF THE CONTRACT SUM, AND EACH ON THE FORMS PROVIDED IN THE PROJECT MANUAL (AIA FORM 312). ALL SUCH BONDS SHALL BE ISSUED BY SURETY ACCEPTABLE TO THE OWNER. INCLUDE THE COSTS OF ALL SUCH BONDS IN THE PROPOSED CONTRACT SUM. PRIOR TO SIGNING THE CONTRACT, THE CONTRACTOR SHALL FURNISH THE NAME, ADDRESS, OFFICE AND FAX TELEPHONE NUMBERS OF THE LOCAL AGENT AND HOME OFFICE.

(3) BONDS SHALL BE EXECUTED BY A SURETY OR GUARANTY OR TRUST COMPANY AUTHORIZED TO DO BUSINESS IN THE STATE OF PROJECT LOCATION AND WITH LOCAL REPRESENTATION. IN THE EVENT OF FAILURE OF SURETY, OR IF AT ANY TIME SUCH IS DECLARED UNSATISFACTORY BY THE OWNER, THE CONTRACTOR SHALL IMMEDIATELY FURNISH A NEW BOND AS REQUIRED HEREIN.

(4) BONDS SHALL BE EXECUTED ON BEHALF OF THE CONTRACTOR IN THE SAME MANNER AND BY THE SAME PERSON WHO EXECUTED AGREEMENT. THE BONDS SHALL BE ACCOMPANIED BY A DULY AUTHENTICATED OR CERTIFIED DOCUMENT, IN DUPLICATE, EVIDENCING THAT THE PERSON EXECUTING THE BOND IN BEHALF

OF THE SURETY HAD THE AUTHORITY TO DO SO ON THE DATE OF THE BONDS. THE DOCUMENT SHALL INDICATE THE DATE OF APPOINTMENT AND ENUMERATION OF POWER OF THE PERSON EXECUTING THE BONDS ACCOMPANIED BY A CERTIFICATION THAT THE APPOINTMENT AND POWERS HAVE NOT BEEN REVOKED AND REMAIN IN EFFECT. THE DATE OF THAT CERTIFICATION SHALL BE THE DATE OF THE BONDS. THE DATE OF THE BONDS SHALL BE THE DATE OF THE AGREEMENT.

(5) AGENTS OF BONDING COMPANIES SHALL FURNISH POWER OF ATTORNEY, BEARING SEAL OF COMPANY, EVIDENCING SUCH AGENT'S AUTHORITY TO EXECUTE THE PARTICULAR TYPE OF BOND FURNISHED. A COPY OF THIS PROOF SHALL BE ATTACHED TO EACH COPY OF THE AGREEMENT.

(6) THE FOLLOWING INFORMATION WILL BE CLEARLY MARKED ON ALL BONDS:

(A) NAME, ADDRESS AND PHONE NUMBER OF THE LOCAL AGENT AND THE HOME OFFICE.

G. ACCEPTABLE SURETY:

TO BE ACCEPTABLE TO THE OWNER AS SURETY FOR BID BONDS AND PERFORMANCE AND PAYMENT BONDS, A SURETY COMPANY SHALL COMPLY WITH THE FOLLOWING PROVISIONS:

(1) THE SURETY COMPANY MUST BE ADMITTED TO DO BUSINESS IN THE STATE OF FLORIDA.

(2) THE SURETY COMPANY SHALL HAVE BEEN IN BUSINESS AND HAVE A RECORD OF SUCCESSFUL CONTINUOUS OPERATIONS FOR AT LEAST FIVE YEARS.

(3) THE SURETY SHALL NOT EXPOSE ITSELF TO ANY LOSS OR ANY ONE RISK IN AN AMOUNT EXCEEDING TEN (10) PERCENT OF ITS SURPLUS TO POLICYHOLDERS, PROVIDED:

(A) ANY RISK OR PORTION OF ANY RISK WHICH SHALL HAVE BEEN REINSURED (IN WHICH CASE THESE MINIMUM REQUIREMENTS CONTAINED HEREIN ALSO APPLY TO THE REINSURING CARRIER) IN ASSUMING INSURER AUTHORIZED OR APPROVED BY THE INSURANCE COMMISSIONER TO DO SUCH BUSINESS IN THIS STATE SHALL BE DEDUCTED IN DETERMINING THE LIMITATIONS OF RISK PRESCRIBED IN THIS SECTION.

H. EXECUTION OF AGREEMENT:

(1) THE FORM OF AGREEMENT WHICH THE SUCCESSFUL BIDDER, AS CONTRACTOR, WILL BE REQUIRED TO EXECUTE IS INCLUDED IN THE PROJECT MANUAL, AND SHALL BE AIA DOCUMENT A 101.

(2) THE BIDDER TO WHOM THE CONTRACT IS AWARDED BY THE OWNER SHALL, WITHIN FIFTEEN (15) DAYS AFTER NOTICE OF

AWARD AND RECEIPT OF AGREEMENT FORMS FROM THE OWNER, SIGN AND DELIVER TO THE OWNER ALL REQUIRED COPIES.

(3) IF CONTRACTOR IS AN INDIVIDUAL, AGREEMENT SHALL BE SIGNED WITH HIS MANUAL SIGNATURE.

(4) IF CONTRACTOR IS A FIRM OR COMPANY OWNED BY AN INDIVIDUAL, AGREEMENT SHALL BE EXECUTED IN NAME OF FIRM OR COMPANY BY MANUAL SIGNATURE OF OWNER.

(5) IF CONTRACTOR IS A CORPORATION, AGREEMENT SHALL BE EXECUTED IN NAME OF CORPORATION AND SHALL BEAR CORPORATE SEAL. IT SHALL BE SIGNED FOR CORPORATION BY THE PRESIDENT AND ATTESTED TO BY THE SECRETARY. EXECUTED CONTRACT SHALL BE ACCOMPANIED BY A DULY AUTHENTICATED DOCUMENT BEARING THE SEAL OF CORPORATION AUTHORIZING OFFICER SO SIGNING TO EXECUTE CONTRACTS ON BEHALF OF CORPORATION OR IF AUTHORIZED BY RESOLUTION OF BOARD OF DIRECTORS TO DESIGNATE SUCH OFFICER AND COPY OF RESOLUTION DESIGNATED AND AUTHORIZING HIM TO EXECUTE ON BEHALF OF CORPORATION. THAT DOCUMENT MUST CONTAIN A STATEMENT THAT AUTHORITY IS IN EFFECT ON DATE OF EXECUTION OF CONTRACT, AND MAY NOT BE DATED EARLIER THAN THE DATE OF EXECUTION OF CONTRACT. SAME OFFICER MAY NOT EXECUTE CONTRACT AND AUTHENTICATE DOCUMENT OF AUTHORITY.

(6) AT OR PRIOR TO DELIVERY OF THE SIGNED AGREEMENT, THE CONTRACTOR SHALL DELIVER TO THE OWNER THE LABOR AND PAYMENT BOND, THE PERFORMANCE BOND, AND THE POLICIES OF INSURANCE OR INSURANCE CERTIFICATES AS REQUIRED BY THE CONTRACT DOCUMENTS. ALL BONDS AND POLICIES OR CERTIFICATES OF INSURANCE SHALL BE APPROVED BY THE OWNER BEFORE THE SUCCESSFUL BIDDER MAY PROCEED WITH THE WORK.

(7) FAILURE TO FURNISH BONDS OR INSURANCE POLICIES OR CERTIFICATES IN A FORM SATISFACTORY TO THE OWNER SHALL SUBJECT THE BIDDER TO LOSS OF TIME FROM THE ALLOWABLE CONSTRUCTION PERIOD EQUAL TO THE TIME OF DELAY IN FURNISHING THE REQUIRED MATERIAL.

I. CONSTRUCTION TIME, LIQUIDATED DAMAGES:

(1) THE AGREEMENT WILL INCLUDE A STIPULATION THAT THE CONTRACTOR WILL START WORK WITHIN 10 DAYS AFTER NOTICE TO PROCEED AND ALL WORK COVERED BY THE CONTRACT WILL BE SUBSTANTIALLY COMPLETE AND A “CERTIFICATE OF OCCUPANCY” ISSUED WITHIN A PERIOD OF TWO HUNDRED EIGHTEEN (218) CALENDAR DAYS FOLLOWING RECEIPT OF NOTICE TO PROCEED. FURTHER, THE CONTRACTOR SHALL ACHIEVE FINAL COMPLETION WITHING THIRTY (30) CALENDAR DAYS FOLLOWING SUBSTANTIAL COMPLETION.

(2) THE AGREEMENT WILL INCLUDE A STIPULATION THAT LIQUIDATED DAMAGES WILL BE ESTABLISHED IN THE AMOUNT OF **$2500.00** PER CALENDAR DAY FOR EACH DAY, AFTER THE SUBSTANTIAL COMPLETION DATE, THAT WORK IS NOT SUBSTANTIALLY COMPLETE. AFTER SUBSTANTIAL COMPLETION AND A "CERTIFICATE OF OCCUPANCY" IS ISSUED, THE CONTRACTOR WILL HAVE 30 CALENDAR DAYS TO FULLY COMPLETE THE PUNCH LIST. IF THE PROJECT IS NOT FULLY COMPLETED AT THE END OF THAT 30 - DAY PERIOD, LIQUIDATED DAMAGES BEGIN TO BE CHARGED AT THE ORIGINAL RATE AND WILL CONTINUE UNTIL FULLY COMPLETE.

4. SPECIAL INSTRUCTIONS:

A. TEMPORARY UTILITIES SHALL BE THE RESPONSIBILITY OF THE CONTRACTOR.

B. ALCOHOL, DRUGS AND TOBACCO PRODUCTS:

1. THE USE OR POSSESSION OF ALCOHOLIC AND INTOXICATING LIQUORS AND BEVERAGES OR NARCOTIC TYPE DRUGS SHALL NOT BE PERMITTED AT ANY SCHOOL CENTER BY ANY PERSON, EXCEPT WHERE THE PERSON HAS PRESCRIPTION DRUGS FOR USE AS PRESCRIBED BY A MEDICAL DOCTOR.

2. TO COMPLY WITH THE FLORIDA CLEAN INDOOR AIR ACT, THE USE OF TOBACCO PRODUCTS (BOTH SMOKING AND SMOKELESS) IS PROHIBITED IN ANY FACILITIES OR ON ANY REAL OR PERSONAL PROPERTY OWNED BY OR UNDER THE CONTROL OF THE SANTA ROSA SCHOOL BOARD.

5. CONSTRUCTION SCHEDULE:

THE CONTRACTOR WILL ERECT TEMPORARY BARRICADES AND FENCING, AS REQUIRED IN ORDER TO KEEP THE PUBLIC OUT OF THE AREA WHERE WORK IS BEING DONE.

6. SAFETY PLAN:

AN OSHA SAFETY PLAN SHALL BE MAINTAINED ON SITE BY THE CONTRACTOR

THE GENERAL CONTRACTOR WILL FURNISH THE ARCHITECT AND OWNER THE NAMES AND TELEPHONE NUMBERS OF AT LEAST TWO (2) INDIVIDUALS THAT CAN BE CONTACTED DURING AND AFTER BUSINESS HOURS IF A PROBLEM ARISES WITH THE PROJECT. IDENTIFY THE CONTACTS PRIOR TO THE PRE-CONSTRUCTION MEETING.

7. OAC MEETINGS: THE CONTRACTOR SHALL BE RESPONSIBLE FOR ARRANGING AND CONDUCTING OAC MEETINS EVERY TWO (2) WEEKS AT A MUTUALLY AGREEABLE SITE.

END OF SECTION

PROPOSAL FORM

DATE:_____

_____

_____

_____

EACH BIDDER WILL FILL IN BIDDER'S NAME AND ADDRESS IN SPACE ABOVE.

TO: THE SANTA ROSA COUNTY SCHOOL BOARD, OFFICE OF THE ASSISTANT SUPERINTENDENT FOR ADMINISTRATIVE SERVICES, 6544 FIREHOUSE ROAD, UPSTAIRS CONFERENCE ROOM (MAINTENANCE BUILDING), MILTON, FLORIDA.

1. PURSUANT TO AND IN COMPLIANCE WITH YOUR INVITATION TO BID AND THE CONTRACT DOCUMENTS RELATING TO CONSTRUCTION OF "SANTA ROSA COUNTY SCHOOL DISTRICT HOBBS MIDDLE SCHOOL - ENERGY UPGRADES" FOR THE SCHOOL DISTRICT OF SANTA ROSA COUNTY, FLORIDA.

   INCLUDING ADDENDA NUMBERS: _____

   INCLUDING CLARIFICATION NUMBERS: _____

   THE UNDERSIGNED BIDDER, HAVING BECOME THOROUGHLY FAMILIAR WITH THE TERMS AND CONDITIONS OF THE CONTRACT DOCUMENTS AND WITH LOCAL CONDITIONS AFFECTING PERFORMANCE AND COSTS OF THE WORK AT THE PLACE WHERE THE WORK IS TO BE DONE, AND HAVING FULLY INSPECTED THE SITE IN ALL PARTICULARS, HEREBY PROPOSES AND AGREES TO FULLY PERFORM THE WORK WITHIN THE TIME STATED AND IN STRICT ACCORDANCE WITH THE CONTRACT DOCUMENTS, FOR THE FOLLOWING SUM OF MONEY:

   (BASE BID) FOR ALL WORK AS SPECIFIED AND NOT INCLUDING BID ITEM #1

   _____DOLLARS$_____

   BASE BID INCLUDES ALLOWANCE #1 – ABOVE CELING ELECTRICAL REMOVAL & REPAIR
   YES / NO (CIRCLE ONE)

   BASE BID INCLUDES ALLOWANCE #2 – DDC SYSTEM
   YES / NO (CIRCLE ONE)

   BASE BID INCLUDES ALLOWANCE #3 – HVAC EQUIPMENT
   YES / NO (CIRCLE ONE)

   BID ALTERNATE #1 ALL WORK RELATED TO ROOMS 022, 022A, 031-031M, 057 PER DRAWINGS.

   _____DOLLARS$_____

   BID ALTERNATE #1 INCLUDES ALLOWANCE #4 – DDC SYSTEM
   YES / NO (CIRCLE ONE)

   BID ALTERNATE #1 INCLUDES ALLOWANCE #5 – HVAC EQUIPMENT
   YES / NO (CIRCLE ONE)

1. I UNDERSTAND THAT THE OWNER RESERVES THE RIGHT TO REJECT THIS BID BUT THAT THIS BID SHALL REMAIN OPEN AND SHALL NOT BE WITHDRAWN FOR A PERIOD OF 60 DAYS AFTER THE DATE PRESCRIBED FOR ITS OPENING.

2. IF WRITTEN NOTICE OF THE ACCEPTANCE OF THIS BID IS MAILED OR DELIVERED PERSONALLY TO THE UNDERSIGNED WITHIN 60 DAYS AFTER THE DATE SET FOR THE OPENING OF THIS BID, OR AT ANY TIME THEREAFTER BEFORE IT IS WITHDRAWN, THE UNDERSIGNED BIDDER WILL EXECUTE AND DELIVER THE CONTRACT DOCUMENTS TO THE OWNER IN ACCORDANCE WITH THIS BID AS ACCEPTED, AND WILL ALSO FURNISH AND DELIVER TO THE OWNER ALL REQUIRED PERFORMANCE BOND, LABOR AND MATERIALS PAYMENT BOND, AND PROOF OF INSURANCE COVERAGE REQUIRED, ALL WITHIN 10 DAYS AFTER PERSONAL DELIVERY OR DEPOSIT IN THE MAIL OF A NOTIFICATION OF ACCEPTANCE OF THIS BID.

3. IF AWARDED THIS CONTRACT, I AGREE TO COMPLETE ALL WORK WITHIN 120 CALENDAR DAYS AFTER RECEIPT OF THE NOTICE TO PROCEED FROM THE ARCHITECT, AND TO PAY LIQUIDATED DAMAGE AS SET FORTH IN THE INSTRUCTIONS TO BIDDERS FOR FAILURE TO COMPLETE THE PROJECT WITHIN THE STATED TIME.

4. NOTICE OF ACCEPTANCE OR REQUEST FOR ADDITIONAL INFORMATION MAY BE ADDRESSED TO THE UNDERSIGNED AT THE ADDRESS SET FORTH BELOW.

5. WHEREVER IN THIS PROPOSAL AN AMOUNT IS STATED IN BOTH WORDS AND FIGURES, IN CASE OF DISCREPANCY BETWEEN WORDS AND FIGURES, THE WORDS SHALL PREVAIL.

6. LIST OF SUB-CONTRACTOR'S PROPOSED FOR THIS PROJECT WILL NOT BE REQUIRED AT TIME OF BIDDING. THE LOW BIDDER WILL BE REQUIRED TO DELIVER, TO THE ARCHITECT'S OFFICE WITHIN 48 HOURS AFTER TIME OF BID OPENING, A COMPLETE LIST OF SUB-CONTRACTOR'S, MATERIAL SUPPLIERS AND TESTING AGENCY FOR APPROVAL.

7. THE NAMES OF ALL PERSONS INTERESTED IN THE FOREGOING BID AS PRINCIPALS ARE:

   IMPORTANT NOTICE: IF BIDDER OR OTHER INTERESTED PERSON IS A CORPORATION, GIVE LEGAL NAME OF CORPORATION, STATE WHERE INCORPORATED AND NAMES OF THE PRESIDENT AND SECRETARY OF THE CORPORATION; IF A PARTNERSHIP, GIVE NAME OF THE FIRM AND NAMES OF ALL INDIVIDUAL CO-PARTNERS COMPOSING THE FIRM; IF BIDDER OR OTHER INTERESTED PERSON IS AN INDIVIDUAL, GIVE FIRST AND LAST NAMES IN FULL.

   _____

   _____

   _____

8. THE UNDERSIGNED BIDDER IS LICENSED IN ACCORDANCE WITH THE REQUIREMENTS OF THE STATE OF FLORIDA, LICENSE NUMBER_____. CONTRACTOR WILL INCLUDE A COPY OF SUB-CONTRACTOR'S LICENSE UPON AWARD OF BID.

9. THE UNDERSIGNED BIDDER HAS SUCCESSFULLY COMPLETED ALL THE REQUIREMENTS FOR PRE-QUALIFICATION AND IS PRESENTLY APPROVED BY THE SCHOOL BOARD OF SANTA ROSA COUNTY TO BID SCHOOL BOARD PROJECTS.

FIRM: _____

BY: _____
(SIGNATURE)

_____
(PRINTED NAME)

TITLE: _____

ADDRESS: _____

_____
CITY, STATE ZIP

PHONE #: _____

END OF SECTION

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ATTACHMENT #1

TRENCH SAFETY ADDENDUM

Any trench safety excavation having a depth in excess of five (5) feet will be subject to the Excavation Safety Standards established by the Occupational Safety and Health Administration, 29.C.F.R. s. 1926.650 Subpart P.

By the signature of its undersigned authorized representative, the Bidder hereby assures the Owner that any such excavation performed by the Bidder will be performed in compliance with all applicable trench safety standards.

The cost of compliance with applicable trench safety standards is estimated by the Bidder to be $_____
which cost is included in the amount of bid.

The specific methods of compliance with applicable Trench Safety Standards, and the cost of compliance are as follows:

_____

_____

_____

_____
AUTHORIZED OFFICIAL

SWORN STATEMENT PURSUANT TO SECTION 287.133(3)(a),
FLORIDA STATUTES, ON PUBLIC ENTITY CRIMES

THIS FORM MUST BE SIGNED AND SWORN TO IN THE PRESENCE OF A NOTARY PUBLIC OR OTHER OFFICIAL AUTHORIZED TO ADMINISTER OATHS.

1. This sworn statement is submitted to The School District of Santa Rosa County

by _____
(print the individual's name and title)

for _____
(print name of entity submitting sworn statement)

whose business address is _____

_____

and (if applicable) its Federal Employer Identification Number (FEIN) is:

_____

(If the entity has no FEIN, include the Social Security Number of the individual signing this

sworn statement: _____

2. I understand that a "public entity crime" as defined in Paragraph 287.133(1)(g), Florida Statutes, means a violation of any state or federal law by a person with respect to an directly related to the transaction of business with any public entity or with an agency or political subdivision of any other state or of the United States, including, but not limited to, any agency or political subdivision of any other state or of the United States and involving antitrust, fraud, theft, bribery, collusion, racketeering, conspiracy, or material misrepresentation.

3. I understand that "convicted" or "conviction" as defined in Paragraph 287.133(1)(b), Florida Statutes, means a finding of guilt or a conviction of a public entity crime, with or without an adjudication of guilt, in any federal or state trial court of record relating to changes brought by indictment or information after July 1, 1997, as a result of a jury verdict, non jury trial, or entry of a plea of guilty or nolo contendere.

4. I understand that an "affiliate" as defined in Paragraph 287.133(1)(a), Florida Statutes, means:

    1. A predecessor or successor of a person convicted of a public entity crime; or
    2. An entity under the control of any natural person who is active in the management of the entity and who has been convicted of a public entity crime. The term "affiliate" includes those officers, directors, executives, partners, shareholders, employees, members, and agents who are active in the management of an affiliate. The ownership by one person of shares constituting a controlling interest in another person, or a pooling of equipment or income among persons when not for fair market value under an arm's length agreement, shall be a prima facie case that one person controls another person. A person who knowingly enters into a joint venture with a person who has been convicted of a public entity crime in Florida during the preceding 36 months shall be considered an affiliate.

5. I understand that a "person" as defined in Paragraph 287.133(1)(e), Florida Statutes, means any natural person or entity organized under the laws of any state or of the United States with the legal power to enter into a binding contract and which bids or applies to bid on contracts for the provision of goods or services let by a public entity, or which otherwise transacts or applies to transact business with a public entity. The term "person" includes those officers, directors, executives, partners, shareholders, employees, members, and agents who are active in management of an entity.

6. Based on information and belief, the statement which I have marked below is true in relation to the entity submitting this sworn statement. (Indicate which statement applies)

_____ Neither the entity submitting this sworn statement, nor any of its officers, directors, executives, partners, shareholders, employees, members, or agents who are active in the management of the entity, nor any affiliate of the entity has been charged with and convicted of a public entity crime subsequent to July 1, 1997.

_____The entity submitting this sworn statement, or one or more of its officers, directors, executives, partners, shareholders, employees, members or agents who are active in the management of the entity, or an affiliate of the entity has been charged with an convicted of a public crime subsequent to July 1, 1997.

_____The entity submitting this sworn statement, or one or more of its officers, directors, executives, partners, shareholders, employees, members, or agents who are active in the management of the entity, or an affiliate of the entity has been charged with and convicted of a public entity crime subsequent to July 1, 1997. However, there has been a subsequent proceeding before a Hearing Officer of the State of Florida, Division of Administrative Hearings and Final Order entered by the Hearing Officer determined that is was not in the public interest to place the entity submitting this sworn statement on the convicted vendor list. (Attach a copy of the final order)

I UNDERSTAND THAT THE SUBMISSION OF THIS FORM TO THE CONTRACTING OFFICER FOR THE PUBLIC ENTITY IDENTIFIED IN PARAGRAPH I (ONE) ABOVE IS FOR THAT PUBLIC ENTITY ONLY AND, THAT THIS FORM IS VALID THROUGH DECEMBER 31 OF THE CALENDAR YEAR IN WHICH IT IS FILED. I ALSO UNDERSTAND THAT I AM REQUIRED TO INFORM THE PUBLIC ENTITY PRIOR TO ENTERING INTO A CONTRACT IN EXCESS OF THE THRESHOLD AMOUNT PROVIDED IN SECTION 287.017, FLORIDA STATUTES FOR A CATEGORY TWO OF ANY CHANGE IN THE INFORMATION CONTAINED IN THIS FORM.

_____
Signature

Sworn to a subscribed before me this _____ day of_____ in the year 20_____.

Personally known: _____OR produced identification:_____

Type of Identification: _____ Notary Public-State of_____

Notary Signature: _____ Notary Stamp and Expiration:

DRUG FREE WORKPLACE

Section 287.087 Florida Statutes

Bids will only be received from a business that certifies that it has implemented a drug-free workplace program.

In order to have a drug-free workplace program, a business shall:

1. Publish a statement notifying employees that the unlawful manufacture, distribution, dispensing, possession, or use of a controlled substance is prohibited in the workplace and specifying the actions that will be taken against employees for violations of such prohibition.
2. Inform employees about the dangers of drug abuse in the workplace, the business's policy of maintaining a drug-free workplace, any available drug counseling, rehabilitation, and employee assistance programs, and the penalties that may be imposed upon employees for drug abuse violations.
3. Give each employee engaged in providing the commodities or contractual services that are under bid a copy of the statement specified in subsection (1).
4. In the statement specified in subsection (1), notify the employees that, as a condition of working on the commodities or contractual services that are under bid, the employees will abide by the terms of the statement and will notify the employer of any conviction of, or plea of guilty or nolo contendere to, any violation of Chapter 893 or of any controlled substance law of the United States or any state, for a violation occurring in the workplace no later than five (5) days after such conviction.
5. Impose a sanction on or require the satisfactory participation in a drug abuse assistance or rehabilitation program if such as available in the employee's community, by an employee who is so convicted.
6. Make a good faith effort to continue to maintain a drug-free workplace through implementation of this section.

As the person authorized to sign the statement, I certify that this firm complies fully with the above requirements.

Contractor's Signature_____ Date:_____

Print Name and Title _____

_____

Certification Regarding Debarment, Suspension, Ineligibility and Voluntary Exclusion - Lower Tier Covered Transactions

This certification is required by the Department of Education regulations implementing Executive Order 12549, Debarment and Suspension, 34 CFR Part 85, for all lower tier transactions meeting the threshold and tier requirements stated at Section 85.110.

Instructions for Certification

1. By signing and submitting this proposal, the prospective lower tier participant is providing the certification set out below.

2. The certification in this clause is a material representation of fact upon which reliance was placed when this transaction was entered into. If it is later determined that the prospective lower tier participant knowingly rendered an erroneous certification, in addition to other remedies available to the Federal Government, the department or agency with which this transaction originated may pursue available remedies, including suspension and/or debarment.

3. The prospective lower tier participant shall provide immediate written notice to the person to whom this proposal is submitted if at any time the prospective lower tier participant learns that its certification was erroneous when submitted or has become erroneous by reason of changed circumstances.

4. The terms '"covered transaction," "debarred," "suspended," "ineligible," "lower tier covered transaction," "participant," "person," "primary covered transaction," "principal," "proposal," and "voluntarily excluded," as used in this clause, have the meanings set out in the Definitions and Coverage sections of rules implementing Executive Order 12549. You may contact the person to which this proposal is submitted for assistance in obtaining a copy of those regulations.

5. The prospective lower tier participant agrees by submitting this proposal that, should the proposed covered transaction be entered into, it shall not knowingly enter into any lower tier covered transaction with a person who is debarred, suspended, declared ineligible, or voluntarily excluded from participation in this covered transaction, unless authorized by the department or agency with which this transaction originated.

6. The prospective lower tier participant further agrees by submitting this proposal that it will include the clause titled "Certification Regarding Debarment, Suspension, Ineligibility, and Voluntary Exclusion-Lower Tier Covered Transactions," without modification of all lower tier covered transactions and in all solicitations for lower tier covered transactions.

7. A participant in a covered transaction may rely upon a certification of a prospective participant in a lower tier covered transaction that it is not debarred, suspended, ineligible, or voluntarily excluded from the covered transaction, unless it knows that the certification is erroneous. A participant may decide the method and frequency by which it determines the eligibility of its principals. Each participant may, but is not required to, check the Nonprocurement List.

8. Nothing contained in the foregoing shall be construed to require establishment of a system of records in order to render in good faith the certification required by this clause. The knowledge and information of a participant is not required to exceed that which is normally possessed by a prudent person in the ordinary course of business dealings.

9. Except for transactions authorized under paragraph 5 of these instructions, if a participant in a covered transaction knowingly enters into a lower tier covered transaction with a person who is suspended, debarred, ineligible, or voluntarily excluded from participation in this transaction, in addition to other remedies available to the Federal Government, the department or agency with which this transaction originated may pursue available remedies, including suspension and/or debarment.

Certification

(1) The prospective lower tier participant certifies, by submission of this proposal, that neither it nor its principals are presently debarred, suspended, proposed for debarment, declared ineligible, or voluntarily excluded from participation in this transaction by any Federal department or agency.

(2) Where the prospective lower tier participant is unable to certify to any of the statements in this certification, such prospective participant shall attach an explanation to this proposal.

NAME OF APPLICANT	AWARD NUMBER AND/OR PROJECT NAME
PRINTED NAME AND TITLE OF AUTHORIZED REPRESENTATIVE	
SIGNATURE	DATE

ED 80-00014, 9/90 (Replaces GCS-009 (REV. 12/88), which is obsolete)

SECTION 00065 – DIRECT PURCHASE PROCEDURES
(Amended March 1, 2017)

1. GENERAL:

A. THE SANTA ROSA COUNTY SCHOOL DISTRICT WILL REQUIRE THE INCORPORATION OF THE FOLLOWING EXHIBIT "C ". THE CONTRACTOR SHALL COOPERATE IN THE FULLEST AND PERFORM ALL WORK AND SERVICES NECESSARY IN ORDER TO FACILITATE THE IMPLEMENTATION OF THESE PROCEDURES.

EXHIBIT C
Direct Purchasing – State Sales Tax Avoidance
School District of Santa Rosa County

ATTACHMENT TO CONSTRUCTION CONTRACT WITH _____
DATED _____ IN AGREEMENT WITH:

OWNER: Santa Rosa County School District
5086 Canal Street
Milton, FL 32570

CONTRACTOR: (Fill In)

ARCHITECT: Sam Marshall Architects
325 S. Palafox St.
Pensacola, FL 32502

REFERENCING Hobbs Middle School - Energy Upgrades

ON THIS DAY, _____.

Direct Purchasing – State Sales Tax Avoidance

SPECIAL CATEGORY OF MATERIALS

The construction contract sum includes applicable state and local sales taxes for all materials purchased in connection with this contract. The Contractor will advise the Owner in writing as to the Contractor's source of the special category materials and the ordering information. (*Note, the contractor is responsible to ensure that items ordered are approved by the architect and engineers. The issuance of a purchase order by the owner does not constitute approval of submittals or products, as that is a separate process*.) The Owner will then have the option to purchase the materials directly from the supplier and issue a deductive change order, which will not have any effect upon the Contractor's mark-up. This will apply to any construction purchase from a single vendor with a project total or cumulative project cost of $5,000 or more. Construction purchases include the purchases of sub contractors, and their subs, as well as those of the general contractor. Deductive change orders will be processed on a monthly basis as actual payments are made. The change order will include actual payment amounts issued to suppliers and the calculated sales tax savings

The following list identifies potential items that the Owner may elect to purchase directly from the Contractor's suppliers: (***this is not an inclusive list and is listed for illustrative purposes only. All divisions should be examined for qualifying direct purchases)***

- Acoustical Ceilings
- Appliances
- Architectural Windows
- Cabinetry
- Ceramic Tile
- Division 10 Specialties
- Electrical Equipment and supplies
- Entrances and Storefronts
- Exterior Lighting Fixtures
- Fire Sprinkler Systems
- Flooring (see exception below)
- Flush Wood Doors
- Generators
- Hurricane Screens
- HVAC, Air Handling Units and Hoods
- Interior Lighting Fixtures
- Irrigation Systems
- Masonry to include ready-mix concrete
- ***Other items as directed by the Owner during construction***
- Paving materials

- Pipe and Tube Railings
- Plumbing Fixtures
- Precast Pre-stressed Concrete
- Pre-Engineered Metal Building
- Reinforcing Bar
- Roofing
- Signage
- Sod and site work including underground piping, boxes, inlets, grates, etc.
- Steel Doors and Frames
- Structural Steel
- Systems

The terms of the contract between the Owner and Contractor will continue to be applicable as if the Contractor, and not the Owner, would be directly paying for the materials. The Contractor shall not assert the fact that the Owner is or will be directly paying for materials as a defense or excuse for later performance or non-performance of the contract, except only in the case of non-payment or late payment by the Owner for the materials, which delays performance of the contract. Any request of the Contractor for an extension of time to perform the contract, which is in any way due to or alleged to be due to the direct payment or non-payment or late payment for materials by the Owner, must be in writing and in all other respects in conformity with change order requests as are provided for under the contract.

Blanket purchase orders, with a “do not exceed” amount will be issued for items that are difficult to quantify, such as ready-mix concrete, blocks, brick, etc. The purchase orders may be increased as needed upon contractor request. Upon completion, the contractor will notify the Owner of that the purchase is complete and the remaining balance on the purchase order will be adjusted and credited back to the contractor.

The Contractor agrees to provide the Owner with technical assistance, statements and all other things reasonably necessary for the Owner to make and pursue warranty claims or breech or contract claims or any other claims for defective or non-conforming materials, whether or not performance under the contract is complete.

The Contractor shall be responsible for requesting that the Owner purchase materials necessary for the work to be performed under the contract. Unless otherwise agreed to in writing, the Owner will not be responsible to initiate the purchase of any materials without appropriate purchase documents being provided to the Owner by the Contractor.

In no event shall the Owner be liable to the Contractor for any loss or damage caused by the delivery, use, storage, transportation, alteration, incorporation into the improvements, or any other condition of the materials by virtue of Owner’s direct payment for the materials. Contractor and Owner agree that all risks of loss or damage

concerning, in any way, the materials will be determined under the terms of the contract documents as if the Contractor and not the Owner had paid directly for the materials.

The Contractor shall notify the Owner of all materials needed and the desirable date of delivery. The Contractor shall, immediately upon delivery, inspect the materials for accuracy of the order. If the delivery is acceptable, the Contractor shall acknowledge receipt and provide the Owner with the accompanying documentation and proper invoice. The Contractor shall be responsible for storage of all materials and security, insurance, inventory records, special handling and all other responsibilities of the Contractor as provided for in the contract documents as if the Contractor has or would be paying directly for the materials.

The contractor must provide to the owner a copy of each invoice, signed *received and approved for payment* in a color other than black, by an authorized representative of the contractor. The signed invoice is to be delivered in a timely manner to the Administrative Services Accountant III for payment or emailed in color .pdf format. Contact Mrs. Jennifer Northrop, Administrative Services Accountant III, at 6544 Firehouse Road, Milton, FL 32570. 850-983-5598 or NorthropJ@santarosa.k12.fl.us if you have questions concerning the direct purchase process.

All contractors must have daily monitored email.

The Owner will pay for the material after delivery to the site and submission of the proper invoice to the Owner.

The Contractor will act as an agent for the Owner when identifying the source of materials to be purchased by the Owner for this construction project.

The Contractor will provide to the Owner a proposal from the supplier in accordance with the terms and conditions of this contract when submitting a supply source for the materials. The Owner will execute the purchase documents within a timely manner after receipt of all necessary data.

This procedure is an integral part of the contract and will in no way diminish the responsibility of the Contractor in establishing required data for production, storage and delivery of materials and the mode of transportation as necessary to meet his or her contract schedule. This procedure will not be a basis for any additive change order to the contract.

Failure by the general contractor to request the owner to issue purchase orders for the materials as described in this section will result in the contractor being charged for the

loss of the tax savings that the Owner would have enjoyed. For example, if the plumbing fixtures totaled $15,000, the general contractor would issue a credit to the owner of $950 (6% state tax, plus 1% on the first $5,000 local option tax (or whatever the current County sales tax rate may be) as penalty for failing to follow the requirements of this section.

By submitting a bid, the contractor acknowledges and agrees to this penalty.

General contractors who have not had previous successful direct purchase contracts with the owner are required to have the office staff that will be handling the direct purchase program meet with the school Owner accountant at her office for training in the mechanics of the program.

Certificate of Entitlement

An executed copy of the following “Certificate of Entitlement” will be delivered to the contractor with each copy of the School System’s Purchase order for Direct Purchase of Materials.

The Contractor will be required to retain each purchase order along with the associated “Certificate of Entitlement” for a period of one (1) year from the date of Substantial Completion”

CERTIFICATE OF ENTITLEMENT

The undersigned authorized representative of Santa Rosa County School District (hereinafter "Governmental Entity"), Florida Consumer's Certificate of Exemption Number 85-8012622341C-0, affirms that the tangible personal property purchased pursuant to Purchase Order Number ##### from (Vendor) on or after (today's date) will be incorporated into or become a part of a public facility as part of a public works contract pursuant to the contract dated mm/dd/yyyy with (contractor name) for the construction of (site & project description).

Governmental Entity affirms that the purchase of the tangible personal property contained in the attached Purchase Order meets the following exemption requirements contained in Section 212.08(6), F.S., and Rule 12A-1.094, F.A.C.:

You must initial each of the following requirements.

____ 1. The attached Purchase Order is issued directly to the vendor supplying the tangible personal property the Contractor will use in the identified public works.

____ 2. The vendor's invoice will be issued directly to Governmental Entity.

____ 3. Payment of the vendor's invoice will be made directly by Governmental Entity to the vendor from public funds.

____ 4. Governmental Entity will take title to the tangible personal property from the vendor at the time of purchase or of delivery by the vendor.

____ 5. Governmental Entity assumes the risk of damage or loss at the time of purchase or delivery by the vendor.

Governmental Entity affirms that if the tangible personal property identified in the attached Purchase Order does not qualify for the exemption provided in Section 212.08(6), F.S., and Rule 12A-1.094, F.A.C., Governmental Entity will be subject to the tax, interest, and penalties due on the tangible personal property purchased. If the Florida Department of Revenue determines that the tangible personal property purchased tax-exempt by issuing this Certificate does not qualify for the exemption, Governmental Entity will be liable for any tax, penalty, and interest determined to be due.

I understand that if I fraudulently issue this certificate to evade the payment of sales tax I will be liable for payment of the sales tax plus a penalty of 200% of the tax and may be subject to conviction of a third degree felony.

Under the penalties of perjury, I declare that I have read the foregoing Certificate of Entitlement and the facts stated in it are true.

_____	Assistant Superintendent for Administrative Services
Signature of Authorized Representative	Title
Joseph B. Harrell	_____
Purchaser's Name (Print or Type)	Date

Federal Employer Identification Number: 59-6000845

Telephone Number: 850-983-5123

You must attach a copy of the Purchase Order to this Certificate of Entitlement.

Do not send to the Florida Department of Revenue. This Certificate of Entitlement must be retained in the vendor's and the contractor's books and records.

THE AMERICAN INSTITUTE OF ARCHITECTS

AIA Document A310

Bid Bond

KNOW ALL MEN BY THESE PRESENTS, that we
(Here insert full name and address or legal title of Contractor)

as Principal, hereinafter called the Principal, and
(Here insert full name and address or legal title of Surety)

a corporation duly organized under the laws of the State of
as Surety, hereinafter called the Surety, are held and firmly bound unto
(Here insert full name and address or legal title of Owner)

as Obligee, hereinafter called the Obligee, in the sum of

Dollars ($),

for the payment of which sum well and truly to be made, the said Principal and the said Surety, bind ourselves, our heirs, executors, administrators, successors and assigns, jointly and severally, firmly by these presents.

WHEREAS, the Principal has submitted a bid for
(Here insert full name, address and description of project)

NOW, THEREFORE, if the Obligee shall accept the bid of the Principal and the Principal shall enter into a Contract with the Obligee in accordance with the terms of such bid, and give such bond or bonds as may be specified in the bidding or Contract Documents with good and sufficient surety for the faithful performance of such Contract and for the prompt payment of labor and material furnished in the prosecution thereof, or in the event of the failure of the Principal to enter such Contract and give such bond or bonds, if the Principal shall pay to the Obligee the difference not to exceed the penalty hereof between the amount specified in said bid and such larger amount for which the Obligee may in good faith contract with another party to perform the Work covered by said bid, then this obligation shall be null and void, otherwise to remain in full force and effect.

Signed and sealed this day of 19

(Witness)

(Principal) (Seal)

(Title)

(Witness)

(Surety) (Seal)

(Title)

AIA® Document A312™ – 1984

Performance Bond

CONTRACTOR *(Name and Address)*: **SURETY** *(Name and Principal Place of Business)*:

OWNER *(Name and Address)*:

Any singular reference to Contract, Surety, Owner or other party shall be considered plural where applicable.

CONSTRUCTION CONTRACT
Date:

Amount:

Description *(Name and Location)*:

BOND
Date *(Not earlier than Construction Contract Date)*:

Amount:

Modifications to this Bond: ■ None ☐ See page 4

CONTRACTOR AS PRINCIPAL		**SURETY**	
Company:	*(Corporate Seal)*	Company:	*(Corporate Seal)*
Signature:		Signature:	
Name and Title:		Name and Title:	

(Any additional signatures appear on page 4)

(FOR INFORMATION ONLY - Name, Address and Telephone)
AGENT or **BROKER**: **OWNER'S REPRESENTATIVE** *(Architect, Engineer or other party)*:

REPRODUCTION

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

§ 2 If the Contractor performs the Construction Contract, the Surety and the Contractor shall have no obligation under this Bond, except to participate in conferences as provided in Section 3.1.

§ 3 If there is no Owner Default, the Surety's obligation under this Bond shall arise after:
§ 3.1 The Owner has notified the Contractor and the Surety at its address described in Section 10 below that the Owner is considering declaring a Contractor Default and has requested and attempted to arrange a conference with the Contractor and the Surety to be held not later than fifteen days after receipt of such notice to discuss methods of performing the Construction Contract. If the Owner, the Contractor and the Surety agree, the Contractor shall be allowed a reasonable time to perform the Construction Contract, but such an agreement shall not waive the Owner's right, if any, subsequently to declare a Contractor Default; and

§ 3.2 The Owner has declared a Contractor Default and formally terminated the Contractor's right to complete the contract. Such Contractor Default shall not be declared earlier than twenty days after the Contractor and the Surety have received notice as provided in Section 3.1; and

§ 3.3 The Owner has agreed to pay the Balance of the Contract Price to the Surety in accordance with the terms of the Construction Contract or to a contractor selected to perform the Construction Contract in accordance with the terms of the contract with the Owner.

§ 4 When the Owner has satisfied the conditions of Section 3, the Surety shall promptly and at the Surety's expense take one of the following actions:
§ 4.1 Arrange for the Contractor, with consent of the Owner, to perform and complete the Construction Contract; or

§ 4.2 Undertake to perform and complete the Construction Contract itself, through its agents or through independent contractors; or

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

§ 4.4 Waive its right to perform and complete, arrange for completion, or obtain a new contractor and with reasonable promptness under the circumstances:

.1 After investigation, determine the amount for which it may be liable to the Owner and, as soon as practicable after the amount is determined, tender payment therefor to the Owner; or

.2 Deny liability in whole or in part and notify the Owner citing reasons therefor.

§ 5 If the Surety does not proceed as provided in Section 4 with reasonable promptness, the Surety shall be deemed to be in default on this Bond fifteen days after receipt of an additional written notice from the Owner to the Surety demanding that the Surety perform its obligations under this Bond, and the Owner shall be entitled to enforce any remedy available to the Owner. If the Surety proceeds as provided in Section 4.4, and the Owner refuses the payment tendered or the Surety has denied liability, in whole or in part, without further notice the Owner shall be entitled to enforce any remedy available to the Owner.

§ 6 After the Owner has terminated the Contractor's right to complete the Construction Contract, and if the Surety elects to act under Section 4.1, 4.2, or 4.3 above, then the responsibilities of the Surety to the Owner shall not be greater than those of the Contractor under the Construction Contract, and the responsibilities of the Owner to the Surety shall not be greater than those of the Owner under the Construction Contract. To the limit of the amount of this Bond, but subject to commitment by the Owner of the Balance of the Contract Price to mitigation of costs and damages on the Construction Contract, the Surety is obligated without duplication for:
§ 6.1 The responsibilities of the Contractor for correction of defective work and completion of the Construction Contract;

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

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

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

§ 8 The Surety hereby waives notice of any change, including changes of time, to the Construction Contract or to related subcontracts, purchase orders and other obligations.

§ 9 Any proceeding, legal or equitable, under this Bond may be instituted in any court of competent jurisdiction in the location in which the work or part of the work is located and shall be instituted within two years after Contractor Default or within two years after the Contractor ceased working or within two years after the Surety refuses or fails to perform its obligations under this Bond, whichever occurs first. If the provisions of this Paragraph are void or prohibited by law, the minimum period of limitation available to sureties as a defense in the jurisdiction of the suit shall be applicable.

§ 10 Notice to the Surety, the Owner or the Contractor shall be mailed or delivered to the address shown on the signature page.

§ 11 When this Bond has been furnished to comply with a statutory or other legal requirement in the location where the construction was to be performed, any provision in this Bond conflicting with said statutory or legal requirement shall be deemed deleted here from and provisions conforming to such statutory or other legal requirement shall be deemed incorporated herein. The intent is that this Bond shall be construed as a statutory bond and not as a common law bond.

§ 12 DEFINITIONS

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

§ 12.2 Construction Contract: The agreement between the Owner and the Contractor identified on the signature page, including all Contract Documents and changes thereto.

§ 12.3 Contractor Default: Failure of the Contractor, which has neither been remedied nor waived, to perform or otherwise to comply with the terms of the Construction Contract.

§ 12.4 Owner Default: Failure of the Owner, which has neither been remedied nor waived, to pay the Contractor as required by the Construction Contract or to perform and complete or comply with the other terms thereof.

REPRODUCTION

§ 13 MODIFICATIONS TO THIS BOND ARE AS FOLLOWS:

(Space is provided below for additional signatures of added parties, other than those appearing on the cover page.)

CONTRACTOR AS PRINCIPAL		SURETY	
Company:	*(Corporate Seal)*	Company:	*(Corporate Seal)*
Signature:		Signature:	
Name and Title:		Name and Title:	
Address:		Address:	

REPRODUCTION

AIA® Document A312™ – 1984

Payment Bond

CONTRACTOR *(Name and Address)*: **SURETY** *(Name and Principal Place of Business)*:

OWNER *(Name and Address)*:

Any singular reference to Contract, Surety, Owner or other party shall be considered plural where applicable.

CONSTRUCTION CONTRACT
Date:

Amount:

Description *(Name and Location)*:

BOND
Date *(Not earlier than Construction Contract Date)*:

Amount:

Modifications to this Bond: ■ None ☐ See page 4

CONTRACTOR AS PRINCIPAL		**SURETY**	
Company:	*(Corporate Seal)*	Company:	*(Corporate Seal)*
Signature:		Signature:	
Name and Title:		Name and Title:	

(Any additional signatures appear on page 4)

(FOR INFORMATION ONLY - Name, Address and Telephone)
AGENT or **BROKER**: **OWNER'S REPRESENTATIVE** *(Architect, Engineer or other party)*:

REPRODUCTION

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

§ 2 With respect to the Owner, this obligation shall be null and void if the Contractor:
§ 2.1 Promptly makes payment, directly or indirectly, for all sums due Claimants, and

§ 2.2 Defends, indemnifies and holds harmless the Owner from claims, demands, liens or suits by any person or entity whose claim, demand, lien or suit is for the payment for labor, materials or equipment furnished for use in the performance of the Construction Contract, provided the Owner has promptly notified the Contractor and the Surety (at the address described in Section 12) of any claims, demands, liens or suits and tendered defense of such claims, demands, liens or suits to the Contractor and the Surety, and provided there is no Owner Default.

§ 3 With respect to Claimants, this obligation shall be null and void if the Contractor promptly makes payment, directly or indirectly, for all sums due.

§ 4 The Surety shall have no obligation to Claimants under this Bond until:
§ 4.1 Claimants who are employed by or have a direct contract with the Contractor have given notice to the Surety (at the address described in Section 12) and sent a copy, or notice thereof, to the Owner, stating that a claim is being made under this Bond and, with substantial accuracy, the amount of the claim.

§ 4.2 Claimants who do not have a direct contract with the Contractor:

.1 Have furnished written notice to the Contractor and sent a copy, or notice thereof, to the Owner, within 90 days after having last performed labor or last furnished materials or equipment included in the claim stating, with substantial accuracy, the amount of the claim and the name of the party to whom the materials were furnished or supplied or for whom the labor was done or performed; and

.2 Have either received a rejection in whole or in part from the Contractor, or not received within 30 days of furnishing the above notice any communication from the Contractor by which the Contractor has indicated the claim will be paid directly or indirectly; and

.3 Not having been paid within the above 30 days, have sent a written notice to the Surety (at the address described in Section 12) and sent a copy, or notice thereof, to the Owner, stating that a claim is being made under this Bond and enclosing a copy of the previous written notice furnished to the Contractor.

§ 5 If a notice required by Section 4 is given by the Owner to the Contractor or to the Surety, that is sufficient compliance.

§ 6 When the Claimant has satisfied the conditions of Section 4, the Surety shall promptly and at the Surety's expense take the following actions:
§ 6.1 Send an answer to the Claimant, with a copy to the Owner, within 45 days after receipt of the claim, stating the amounts that are undisputed and the basis for challenging any amounts that are disputed.

§ 6.2 Pay or arrange for payment of any undisputed amounts.

§ 7 The Surety's total obligation shall not exceed the amount of this Bond, and the amount of this Bond shall be credited for any payments made in good faith by the Surety.

§ 8 Amounts owed by the Owner to the Contractor under the Construction Contract shall be used for the performance of the Construction Contract and to satisfy claims, if any, under any Construction Performance Bond. By the Contractor furnishing and the Owner accepting this Bond, they agree that all funds earned by the Contractor in the performance of the Construction Contract are dedicated to satisfy obligations of the Contractor and the Surety under this Bond, subject to the Owner's priority to use the funds for the completion of the work.

§ 9 The Surety shall not be liable to the Owner, Claimants or others for obligations of the Contractor that are unrelated to the Construction Contract. The Owner shall not be liable for payment of any costs or expenses of any Claimant under this Bond, and shall have under this Bond no obligations to make payments to, give notices on behalf of, or otherwise have obligations to Claimants under this Bond.

§ 10 The Surety hereby waives notice of any change, including changes of time, to the Construction Contract or to related subcontracts, purchase orders and other obligations.

§ 11 No suit or action shall be commenced by a Claimant under this Bond other than in a court of competent jurisdiction in the location in which the work or part of the work is located or after the expiration of one year from the date (1) on which the Claimant gave the notice required by Section 4.1 or Section 4.2.3, or (2) on which the last labor or service was performed by anyone or the last materials or equipment were furnished by anyone under the Construction Contract, whichever of (1) or (2) first occurs. If the provisions of this Paragraph are void or prohibited by law, the minimum period of limitation available to sureties as a defense in the jurisdiction of the suit shall be applicable.

§ 12 Notice to the Surety, the Owner or the Contractor shall be mailed or delivered to the address shown on the signature page. Actual receipt of notice by Surety, the Owner or the Contractor, however accomplished, shall be sufficient compliance as of the date received at the address shown on the signature page.

§ 13 When this Bond has been furnished to comply with a statutory or other legal requirement in the location where the construction was to be performed, any provision in this Bond conflicting with said statutory or legal requirement shall be deemed deleted herefrom and provisions conforming to such statutory or other legal requirement shall be deemed incorporated herein. The intent is that this Bond shall be construed as a statutory bond and not as a common law bond.

§ 14 Upon request by any person or entity appearing to be a potential beneficiary of this Bond, the Contractor shall promptly furnish a copy of this Bond or shall permit a copy to be made.

§ 15 DEFINITIONS

§ 15.1 Claimant: An individual or entity having a direct contract with the Contractor or with a subcontractor of the Contractor to furnish labor, materials or equipment for use in the performance of the Contract. The intent of this Bond shall be to include without limitation in the terms "labor, materials or equipment" that part of water, gas, power, light, heat, oil, gasoline, telephone service or rental equipment used in the Construction Contract, architectural and engineering services required for performance of the work of the Contractor and the Contractor's subcontractors, and all other items for which a mechanic's lien may be asserted in the jurisdiction where the labor, materials or equipment were furnished.

§ 15.2 Construction Contract: The agreement between the Owner and the Contractor identified on the signature page, including all Contract Documents and changes thereto.

§ 15.3 Owner Default: Failure of the Owner, which has neither been remedied nor waived, to pay the Contractor as required by the Construction Contract or to perform and complete or comply with the other terms thereof.

REPRODUCTION

§ 16 MODIFICATIONS TO THIS BOND ARE AS FOLLOWS:

(Space is provided below for additional signatures of added parties, other than those appearing on the cover page.)

CONTRACTOR AS PRINCIPAL		SURETY	
Company:	*(Corporate Seal)*	Company:	*(Corporate Seal)*
Signature:		Signature:	
Name and Title:		Name and Title:	
Address:		Address:	

REPRODUCTION

AIA® Document G702™ – 1992

Application and Certificate for Payment

TO OWNER:

PROJECT:

APPLICATION NO:

PERIOD TO:

CONTRACT FOR:

CONTRACT DATE:

PROJECT NOS: / /

Distribution to:
OWNER ☐
ARCHITECT ☐
CONTRACTOR ☐
FIELD ☐
OTHER ☐

FROM CONTRACTOR:

VIA ARCHITECT:

CONTRACTOR'S APPLICATION FOR PAYMENT

Application is made for payment, as shown below, in connection with the Contract.
Continuation Sheet, AIA Document G703, is attached.

1. **ORIGINAL CONTRACT SUM** ..... $ _____
2. **Net change by Change Orders** ..... $ _____
3. **CONTRACT SUM TO DATE** (Line 1 ± 2) ..... $ _____
4. **TOTAL COMPLETED & STORED TO DATE** (Column G on G703) ..... $ _____
5. **RETAINAGE:**
   a. _____ % of Completed Work (Column D + E on G703) $ _____
   b. _____ % of Stored Material (Column F on G703) $ _____

   Total Retainage (Lines 5a + 5b or Total in Column I of G703)..... $ _____
6. **TOTAL EARNED LESS RETAINAGE** ..... $ _____
   (Line 4 Less Line 5 Total)
7. **LESS PREVIOUS CERTIFICATES FOR PAYMENT** ..... $ _____
   (Line 6 from prior Certificate)
8. **CURRENT PAYMENT DUE** ..... $
9. **BALANCE TO FINISH, INCLUDING RETAINAGE**
   (Line 3 less Line 6) $ _____

CHANGE ORDER SUMMARY	ADDITIONS	DEDUCTIONS
Total changes approved in previous months by Owner	$	$
Total approved this Month	$	$
TOTALS	$	$
NET CHANGES by Change Order	$	

The undersigned Contractor certifies that to the best of the Contractor's knowledge, information and belief the Work covered by this Application for Payment has been completed in accordance with the Contract Documents, that all amounts have been paid by the Contractor for Work for which previous Certificates for Payment were issued and payments received from the Owner, and that current payment shown herein is now due.

CONTRACTOR:

By: _____ Date: _____

State of:

County of:

Subscribed and sworn to before me this day of

Notary Public:

My Commission expires:

ARCHITECT'S CERTIFICATE FOR PAYMENT

In accordance with the Contract Documents, based on on-site observations and the data comprising this application, the Architect certifies to the Owner that to the best of the Architect's knowledge, information and belief the Work has progressed as indicated, the quality of the Work is in accordance with the Contract Documents, and the Contractor is entitled to payment of the AMOUNT CERTIFIED.

AMOUNT CERTIFIED ..... $ _____

(Attach explanation if amount certified differs from the amount applied. Initial all figures on this Application and on the Continuation Sheet that are changed to conform with the amount certified.)

ARCHITECT:

By: _____ Date: _____

This Certificate is not negotiable. The AMOUNT CERTIFIED is payable only to the Contractor named herein. Issuance, payment and acceptance of payment are without prejudice to any rights of the Owner or Contractor under this Contract

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AIA® Document G703™ – 1992

Continuation Sheet

AIA Document G702, APPLICATION AND CERTIFICATION FOR PAYMENT, containing Contractor's signed certification is attached.
In tabulations below, amounts are stated to the nearest dollar.
Use Column I on Contracts where variable retainage for line items may apply.

APPLICATION NO:
APPLICATION DATE:
PERIOD TO:
ARCHITECT'S PROJECT NO:

A	B	C	D	E	F	G		H	I
ITEM NO.	DESCRIPTION OF WORK	SCHEDULED VALUE	WORK COMPLETED		MATERIALS PRESENTLY STORED (NOT IN D OR E)	TOTAL COMPLETED AND STORED TO DATE (D+E+F)	% (G ÷ C)	BALANCE TO FINISH (C - G)	RETAINAGE (IF VARIABLE RATE)
			FROM PREVIOUS APPLICATION (D + E)	THIS PERIOD					

CAUTION: You should sign an original AIA Contract Document, on which this text appears in RED. An original assures that changes will not be obscured.

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SECTION 00069 – SUPPLEMENTAL CONDITIONS

1. GENERAL:

A. GENERAL CONDITIONS:

THE AMERICAN INSTITUTE OF ARCHITECTS, GENERAL CONDITIONS OF THE CONTRACT FOR CONSTRUCTION OF BUILDINGS, STANDARD FORM AIA-201, 1997 EDITION ARTICLES ONE THROUGH FIFTEEN, INCLUSIVE, ARE HEREBY MADE A PART OF THESE SPECIFICATIONS. COPIES OF THIS DOCUMENT ARE ON FILE AT THE ARCHITECT'S OFFICE, AND MAY BE EXAMINED BY ANY PARTY.

B. SUPPLEMENTS:

THE FOLLOWING SUPPLEMENTS SHALL MODIFY, DELETE, AND/OR ADD TO THE GENERAL CONDITIONS. WHERE ANY ARTICLE, PARAGRAPH, OR SUB-PARAGRAPH IN THE GENERAL CONDITIONS IS SUPPLEMENTED BY ONE OF THE FOLLOWING PARAGRAPHS, THE PROVISIONS OF SUCH ARTICLE, PARAGRAPH, OR SUB-PARAGRAPH SHALL REMAIN IN EFFECT AND THE SUPPLEMENTAL PROVISIONS SHALL BE CONSIDERED AS ADDED THERETO. WHERE ANY ARTICLE, PARAGRAPH, OR SUB-PARAGRAPH IN THE GENERAL CONDITIONS IS AMENDED, VOIDED, OR SUPERSEDED BY ANY OF THE FOLLOWING PARAGRAPHS, THE PROVISIONS OF SUCH ARTICLE, PARAGRAPH, OR SUB-PARAGRAPH NOT SO AMENDED, VOIDED OR SUPERSEDED SHALL REMAIN IN EFFECT.

(1) ARTICLE 1: CONTRACT DOCUMENTS

(A) PARAGRAPH 1.1.1: ADD THE FOLLOWING TO THE FIRST SENTENCE:

"PERFORMANCE BOND, LABOR AND MATERIAL PAYMENT BOND."

(B) PARAGRAPH 1.2.1: ADD THE FOLLOWING:

"IF A DISCREPANCY OCCURS ON THE DRAWINGS, IN SPECIFICATIONS, OR BETWEEN DRAWINGS AND SPECIFICATIONS, THE GREATER QUANTITY OR VALUE TAKES PRECEDENCE."

(2) ARTICLE 2: OWNER

(A) PARAGRAPH 2.2.5: DELETE IT IN ITS ENTIRETY AND SUBSTITUTE THE FOLLOWING:

THE CONTRACTOR WILL PROCURE BID DOCUMENTS FROM BAY AREA BLUEPRINTING.
BID DOCUMENTS WILL NOT BE PROVIDED THRU THE ARCHITECT'S OFFICE.

(3) ARTICLE 3: CONTRACTOR

(A) PARAGRAPH 3.5: ADD THE FOLLOWING:

"EXCEPT AS OTHERWISE SPECIFIED, ALL WORK SHALL BE GUARANTEED BY THE CONTRACTOR AGAINST DEFECTS RESULTING FROM THE USE OF INFERIOR MATERIALS, EQUIPMENT OR WORKMANSHIP FOR ONE YEAR FROM THE DATE OF FINAL COMPLETION OF THE CONTRACT, OR FROM FULL OCCUPANCY OF USE OF THE PROJECT (FOR WHICH IT WAS DESIGNED) BY THE OWNER, WHICHEVER IS EARLIER. (THE ROOF WARRANTY IS FOR TWENTY (20) YEARS.)

IF WITHIN ANY GUARANTEE PERIOD, REPAIRS OR CHANGES ARE REQUIRED IN CONNECTION WITH THE GUARANTEE WORK, WHICH IN THE OPINION OF THE ARCHITECT IS RENDERED NECESSARY AS THE RESULT OF THE USE OF MATERIALS, EQUIPMENT OR WORKMANSHIP, WHICH ARE DEFECTIVE, OR INFERIOR, OR NOT IN ACCORDANCE WITH THE TERMS OF THE CONTRACT, THE CONTRACTOR, SHALL, PROMPTLY UPON RECEIPT OF NOTICE FROM THE OWNER, AND WITHOUT EXPENSE TO THE OWNER, PROCEED TO:

PLACE IN SATISFACTORY CONDITION IN EVERY PARTICULAR ALL OF SUCH GUARANTEED WORK, CORRECT ALL DEFECTS THEREIN; AND MAKE GOOD ALL DAMAGES TO THE STRUCTURE OR SITE, OR EQUIPMENT OR CONTENTS THEREOF WHICH, IN THE OPINION OF THE ARCHITECT IS THE RESULT OF THE USE OF MATERIALS, EQUIPMENT OR WORKMANSHIP WHICH ARE INFERIOR, DEFECTIVE, OR NOT IN ACCORDANCE WITH THE TERMS OF THE CONTRACT; OR THE EQUIPMENT AND CONTENTS OR STRUCTURES OR SITE DISTURBED IN FULFILLING ANY SUCH GUARANTEE.

(4) ARTICLE 4: ARCHITECT

(A) PARAGRAPH 4.2.2: ADD THE FOLLOWING:

"ARCHITECT'S OBSERVATION OF WORK WILL CONSIST OF GENERAL ADMINISTRATION OF THE CONTRACT (NOT OF THE WORK). FIELD OBSERVATION WILL BE LIMITED TO MAKING OF GENERAL OBSERVATIONS ONLY AS NECESSARY TO DETERMINE THAT WORK IS PROCEEDING IN ACCORDANCE WITH CONTRACT DOCUMENTS, TO THE END THAT COMPLETED WORK WILL COMPLY THEREWITH. OWNER AND ARCHITECT WILL ASSUME NO OBLIGATION TOWARD SAFEGUARDING CONTRACTOR FROM ERROR; THEY WILL NOT ASSUME RESPONSIBILITY FOR MANNER OR METHODS BY WHICH WORK IS CARRIED OUT, OR FOR SAFETY ASPECTS OF SAME."

(5) ARTICLE 7: CHANGES IN THE WORK

(A) PARAGRAPH 7.1.1: ADD THE FOLLOWING:

"MAXIMUM PERCENTAGES OF OVERHEAD AND PROFIT WHICH MAY BE ADDED BY THE CONTRACTOR TO ACTUAL COSTS OF SUCH CHANGES IN THE WORK ARE SPECIFICALLY SET FORTH AS FOLLOWS:

FOR ALL WORK DONE BY THIS ORGANIZATION, OR SUBSIDIARIES OF HIS OWN ORGANIZATIONS, INCLUDING WORK TRADITIONALLY CONSIDERED AS SUB-CONTRACTOR WORK, THE CONTRACTOR MAY ADD 15% OF HIS ACTUAL COSTS FOR COMBINED OVERHEAD AND PROFIT.

FOR ALL WORK DONE BY HIS SUB-CONTRACTORS THE RESPECTIVE SUB-CONTRACTORS MAY ADD 10% OF THEIR ACTUAL COSTS FOR COMBINED OVERHEAD AND PROFIT, AND THE GENERAL CONTRACTOR MAY ADD 5% OF THE ABOVE SUB-CONTRACTOR'S COSTS FOR HIS OVERHEAD AND PROFIT.

A BOND COST OF 1% OF THE TOTAL AMOUNT OF THE ADDED COSTS WILL BE ALLOWED THE CONTRACTOR AS A LEGITIMATE ITEM OF COST, AND 1% OF ALL CREDIT AMOUNTS SHALL BE ADDED TO THE TOTAL CREDIT ALLOWED THE OWNER. NO BOND COST SHALL BE ALLOWED FOR SUB-CONTRACTOR'S BOND COST.

THE ABOVE PERCENTAGES SHALL BE CONSIDERED REASONABLE ALLOWANCE FOR OVERHEAD AND PROFIT DUE TO THE CONTRACTOR.

THE CONTRACTOR SHALL SUBMIT RECEIPTS OR OTHER EVIDENCE SHOWING HIS COSTS AND HIS RIGHT TO THE PAYMENT CLAIMS.

LABOR COSTS SHALL INCLUDE SUPERVISION, MECHANIC'S AND LABORER'S WAGES INCLUDING PAYROLL TAXES AND INSURANCE. LABOR COSTS FOR CHANGE ORDER PREPARATION WILL NOT BE ALLOWED

MATERIAL, EQUIPMENT AND EQUIPMENT RENTAL COSTS SHALL BE THE TRADE DISCOUNTS COSTS PLUS STATE SALES TAX WHERE APPLICABLE."

(7) ARTICLE 9: PAYMENTS AND COMPLETION

(A) PARAGRAPH 9.3.1.: ADD THE FOLLOWING:

"APPLICATIONS FOR PAYMENT SHALL BE SUBMITTED IN TRIPLICATE BY THE CONTRACTOR ON THE TWENTY-FIFTH DAY OF EACH MONTH UTILIZING AIA DOCUMENT G702-1992 AND G703-1992 (APPLICATION AND CERTIFICATE FOR PAYMENT) ATTACHED HERETO. COMPUTER GENERATED APPLICATIONS FOR PAYMENT WILL BE ACCEPTED UPON APPROVAL OF FORM BY OWNER AND SHOULD CONTAIN ALL APPLICABLE INFORMATION CONTAINED IN AIA DOCUMENTS G702-1992 AND G703-1992."

"EACH APPLICATION FOR PAYMENT FOLLOWING APPLICATION #1 SHALL INCLUDE AN EXECUTED AIA DOCUMENT G706A-1994 CONTRACTORS AFFIDAVIT OF RELEASE OF LIENS OR AN APPROVED EQUAL."

"THE CONTRACTOR SHALL SUBMIT WITH THE INITIAL APPLICATION FOR PAYMENT, A PROGRESS SCHEDULE FOR THE ENTIRE PROJECT WITH THE CRITICAL PATH INDICATED AND CHARTED AGAINST THE PROJECT DURATION. EACH SUBSEQUENT APPLICATION FOR PAYMENT SHALL INCLUDE AN UPDATED PROGRESS SCHEDULE. IN THE EVENT THAT THE PROGRESS SCHEDULE INDICATES THAT THE PROJECT IS BEHIND SCHEDULE, A LETTER CONTAINING SPECIFIC STEPS THAT WILL BE TAKEN TO BRING THE PROJECT BACK ON SCHEDULE SHALL BE SUBMITTED ALONG WITH THE PAY REQUEST."

"AN AMOUNT EQUAL TO 10% OF ALL LABOR AND MATERIAL INCORPORATED IN THE WORK SHALL BE RETAINED. RETAINAGE SHALL NOT BE PAID UNTIL SATISFACTORY COMPLETION OF THE PROJECT."

(B) PARAGRAPH 9.3.2.: DELETE ALL REFERENCES TO PAYMENT FOR MATERIALS STORED OFF SITE AND ADD THE FOLLOWING:

"PAYMENT SHALL BE MADE FOR MATERIALS IN PLACE OR IN STORAGE ON SITE ONLY."

"THE FINAL APPLICATION FOR PAYMENT SHALL BE ACCOMPANIED BY AFFIDAVITS AND RELEASES OF LIEN FROM THE GENERAL CONTRACTOR, SUB-CONTRACTORS, AND SUPPLIERS FOR PAYMENT OF THAT PORTION OF WORK REQUESTED."

(C) PARAGRAPH 9.2: ADD THE FOLLOWING:

"THIS SCHEDULE SHALL BE BROKEN DOWN INTO LINE ITEMS AS MAY BE REQUESRTED BY THE ARCHITECT. CONSULT WITH THE ARCHITECT PRIOR TO SUBMISSION.

"EACH APPLICATION FOR PAYMENT SUBMITTED BY CONTRACTOR FOR PARTIAL PAYMENT SHALL BE BASED ON APPROVED DIVISIONS OF THE CONTRACT. SUBMIT TO ARCHITECT FOR APPROVAL PRIOR TO INITIAL PAY APPLICATION"

(D) PARAGRAPH 9.5.1: "ADD ITEM .8 AND .8(a)"

.8 FAILURE TO MAINTAIN AND DELIVER AS BUILT DRAWINGS IN ACCORDANCE WITH THE GENERAL CONDITIONS OF THE CONTRACT FOR CONSTRUCTION: PARAGRAPH 3.11.

(a) DRAWINGS WILL BE REVIEWED MONTHLY UPON RECEIPT OF EACH OF THE CONTRACTOR'S APPLICATION FOR PAYMENT. FAILURE TO

MAINTAIN THESE DRAWINGS WILL BE CAUSE FOR REJECTION OF THE CONTRACTOR'S APPLICATION.

THE SCHOOL SYSTEM HAS MADE IT CLEAR THAT THEY ARE TO BE PROVIDED WITH ACCURATE AS BUILT DRAWINGS UPON COMPLETION OF THE PROJECT. IN ORDER TO FACILITATE THIS REQUEST, THE CONTRACTOR WILL BE REQUIRED TO MAINTAIN ON SITE, ONE SET OF ACCURATE AND UP TO DATE AS BUILT DRAWINGS. UPON COMPLETION OF THE PROJECT, THE CONTRACTOR SHALL TRANSCRIBE TO A NEW SET OF DRAWINGS, ALL CHANGES THAT HAVE TRANSPIRED DURING THE CONSTRUCTION PERIOD. THESE TRANSCRIPTIONS SHALL BE MADE IN RED INK AND DONE IN A PROFESSIONAL MANNER ACCEPTABLE TO THE ARCHITECT. AFTER SUBMISSION TO AND APPROVAL BY THE ARCHITECT, THE CONTRACTOR SHALL HAVE THESE APPROVED DRAWINGS RED LINE SCANNED INTO A PDF FORMAT. THESE DRAWINGS AND ONE CD SHALL THEN BE SUBMITTED TO THE ARCHITECT FOR TRANSMITTION TO THE OWNER.

(E) PARAGRAPH 9.5.1: "ADD ITEM .9"

.9 "REQUESTING PAYMENT AND OR PARTIAL PAYMENT FOR WORK PRIOR TO SUMBISSION OF SHOP DRAWINGS.

(8) ARTICLE 11: INSURANCE AND BONDS

(A) PARAGRAPH 11.4.1: IN THE FIRST LINE, FOLLOWING THE WORD "BONDS", INSERT THE FOLLOWING:

"IN A COMPANY OR COMPANIES WITH A CLASS "A" OR BETTER RATING, ACCEPTABLE TO THE OWNER AND LICENSED TO DO BUSINESS IN THE STATE WHERE THE PROJECT IS LOCATED"

(B) PARAGRAPH 11.4.1: ADD THE FOLLOWING:

"THESE BONDS SHALL BE EXECUTED ON BEHALF OF THE CONTRACTOR IN THE SAME MANNER AND BY THE SAME PERSON WHO EXECUTED THE AGREEMENT."

"THE OWNER WILL REQUIRE THE CONTRACTOR TO FURNISH BOTH A PERFORMANCE BOND AND A LABOR AND MATERIAL PAYMENT BOND (TWO SEPARATE BONDS) IN THE AMOUNT OF NOT LESS THAN 100% OF THE CONTRACT PRICE FOR EACH TYPE OF BOND, COVERING FAITHFUL PERFORMANCE OF THE CONTRACT AND THE PAYMENT OF ALL OBLIGATIONS ARISING THEREUNDER IN SUCH FORMS AS THE OWNER MAY PRESCRIBE AND WITH SUCH SECURITIES AS HE MAY APPROVE. THE PREMIUMS FOR THE REQUIRED BONDS SHALL BE PAID BY THE CONTRACTOR. THE PERFORMANCE AND PAYMENT BOND SHALL FOLLOW THE GENERAL FORM AND INCLUDE COVERAGES AS DESCRIBED IN FLORIDA STATUTE 235.32.

(B) PARAGRAPH 11.1.2.: ADD THE FOLLOWING:

"THE OWNER SHALL BE EXEMPT FROM, AND IN NO WAY LIABLE FOR, ANY SUMS OF MONEY WHICH MAY REPRESENT A DEDUCTIBLE IN ANY INSURANCE POLICY. THE PAYMENT OF SUCH DEDUCTIBLE SHALL BE THE SOLE RESPONSIBILITY OF THE GENERAL CONTRACTOR AND/OR SUB-CONTRACTOR PROVIDING SUCH INSURANCE."

(C) CONTRACTORS INSURANCE: ARTICLE 11, "INSURANCE" OF THE GENERAL CONDITIONS SHALL BE AMENDED AND SUPPLEMENTED AS FOLLOWS:

(1) CONTRACTOR SHALL NOT COMMENCE WORK UNDER THIS CONTRACT UNTIL HE HAS OBTAINED ALL INSURANCE REQUIRED UNDER THIS PARAGRAPH, CERTIFICATES OF INSURANCE HAVE BEEN SUBMITTED, AND SUCH INSURANCE HAS BEEN APPROVED BY THE OWNER, NOR SHALL THE CONTRACTOR ALLOW ANY SUB-CONTRACTOR TO COMMENCE WORK ON HIS SUB-CONTRACT UNTIL ALL SIMILAR INSURANCE REQUIRED OF THE SUB-CONTRACTOR HAS BEEN SO OBTAINED AND APPROVED. THE SUCCESSFUL CONTRACTOR SHALL BE PREPARED AT THE TIME OF CONTRACT AWARD TO PROVIDE THE BOARD WITH AN INSURANCE POLICY NUMBER. FAILURE ON THE PART OF THE CONTRACTOR TO PROVIDE THIS POLICY WITHIN 10 WORKING DAYS OF AWARD OF CONTRACT COULD RESULT IN THE WITHDRAWAL BY THE OWNER OF THE AWARD OF THE BID."

(2) COMPENSATION INSURANCE:

CONTRACTOR SHALL TAKE OUT AND MAINTAIN DURING THE LIFE OF THIS CONTRACT, WORKER'S COMPENSATION INSURANCE FOR ALL OF HIS EMPLOYEES, EMPLOYED AT THE SITE OF THE PROJECT. WORKER'S COMPENSATION POLICY SHALL INCLUDE EMPLOYER'S LIABILITY IN THE AMOUNT OF AT LEAST $1,000,000.00. IN CASE ANY WORK IS SUBLET, CONTRACTOR SHALL REQUIRE SUB-CONTRACTOR SIMILARLY TO PROVIDE WORKER'S COMPENSATION INSURANCE FOR ALL THE LATTER'S EMPLOYEES UNLESS SUCH EMPLOYEES ARE COVERED BY THE PROTECTION AFFORDED BY THE CONTRACTOR. IN CASE ANY CLASS OF EMPLOYEES ENGAGED IN HAZARDOUS WORK UNDER THIS CONTRACT AT THE SITE OF THE PROJECT IS NOT PROTECTED UNDER THE WORKER'S COMPENSATION STATUTE, THE CONTRACTOR SHALL PROVIDE AND SHALL CAUSE EACH SUB-CONTRACTOR TO PROVIDE ADEQUATE INSURANCE, SATISFACTORY TO OWNER, FOR THE PROTECTION OF HIS EMPLOYEES NOT OTHERWISE PROTECTED. POLICY SHALL BE IN COMPLIANCE WITH CHAPTER 440, FLORIDA STATUTES.

(3) PUBLIC LIABILITY AND PROPERTY DAMAGE INSURANCE: CONTRACTOR SHALL PURCHASE AND MAINTAIN DURING THE LIFE OF THIS CONTRACT, PUBLIC LIABILITY INSURANCE AGAINST BODILY INJURY, PERSONAL INJURY, PROPERTY DAMAGE, AND AUTOMOBILE AS SHALL PROTECT

OWNER/ARCHITECT FROM CLAIMS FOR DAMAGES WHICH MAY ARISE FROM OPERATIONS UNDER THIS CONTRACT, WHETHER SUCH OPERATIONS BE BY HIMSELF OR BY AN SUB-CONTRACTOR OR BY ANYONE DIRECTLY OR INDIRECTLY EMPLOYED BY EITHER OF THEM. CONTRACTORS LIABILITY INSURANCE SHALL INCLUDE COMMERCIAL GENERAL LIABILITY. LIMITS OF LIABILITY SHALL BE AT LEAST $1,000,000.00 PER OCCURRENCE, $2,000,000.00 GENERAL AGGREGATE, $1,000,000.00 PRODUCTS AND COMPLETED OPERATIONS, AGGREGATE, $2,000,000.00, $1,000,000.00 PERSONAL INJURY, $50,000 FIRE LEGAL LIABILITY, AND $5,000 MEDICAL PAYMENTS.

(4) CONTRACTUAL LIABILITY AND PROPERTY DAMAGE INSURANCE: CONTRACTOR SHALL INDEMNIFY AND HOLD HARMLESS THE OWNER AGAINST ANY AND ALL CLAIMS FOR PERSONAL INJURIES AND/OR PROPERTY DAMAGE AS A RESULT OF THE CONTRACTOR'S OPERATIONS AND SHALL CARRY CONTRACTUAL LIABILITY AND PROPERTY DAMAGE INSURANCE TO COVER SUCH INDEMNIFI- CATION. THE INDEMNIFICA- TION OBLIGATION 4.18 SHALL BE LIMITED TO $1,000,000.00 PER CLAIMANT / $2,000,000.00 AGGREGATE IN LIEU OF UNLIMITED AMOUNT AS SPECIFIED IN PARAGRAPH 4.18.2 OF THE AIA GENERAL CONDITIONS.

(5) PRODUCTS AND COMPLETED OPERATIONS INSURANCE: CONTRACTOR SHALL FURNISH PRODUCTS AND COMPLETED OPERATIONS INSURANCE. THE LIMITS OF PRODUCTS AND COMPLETE OPERATIONS SHALL AGREE WITH THE LIMITS STATED ABOVE FOR CONTRACTOR'S REGULAR COMMERCIAL GENERAL LIABILITY.

(6) OWNERS AND CONTRACTOR’S PROTECTIVE LIABILITY INSURANCE: CONTRACTOR SHALL PURCHASE AND MAINTAIN DURING THE LIFE OF THIS CONTRACT OWNERS AND CONTRACTORS PROTECTIVE LIABILITY INSURANCE IN THE NAME OF THE SCHOOL BOARD OF SANTA ROSA COUNTY, FLORIDA AND THE AMOUNT OF INSURANCE SHALL BE IN LIMITS OF NOT LESS THAN $1,000,000.00 PER OCCURRENCE.

(7) ADDITIONAL INSURED CLAUSE: THE SCHOOL BOARD OF SANTA ROSA COUNTY, FLORIDA SHALL BE NAMED AS ADDITIONAL INSURED ON ALL CONTRACTOR' LIABILITY POLICIES.

(8) <u>BUILDER’S RISK INSURANCE: THE CONTRACTOR WILL NOT BE REQUIRED TO FURNISH BUILDER’S RISK INSURANCE.</u> THE SCHOOL BOARD OF SANTA ROSA COUNTY WILL FURNISHES BUILDERS RISK INSURANCE.

(9) AUTOMOBILE LIABILITY INSURANCE: THE CONTRACTOR SHALL MAINTAIN AUTOMOBILE LIABILITY INSURANCE AGAINST BODILY INJURY AND PROPERTY DAMAGE IN THE

AMOUNT OF $1,000,000 PER OCCURRENCE. THE BOARD SHALL BE NAMED AS AN ADDITIONAL INSURED ON THE AUTOMOBILE POLICY. THIS COVERAGE MUST INCLUDE HIRED AND NON-OWNED AUTOS USED ON THE PROJECT.

(D) PARAGRAPH 11.1.3: ADD THE FOLLOWING:

"CERTIFICATES OF INSURANCE SHALL BE COMPLETED AND SIGNED BY THE AUTHORIZED RESIDENT AGENT AND RETURNED TO THE ARCHITECT. THIS CERTIFICATE SHALL BE DATED AND SHOW: THE NAME OF THE INSURED CONTRACTOR, THE SPECIFIC JOB BY NAME AND JOB NUMBER, THE NAME OF THE INSURER, THE NUMBER OF THE POLICY, ITS EFFECTIVE DATE, AND ITS TERMINATION DATE. THE CERTIFICATE OF INSURANCE SHALL SPECIFICALLY NAME THE OWNER AS AN ADDITIONAL INSURED.

STATEMENT THAT THE INSURER WILL MAIL NOTICE TO THE OWNER AND A COPY TO THE ARCHITECT AT LEAST THIRTY (30) DAYS PRIOR TO ANY MATERIAL CHANGES IN PROVISIONS OR CANCELLATION OF THE POLICY.

CERTIFICATES CALLED FOR HEREIN SHALL BE FURNISHED IN DUPLICATE AND SHALL SPECIFICALLY SET FORTH EVIDENCE OF ALL COVERAGE REQUIRED BY 11.1.1, 11.1.2, AND 11.1.3, AND THE CONTRACTOR SHALL FURNISH TO THE ARCHITECT COPIES OF ALL ENDORSEMENT THAT ARE SUBSEQUENTLY ISSUED AMENDING COVERAGE OR LIMITS.

CONTRACTOR SHALL NOT COMMENCE WORK ON SITE UNTIL CERTIFICATE OF COVERAGE HAS BEEN RECEIVED AND ACCEPTED BY OWNER."

(9) ARTICLE 13: MISCELLANEOUS PROVISIONS

(A) PARAGRAPH 13.1: ADD THE FOLLOWING:

"THE BIDDER IS REQUIRED TO BE FAMILIAR WITH ALL FEDERAL, STATE AND LOCAL LAWS, ORDINANCES, RULES AND REGULATIONS THAT IN ANY MANNER AFFECT THE WORK.

IGNORANCE ON THE PART OF THE BIDDER WILL IN NO WAY RELIEVE HIM FROM RESPONSIBILITY."

2. STANDARDS AND CODES:

A. CONTRACTOR SHALL PROVIDE ON PROJECT SITE, FOR USE BY THE ARCHITECT, A COPY OF EACH SPECIFICATION, MANUAL, STANDARD, AND CODE TO WHICH REFERENCE IS MADE IN THIS SPECIFICATION. MATERIAL SHALL BE BOUND IN HARD BINDER AND INDEXED.

B. WHERE REFERENCE IS MADE TO THE STANDARD SPECIFICATIONS OF THE AMERICAN SOCIETY FOR TESTING AND MATERIALS (A.S.T.M.) UNITED STATES GOVERNMENT FEDERAL SPECIFICATIONS, OR TO OTHER MANUFACTURER'S ORGANIZATIONS, OR TRADES, IN CONNECTION WITH THE REQUIRED QUALITY OF MATERIALS, METHODS, ETC., THEN THE APPLICABLE SPECIFICATIONS SHALL BE THE LATEST REVISED EDITION UNLESS OTHERWISE SPECIFICALLY STATED.

C. ALL WORK WILL BE IN COMPLIANCE WITH THE FLORIDA BUILDING, PLUMBING, MECHANICAL AND ENERGY CODES, FIFTH ADDITION, 2017, OR LATER IF ENACTED AND SHALL PASS OCCUPANCY INSPECTION BEFORE FINAL PAYMENT IS DUE. THE BUILDING SHALL NOT BE OCCUPIED UNTIL AN OCCUPANCY CERTIFICATE HAS BEEN ISSUED. THE CONTRACTOR OR HIS REPRESENTATIVE AND ALL NECESSARY SUB-CONTRACTORS OF THEIR REPRESENTATIVE SHALL BE PRESENT AT TIME OF INSPECTION.

3. ORDERING OF MATERIALS:

A. CONTRACTOR AND EACH SUB-CONTRACTOR SHALL PARTICIPATE IN THE SCHOOL DISTRICT'S "DIRECT PURCHASING PROGRAM". SEE SPECIFICATION SECTION 00065 FOR INFORMATION.

B. CONTRACTOR AND EACH SUB-CONTRACTOR SHALL PLACE ORDERS FOR MATERIALS AND EQUIPMENT TO BE EMPLOYED IN WORK AS SOON AS POSSIBLE AFTER AWARDS OF CONTRACT.

C. CONTRACTOR SHALL KEEP OWNER AND ARCHITECT INFORMED AS AVAILABILITY OF SPECIAL MATERIALS AND EQUIPMENT. THE GENERAL CONTRACTOR SHALL BE RESPONSIBLE FOR MONITORING AVAILABILITY OF EQUIPMENT AND MATERIAL TO BE FURNISHED TO SUB-CONTRACTORS AND SHALL TAKE IMMEDIATE CORRECTIVE ACTION TO ENSURE THE TIMELY COMPLETION OF THE CONTRACT UPON INDICATION THAT A DELIVERY PROBLEM EXISTS, REGARDLESS OF THE NATURE OF DELAY.

4. LAYOUT WORK:

A. EACH CONTRACTOR AND SUB-CONTRACTOR SHALL BE RESPONSIBLE FOR THE ACCURATE LAYOUT OF HIS WORK AND SHALL CORRECT ANY INACCURACIES AS DIRECTED BY THE ARCHITECT.

B. ALL CONTRACTORS AND SUB-CONTRACTORS SHALL COORDINATE THEIR WORK WITH THE WORK OF OTHER TRADES AFFECTING THEIR WORK IN SUFFICIENT TIME THAT NO CONFLICT OCCURS BETWEEN THE TRADES AT ANY GIVEN TIME THROUGHOUT THE PROGRESS OF THE WORK. WORK REQUIRING MODIFICATION DUE TO THE LACK OF COORDINATION SHALL BE REMOVED AND REPLACED CORRECTLY AT THE CONTRACTOR'S EXPENSE, INCLUDING THE WORK OF OTHERS THAT MAY BE NECESSARY TO REMOVE IN ORDER TO CORRECT SUCH FAULTS.

5. PROTECTION OF MATERIALS AND PROPERTY:

   A. MATERIALS DELIVERED TO THE JOB IN FINISHED CONDITION, INSTALLED IN FINISHED CONDITION, OR INSTALLED AND FINISHED BEFORE COMPLETION OF WORK, SHALL BE PROTECTED FROM DAMAGE UNTIL ACCEPTANCE OF PROJECT. MATERIALS DAMAGED BEFORE OR AFTER INSTALLATION, SHALL BE REPLACED WITH NEW MATERIALS. METHOD OF STORAGE AND LOCATION OF ANY SHEDS IS SUBJECT TO ARCHITECT'S APPROVAL.

   B. THE CONTRACTOR AND SUB-CONTRACTOR SHALL PROTECT WORK INSTALLED BY OTHERS DURING PERFORMANCE OF THEIR WORK. SHOULD INSTALLED WORK BE DAMAGED, IT SHALL PLACE UPON HIM RESPONSIBILITY FOR REPLACING HIS WORK AND WORK OF OTHERS THAT IT MAY BE NECESSARY TO REMOVE IN ORDER TO CORRECT SUCH FAULTS.

   C. THEFT FROM THE CONSTRUCTION SITE IS THE RESPONSIBILITY OF CONTRACTOR AND HIS SUB-CONTRACTORS REGARDLESS OF HOW PROPERTY IS PROTECTED.

   D. ALL PROPERTY PROTECTION AS MAY BE REQUIRED IS THE RESPONSIBILITY OF THE CONTRACTOR AND SUB-CONTRACTORS.

   E. THE OWNER RESERVES THE RIGHT TO PROVIDE CERTAIN FORCES FOR PROPERTY PROTECTION.

   F. CONTRACTOR SHALL KEEP INTERIOR OF BUILDING FREE OF STORED OR UNATTENDED COMBUSTIBLE MATERIAL.

6. NO WAIVER BY OWNER:

   FAILURE OF OWNER IN ONE OR MORE INSTANCES TO INSIST UPON STRICT PERFORMANCE OF TERMS OF THIS CONTRACT OR TO EXERCISE OPTION HEREIN CONFERRED, SHALL NOT BE CONSTRUED AS A WAIVER OR RELINQUISHMENT TO ANY EXTENT OF RIGHT TO ASSERT OR RELY UPON SUCH TERMS OR OPTIONS ON FUTURE OCCASIONS.

7. SUSPENSION OF WORK:

   IF WHOLE OR PART OF WORK IS SUSPENDED, CONTRACTOR SHALL COVER, SECURE AND PROTECT ALL PARTS OF THIS WORK THAT MIGHT BE INJURED FROM ANY CAUSE.

8. TERMINATION OF EMPLOYEES:

   THE ARCHITECT SHALL HAVE AUTHORITY TO CAUSE THE TERMINATION AND HIS OR HER IMMEDIATE REMOVAL FROM THE PROJECT, ANY EMPLOYEE OF THIS CONTRACT WHO SHALL BE FOUND INCOMPETENT OR DETRIMENTAL TO THE BEST INTEREST OF THE WORK.

9. DIVISION OF WORK:

   DIVISION OF WORK UNDER TITLES AND SUBTITLES IS FOR CONVENIENCE ONLY AND NO RESPONSIBILITY IS ASSUMED BY ARCHITECT FOR OMISSIONS OR DUPLICATION CAUSED BY ARRANGEMENT OF MATTER IN CONTRACT DOCUMENTS.

10. INSPECTIONS - PRIOR TO FINAL PAYMENT

A. INITIAL - CONDUCTED BY CONTRACTOR AND SUBMITTED TO ARCHITECT TWO WEEKS PRIOR TO CALLING FOR A PRE-FINAL INSPECTION. ALL INCOMPLETE ITEMS SHOULD BE LISTED BY ROOM NUMBER OR AREA AND INCLUDE BOTH ARCHITECTURAL AND P.M. & E. ITEMS. THE ARCHITECT WILL REVIEW THIS LIST WITHIN TWO WEEKS. IF SUFFICIENT CORRECTIVE MEASURES HAVE BEEN ACCOMPLISHED, THE CONTRACTOR CAN THEN REQUEST A PRE-FINAL INSPECTION.

B. PRE-FINAL INSPECTION - CONDUCTED BY THE ARCHITECT, HIS CONSULTANTS, SANTA ROSA CO. SCHOOLS PERSONAL AND THE CONTRACTOR AND HIS SUB-CONTRACTORS. **TEST AND BALANCE REPORT MUST BE ON SITE AT THE TIME OF THE INSPECTION**. THE CONTRACTOR WILL BE ALLOWED FOUR WEEKS TO COMPLETE THIS LIST AND TURN OVER ALL PROJECT CLOSE OUT DOCUMENTS.

C. FINAL INSPECTION - CONDUCTED BY THE ARCHITECT, HIS CONSULTANTS, THE CONTRACTOR AND HIS SUB-CONTRACTOR. IF THE ITEMS OUTLINED ON THE PRE-FINAL INSPECTION ARE COMPLETE AND PROJECT CLOSE OUT DOCUMENTS ARE TURNED IN, FINAL PAYMENT MAY BE REQUESTED.

D. IF ADDITIONAL INSPECTIONS ARE REQUIRED BY THE ARCHITECT (AND OR THEIR CONSULTANTS) IN ORDER TO VERIFY COMPLETION OF FINAL PUNCH LIST ITEMS, THE OWNER WILL DEDUCT THE COSTS INCURRED BY THE ARCHITECT AND THEIR CONSULTANTS FOR SUCH RE-INSPECTIONS FROM THE CONTRACT AMOUNT.

11. YEAR-END INSPECTION:

SHALL BE CONDUCTED JOINTLY BY ARCHITECT, OWNER, AND CONTRACTOR APPROXIMATELY ONE (1) YEAR AFTER COMPLETION AND UPON NOTIFICATION BY CONTRACTOR. ALL DEFECTS OF MATERIAL AND WORKMANSHIP NOTED AT THAT TIME SHALL BE CORRECTED. NOTHING CONTAINED HEREIN SHALL BE DEEMED TO IMPLY THAT GUARANTEES APPLY TO WORK WHICH HAS BEEN ABUSED OR NEGLECTED BY OWNER.

12. EQUAL OPPORTUNITY:

A. CONTRACTOR SHALL NOT DISCRIMINATE AGAINST ANY EMPLOYEE OR APPLICANT FOR EMPLOYMENT BECAUSE OF RACE, COLOR, RELIGION, SEX OR NATIONAL ORIGIN. CONTRACTOR SHALL TAKE AFFIRMATIVE ACTION TO ENSURE THAT APPLICANTS ARE EMPLOYED AND THAT EMPLOYEES ARE TREATED, DURING EMPLOYMENT, WITHOUT REGARD TO THEIR RACE, COLOR, RELIGION, SEX OR NATIONAL ORIGIN.

B. CONTRACTOR SHALL COMPLY WITH ALL STATUTES CONCERNING EQUAL EMPLOYMENT OPPORTUNITY AS APPLICABLE.

13. WAGE RATES:

THERE WILL BE NO WAGE RATE REQUIREMENTS FOR THIS PROJECT.

14. MAINTENANCE MANUAL:

A. THE CONTRACTOR, AT THE TIME OF SUBSTANTIAL COMPLETION, SHALL DELIVER TO THE OWNER ONE (1) HARD COPY AND ONE (1) ELECTRONIC COPY OF EACH MANUAL ASSEMBLED AND BOUND IN HARD COVER, THREE-RING BINDERS CONSISTING OF THE FOLLOWING MATERIALS FROM SUB-CONTRACTORS FOR WHICH THE CONTRACTOR SHALL BE RESPONSIBLE FOR COLLECTING, IDENTIFYING, INDEXING, AND COLLATING:

(1) RELEASES OF LIEN COVERING ALL LABOR AND MATERIALS, GENERAL WARRANTY AND SUB-CONTRACTORS WARRANTIES AND, FOR THE OWNER'S GUIDANCE, FULL DETAILS FOR CARE AND MAINTENANCE OF VISIBLE SURFACES AND EQUIPMENT INCLUDED IN CONTRACT.

(2) COMPLETE EQUIPMENT AND MECHANICAL SYSTEM DIAGRAMS OPERATING INSTRUCTIONS SPECIFICALLY COVERING THE SYSTEMS AS INSTALLED FOR THIS PARTICULAR PROJECT. THE OPERATING INSTRUCTIONS SHALL INCLUDE MAINTENANCE, MANUALS, PARTS LISTS, WIRING DIAGRAMS COMPLETE WITH SEQUENCE OF OPERATION, TEST AND BALANCE REPORTS, INSPECTION REPORTS, GUARANTEES AND WARRANTIES, AS APPLICABLE, FOR EACH AND EVERY PIECE OF EQUIPMENT INCLUDING MOTORS FURNISHED UNDER THIS CONTRACT, AND OTHER INFORMATION THAT WILL BE USEFUL TO THE OWNER IN OVERALL OPERATION AND MAINTENANCE.

(3) SPECIFIC INFORMATION REGARDING MANUFACTURER'S NAME AND ADDRESS, NEAREST DISTRIBUTOR AND SERVICE REPRESENTATIVE'S NAME, ADDRESS, OFFICE, AND HOME PHONE NUMBERS, MAKE AND MODEL NUMBERS, OPERATING DESIGN AND CHARACTERISTICS, ETC., WILL BE REQUIRED. ALL INFORMATION SUBMITTED SHALL BE UPDATED TO REFLECT EXISTING CONDITIONS.

(4) WHERE CONTENTS OF MANUAL INCLUDES MANUFACTURER'S CATALOG PAGES, CLEARLY INDICATE THE PRECISE ITEMS INCLUDED IN THIS INSTALLATION AND DELETE OR OTHERWISE CLEARLY INDICATE ALL MANUFACTURER'S DATA WITH WHICH THIS INSTALLATION IS NOT CONCERNED.

B. ALL MATERIAL IN MANUAL SHALL BE OF EQUAL SIZE AND TABBED TO PROVIDE A PROFESSIONAL PRESENTATION ACCEPTABLE TO THE ARCHITECT.

15. ARBITRATION:

NOTWITHSTANDING ANY PROVISION CONTAINED IN THE CONTRACT DOCUMENTS OR ELSEWHERE, NEITHER PARTY TO THIS CONTRACT SHALL BE REQUIRED TO SUBMIT TO LITIGATION ANY CLAIM, DISPUTE OR OTHER MATTER ARISING OUT OF OR RELATING TO THE CONTRACT DOCUMENTS, THE CONTRACT, OR THE PERFORMANCE THEREOF.

16. CLAIMS:

NOTWITHSTANDING ANY PROVISION CONTAINED IN THE CONTRACT DOCUMENTS OR ELSEWHERE, THE OWNER SHALL NOT BE REQUIRED TO MAKE ANY PAYMENT TO THE

CONTRACTOR ON ACCOUNT OF DAMAGES FOR DELAY, IMPACT CLAIMS OR SIMILAR CLAIMS ARISING OUT OF ANY CHANGE IN THE WORK (AS THAT TERM IS USED IN ARTICLE 12 OF THE GENERAL CONDITIONS OF THE CONTRACT FOR CONSTRUCTION) EXCEPT AS MAY BE MUTUALLY AGREED TO IN WRITING BY THE OWNER AND THE CONTRACTOR PRIOR TO COMMENCEMENT OF THE WORK CALLED FOR BY THE CHANGE, AND SUPPORTED BY COST DATA, FURNISHED BY THE CONTRACTOR, IN SUFFICIENT DETAIL TO ENABLE THE ARCHITECT TO CONFIRM THE ACCURACY OF SAME.

17. STATE OF FLORIDA TOXIC SUBSTANCE ACT:

(WORKER'S RIGHT TO KNOW LAW), CHAPTER 442, FLORIDA STATUTES CONTRACTORS SHALL COMPLY WITH ALL OF THE REQUIREMENTS OF THE FLORIDA TOXIC SUBSTANCE ACT, AS AMENDED (THE "ACT"), SPECIFICALLY, BUT NOT LIMITED SUBSTANCE IN CONSTRUCTION, REPAIR, OR MAINTENANCE OF PUBLIC SCHOOL FACILITIES.

A. ALL TOXIC SUBSTANCE ENUMERATED IN THE FLORIDA SUBSTANCE LIST ESTABLISHED PURSUANT TO S. 442.103, FLORIDA STATUTES, THAT ARE TO BE USED IN THE CONSTRUCTION, REPAIR OR MAINTENANCE OF EDUCATIONAL FACILITIES ARE RESTRICTED TO USAGE ACCORDING TO THE FOLLOWING PROVISION:

BEFORE ANY SUCH SUBSTANCE MAY BE USED, THE CONTRACTOR SHALL NOTIFY THE SUPERINTENDENT, THE DIRECTOR OF MAINTENANCE AND THE ARCHITECT/ENGINEER IN WRITING AT LEAST TEN (10) WORKING DAYS PRIOR TO USING THE SUBSTANCE. THE NOTIFICATION SHALL CONTAIN:

(1) THE NAME OF THE SUBSTANCE TO BE USED.

(2) WHERE THE SUBSTANCE IS TO BE USED.

(3) WHEN THE SUBSTANCE IS TO BE USED.

THERE SHALL BE ATTACHED TO THE NOTIFICATION A COPY OF A MATERIAL SAFETY DATA SHEET AS DEFINED IN S. 442.102, FLORIDA STATUTES, FOR EACH SUCH SUBSTANCE.

B. THE CONTRACTOR SHALL COMPLY WITH, THE SAFETY PRECAUTIONS AND HANDLING INSTRUCTIONS SET FORTH IN THE MATERIAL SAFETY DATA SHEET FOR EACH SUBSTANCE USED BY THE CONTRACTOR SO THAT USAGE OF THE SUBSTANCE POSES NO THREAT TO THE HEALTH AND SAFETY OF STUDENTS, SCHOOL PERSONNEL, AND THE GENERAL PUBLIC.

18. HAZARDOUS MATERIALS:

CONTRACTORS BRINGING HAZARDOUS MATERIALS INTO A PUBLIC-SCHOOL WORKPLACE MUST SUPPLY THE SITE ADMINISTRATOR AND DIRECTOR OF MAINTENANCE WITH A MATERIAL SAFETY DATA SHEET (MSDS) ON EACH SUBSTANCE BROUGHT INTO THE SITE.

A. CONTRACTOR SHALL NOT USE ANY ASBESTOS CONTAINING MATERIALS IN THE PROJECT. CONTRACTOR SHALL PROVIDE A CERTIFICATION LETTER THAT NO ASBESTOS CONTAINING MATERIALS WERE USED IN THE CONSTRUCTION OF THE PROJECT AND INCLUDE THE LETTER IN THE CLOSE OUT DOCUMENTS.

19. WOOD PRODUCTS:

USE OF FLORIDA FOREST PRODUCTS SHOULD BE USED WHERE AVAILABLE IN ACCORDANCE WITH 255.20 F.S.

20. PROOF OF LICENSING:

A. GENERAL CONTRACTORS AND SUB-CONTRACTORS:
ALL CONSTRUCTION ON BOARD-OWNED PROPERTY INCLUDING VOLUNTEER OR SERVICE ORGANIZATION PROJECTS, SHALL BE PERFORMED BY STATE-CERTIFIED OR LICENSED GENERAL CONTRACTORS AND SUB-CONTRACTORS, OR LOCALLY REGISTERED SUB-CONTRACTORS WHERE APPLICABLE, AS REQUIRED BY CHAPTER 489, F.S. LOCALLY REGISTERED SUB-CONTRACTORS MAY ONLY PROVIDE SERVICES TO BOARDS IN MUNICIPALITIES OR COUNTIES WHERE THEIR REGISTRATION IS VALID. WHERE MANDATED BY LOCAL ORDINANCE, AN OCCUPATIONAL LICENSE MAY ALSO BE REQUIRED.

B. PROOF OF LICENSING WILL BE REQUIRED OF, BUT NOT LIMITED TO THE FOLLOWING CATAGORIES OF CONTRACTORS:

GENERAL
BUILDING
RESIDENTIAL
ROOFING
AIR CONDITIONING AA
AIR CONDITIONING AB
MECHANICAL
PLUMBING
ELECTRICAL
SHEETMETAL
COMMERCIAL POOLS / SPA
RESIDENTIAL POOLS / SPA
POOL / SPA SERVICING
UNDERGROUND UTILITY
DRYWALL
SOLAR ENERGY
SPECIALTY STRUCTURE
PRECISION TANK TESTER
TANK LINING APPLICATOR

C. COPIES OF ALL LICENSES WILL BE COMPILED BY THE GENERAL CONTRACTOR AND TRANSMITTED TO THE ARCHITECT PRIOR TO COMMENCING WORK.

21. RELATION OF DIVISION 1 TO ALL OTHER DIVISIONS:

DIVISION 1 IS A PART OF ALL OTHER DIVISIONS AND SECTIONS AS IF REPEATED IN FULL IN EACH INSTANCE.

END OF SECTION

SECTION 00070 – PERMITTING

PART 1 - GENERAL

1. THE GENERAL CONTRACTOR AND HIS OR HER SUBCONTRACTORS AND THE SCHOOLS CONTRACTORS WILL BE REQUIRED TO OBTAIN CONSTRUCTION PERMITS FROM SANTA ROSA COUNTY DEVELOPMENT SERVICES PRIOR TO COMMENCEMENT OF WORK.

   THE SCHOOL SYSTEM WILL PAY FOR THE COSTS OF THESE PERMITS.

2. IN ADDITION, MR. TOBIN FACINE WILL ACT AS THE SCHOOL SYSTEMS AHJ AS IT RELATES TO LIFE AND FIRE SAFETY ITEMS. WORK (850-983-5008) CELL (850) 479-2471
   A. LIFE SAFETY SUBMITTALS WILL BE A MINIMUM OF 2 COPIES, FULL SIZE AND SIGNED AND SEALED.

3. THE GENERAL CONTRACTOR WILL BE REQUIRED TO COORDINATE ALL ASPECTS OF PERMITTING.

   THE ISSUANCE OF THESE PERMITS DOES NOT PRECLUDE THE REQUIREMENT OF PERMITS BY ANY OTHER AHJ

END OF SECTION

SECTION 00073 – DAILY WEATHER DELAY LOG

A. PROJECT: HOBBS MIDLE SCHOOL - PHASE B

B. DATE:

C. WEATHER:

D. TEMP. AM

E. TEMP. PM

F. RAIN AMOUNT: (ABOVE .1 INCH)

G. WEATHER DELAY (YES OR NO)

H. ALL WORK IN PROGRESS: BY SUBCONTRACTORS:

I. ITEM THAT WAS DELAYED AND WHY:

J. IS THE DELAYED ITEM ON THE CRITICAL PATH: (YES OR NO)

K. LENGTH OF DELAY:

L. SUBMITTED BY:

M. SIGNATURE:

N. GENERAL CONTRACTOR:

INSTRUCTIONS:

1. DAILY REPORTS FOR EACH DAY OF THE MONTH AND CONTAINING THE ABOVE REFERENCED INFORMATION WILL BE REQUIRED TO BE SUBMITTED WITH EACH PAY APPLICATION. FAILURE TO DO SO WILL NEGATE ANY FUTURE CLAIM FOR DELAY. THE NOA WEATHER REPORT AND SUPERINTENDENTS DAILY LOG MUST BE SUBMITTED WITH ANY WEATHER EXTENSION REQUEST.
2. THIS INFORMATION AND THE 10 YEAR MONTHLY RAIN DAY AVERAGE WILL BE REQUIRED AS BACK-UP TO GRANT A TIME EXTENSION REQUEST FOR DELAYS CAUSED BY WEATHER EVENTS.
3. ONLY DIRECT DELAYS FOR WORK STOPPAGES THAT ARE ON THE CRITICAL PATH AND IN EXCESS OF THE 10 YEAR AVERAGE WILL BE CONSIDERED.
4. DELAYS FOR WORK NOT ON THE CRITICAL PATH SHALL BE LOGGED AND DELAY LOGS FOR THAT CATEGORY OF WORK SHALL BE ACCUMULATED AND SUBMITTED IN THE EVENT THE WORK ENTERS THE CRITICAL PATCH AND CAUSES A DELAY OF THE PROJECT.

REFERENCES:

GENERAL CONDITIONS OF THE CONTRACT FOR CONSTRUCTION – A201-1997

END OF SECTION

SECTION 01010 – SUMMARY OF WORK

PART 1 - GENERAL

1.1 WORK COVERED BY CONTRACT DOCUMENTS

A. CONSTRUCTION OF ONE ENERGY UPGRADES
   1. PROJECT LOCATION: HOBBS MIDDLE SCHOOL
      5317 GLOVER LN.
      MILTON, FL 32570

   2. OWNER: THE SCHOOL DISTRICT OF SANTA ROSA COUNTY.

B. CONTRACT DOCUMENTS DATED NOV 16, 2021, WERE PREPARED FOR THE PROJECT BY
   SAM MARSHALL ARCHITECTS
   325 S. PALAFOX ST.
   PENSACOLA, FL 32502
   (850) 433-7842

C. PROJECT SUMMARY:

   1. THE WORK CONSISTS OF: CONSTRUCTION OF ENERGY UPGRADES TO THE SOUTH END OF THE EXISTING MAIN CLASSROOM WING AS SHOWN ON CONTRACT DRAWINGS.

   MAJOR ITEMS OF WORK WILL INCLUDE BUT MAY NOT BE LIMITED TO THE FOLLOWING:
   - INSULATION OF EXISTING EXTERIOR WALLS AND ROOF AND REPLACEMENT OF EXISTING WINDOWS.
   - REPLACEMENT OF EXISTING HVAC SYSTEM
   - REPLACEMENT OF EXISTING LIGHTING

D. THE WORK WILL BE CONSTRUCTED UNDER A SINGLE PRIME CONTRACT.

E. THE PROJECT SCHEDULE FOR THE BASE BID IS AS FOLLOWS:

   1. ANTICIPATED NOTICE TO PROCEED: DEC. 13, 2021
   2. SUBSTANTIAL COMPLETION: JUNE 30, 2023
   3. FINAL COMPLETION: JULY 21, 2023

1.2 WORK UNDER OTHER CONTRACTS

A. SEPARATE CONTRACT: THE OWNER HAS AWARDED A SEPARATE CONTRACT FOR PERFORMANCE OF CERTAIN CONSTRUCTION OPERATIONS AT THE SITE. THOSE OPERATIONS WILL BE CONDUCTED SIMULTANEOUSLY WITH WORK UNDER THIS CONTRACT. THOSE CONTRACTS INCLUDES THE FOLLOWING:

   1. CONTRACT: TEST AND BALANCE (REFER TO MECHANICAL FOR ADDITIONAL INFORMATION)
   2. CONTRACT: INTERCOM WIRE AND DEVICES
   3. CONTRACT: FIRE ALARM WIRE AND DEVICES

4. CONTRACT: SECURITY SYSTEM (STAR ASSET SECURETY)
5. CONTRACT: DATA WIRE AND DEVICES
6. CONTRACT: ROOFING

B. THE GENERAL CONTRACTOR IS REQUIRED TO COORDINATE, COOPERATE AND FACILITATE SEPARATE CONTRACTORS SO THAT WORK UNDER THOSE CONTRACTS MAY BE CARRIED OUT SMOOTHLY, WITHOUT INTERFERING WITH OR DELAYING WORK UNDER THIS CONTRACT. THE CONTRACTOR'S RESPONSIBILITY FOR CONTRACTS 1.2.B.1, 3, 4, 5, 6 WILL BE THE SAME AS IF THEY WERE THE GENERAL CONTRACTOR'S SUBCONTRACTORS.

1.3 CONTRACTOR USE OF PREMISES

A. GENERAL: MUCH OF THE WORK WILL TAKE PLACE WHILE HOBBES MIDDLE SCHOOL IS OCCUPIED. DURING THE CONSTRUCTION PERIOD THE CONTRACTOR SHALL HAVE USE OF A PORTION OF THE SCHOOL FOR CONSTRUCTION OPERATIONS. HOWEVER, ALL WORK BEING PERFORMED FOR ALTERNATE #1 SPACES AND ANY WORK THAT COULD CAUSE THE LOSS OF USE OF ANY SPACES SHALL BE PERFORMED DURING "SPRING/SUMMER BREAK" HOURS. THE REMAINDER OF THE WORK CAN BE ACCOMPLISHED DURING THE SCHOOL YEAR. HOWEVER, WORK THAT MAY BE DISRUPTIVE TO THE SCHOOL DAY WILL NEED TO BE PERFORMED AFTER SCHOOL HOURS OR DURING THE WEEKEND. THE SCHOOL DISTRICT WILL PROVIDE KEYS FOR TO THE GENERAL CONTRACTOR'S USE. IN THE EVENT THAT KEYS ARE NOT RETURNED, THE SCHOOL WILL BE REKEYED AT THE CONTRACTORS EXPENSE.

1. EXISTING SITE CONDITIONS: THE CONTRACTOR SHALL ERECT AND MAINTAIN CONSTRUCTION FENCES AND TEMPORARY BARRIERS AS REQUIRED AND AT THE DIRECTION OF THE SCHOOL DISTRICT IN ORDER TO PROVIDE CONTINUOUS PROTECTION OF PUBLIC LIFE SAFETY.

2. DRIVEWAYS AND ENTRANCES: KEEP DRIVEWAYS AND ENTRANCES SERVING THE PREMISES CLEAR AND AVAILABLE TO THE OWNER, THE OWNER'S EMPLOYEES, AND EMERGENCY VEHICLES AT ALL TIMES. DO NOT USE THESE AREAS FOR PARKING OR STORAGE OF MATERIALS.

1.4 OWNER FURNISHED PRODUCTS

A. THE OWNER WILL FURNISH AND INSTALL THE FOLLOWING PRODUCTS:

1. FIRE ALARM WIRE AND DEVICES
2. INTERCOM WIRE AND DEVICES
3. DATA WIRE AND DEVICES

B. STAR ASSET SECURITY'S SCOPE OF WORK INCLUDES BUT MAY NOT BE LIMITED TO:

PROVIDING AND INSTALLING ALL CARD READERS AND DOOR CONTACTS AND CONNECTING ALL LOW VOLTAGE WIRING FOR ALL ELECTRIFIED HARDWARE AND SECURITY ITEMS.

THE GENERAL CONTRACTOR WILL BE RESPONSIBLE FOR PROVIDING AND INSTALLING ALL CONDUIT AND PULL STRINGS, ALL HARDWARE LISTED IN SECTION 08710, PROVIDING AND CONNECTING ALL LINE VOLTAGE WIRING TO THE POWER SUPPLIES.

THE CONTRACTOR SHALL COORDINATING AND FACILITATING THE LOW VOLTAGE CONNECTIONS BEING PROVIDED BY STAR ASSETS.

PART 2 - PRODUCTS (NOT APPLICABLE)

PART 3 - EXECUTION (NOT APPLICABLE)

END OF SECTION

SECTION 01035 – MODIFICATION PROCEDURES

PART 1 - GENERAL

1.1 SUMMARY

A THIS SECTION SPECIFIES ADMINISTRATIVE AND PROCEDURAL REQUIREMENTS FOR HANDLING AND PROCESSING CONTRACT MODIFICATIONS.

1.2 MINOR CHANGES IN THE WORK

A. THE ARCHITECT WILL ISSUE SUPPLEMENTAL INSTRUCTIONS AUTHORIZING MINOR CHANGES IN THE WORK, NOT INVOLVING ADJUSTMENT TO THE CONTRACT SUM OR CONTRACT TIME, ON AIA FORM G710, ARCHITECT'S SUPPLEMENTAL INSTRUCTIONS.

1.3 CHANGE ORDER PROPOSAL REQUESTS

A. OWNER-INITIATED PROPOSAL REQUESTS: THE ARCHITECT WILL ISSUE A DETAILED DESCRIPTION OF PROPOSED CHANGES IN THE WORK THAT WILL REQUIRE ADJUSTMENT TO THE CONTRACT SUM OR CONTRACT TIME. IF NECESSARY, THE DESCRIPTION WILL INCLUDE SUPPLEMENTAL OR REVISED DRAWINGS AND SPECIFICATIONS.

1. PROPOSAL REQUESTS ISSUED BY THE ARCHITECT ARE FOR INFORMATION ONLY. DO NOT CONSIDER THEM AS AN INSTRUCTION EITHER TO STOP WORK IN PROGRESS OR TO EXECUTE THE PROPOSED CHANGE.

2. WITHIN 14 DAYS OF RECEIPT OF A PROPOSAL REQUEST, SUBMIT AN ESTIMATE OF COST NECESSARY TO EXECUTE THE CHANGE TO THE ARCHITECT FOR THE OWNER'S REVIEW.

3.

A. INCLUDE A STATEMENT INDICATING THE EFFECT THE PROPOSED CHANGE IN THE WORK WILL HAVE ON THE CONTRACT TIME.

B. INCLUDE SEPARATE LINE ITEMS FOR EACH ITEM OF WORK. LINE ITEMS SHALL INCLUDE UNIT QUANTITIES, LABOR COSTS PER UNIT, LABOR TAXES, MATERIAL COSTS PER UNIT, SALES TAX AND EQUIPMENT COSTS PER UNIT IF APPLICABLE. THE TOTAL OF THESE LINE ITEMS SHALL BE MARKED UP BY THE CONTRACTOR BY THE AMOUNTS ALLOWED BY THE CONTRACT. ITEMS INVOLVING WORK BY SUBCONTRACTORS SHALL INCLUDE THE SAME COST BREAK-DOWN WITH NO ALLOWANCE FOR BOND COSTS. THE GENERAL CONTRACTOR WILL BE ALLOWED TO ADD 1% BOND TO THE TOTAL OF THE GENERAL CONTRACTOR AND SUBCONTRACTORS TOTAL COST. THIS INFORMATION IS REQUIRED AS A MINIMUM FOR REVIEW AND APPROVAL OF COST CHANGES TO THE CONTRACT.

B. CONTRACTOR-INITIATED PROPOSALS: WHEN LATENT OR UNFORESEEN CONDITIONS REQUIRE MODIFICATIONS TO THE CONTRACT, THE CONTRACTOR MAY PROPOSE CHANGES BY SUBMITTING A REQUEST FOR A CHANGE TO THE ARCHITECT.

1. INCLUDE A STATEMENT OUTLINING THE 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 CONTRACT TIME.
2. INCLUDE A COST BREAKDOWN IN THE FORMAT OUTLINED IN PARAGRAPH 1.3.A.3.A. WHEN REQUESTED, FURNISH SURVEY DATA TO SUBSTANTIATE QUANTITIES.
3. COMPLY WITH REQUIREMENTS IN SECTION "PRODUCT SUBSTITUTIONS" IF THE PROPOSED CHANGE REQUIRES SUBSTITUTION OF ONE PRODUCT OR SYSTEM FOR A PRODUCT OR SYSTEM SPECIFIED.
4. SUBMIT PROPOSED CHANGES AND REQUEST WITHIN 21 DAYS OF IDENTIFYING ITEM.

C. PROPOSAL REQUEST FORM: USE AIA DOCUMENT G709 FOR CHANGE ORDER PROPOSAL REQUESTS.

1.4 ALLOWANCES

A. ALLOWANCE ADJUSTMENT: FOR ALLOWANCE-COST ADJUSTMENT, BASE EACH CHANGE ORDER PROPOSAL ON THE DIFFERENCE BETWEEN THE ACTUAL PURCHASE AMOUNT AND THE ALLOWANCE, MULTIPLIED BY THE FINAL MEASUREMENT OF WORK-IN-PLACE. WHERE APPLICABLE, INCLUDE REASONABLE ALLOWANCES FOR CUTTING LOSSES, TOLERANCES, MIXING WASTES, NORMAL PRODUCT IMPERFECTIONS, AND SIMILAR MARGINS.

1. INCLUDE INSTALLATION COSTS IN THE PURCHASE AMOUNT ONLY WHERE INDICATED AS PART OF THE ALLOWANCE.
2. WHEN REQUESTED, PREPARE EXPLANATIONS AND DOCUMENTATION TO SUBSTANTIATE THE MARGINS CLAIMED.
3. SUBMIT SUBSTANTIATION OF A CHANGE IN SCOPE OF WORK CLAIMED IN THE CHANGE ORDERS RELATED TO UNIT-COST ALLOWANCES.
4. THE OWNER RESERVES THE RIGHT TO ESTABLISH THE ACTUAL QUANTITY OF WORK-IN-PLACE BY INDEPENDENT QUANTITY SURVEY, MEASURE, OR COUNT.

B. SUBMIT CLAIMS FOR INCREASED COSTS BECAUSE OF A CHANGE IN SCOPE OR NATURE OF THE ALLOWANCE DESCRIBED IN THE CONTRACT DOCUMENTS, WHETHER FOR THE PURCHASE ORDER AMOUNT OR THE CONTRACTOR'S HANDLING, LABOR, INSTALLATION, OVERHEAD, AND PROFIT. SUBMIT CLAIMS WITHIN 21 DAYS OF RECEIPT OF THE CHANGE ORDER OR CONSTRUCTION CHANGE DIRECTIVE AUTHORIZING WORK TO PROCEED. THE OWNER WILL REJECT CLAIMS SUBMITTED LATER THAN 21 DAYS.

1. DO NOT INCLUDE THE CONTRACTOR'S OR SUBCONTRACTOR'S INDIRECT EXPENSE IN THE CHANGE ORDER COST AMOUNT UNLESS IT IS CLEARLY SHOWN THAT THE NATURE OR EXTENT OF WORK HAS CHANGED FROM WHAT COULD HAVE BEEN FORESEEN FROM INFORMATION IN CONTRACT DOCUMENTS.
2. NO CHANGE TO THE CONTRACTOR'S INDIRECT EXPENSE IS PERMITTED FOR SELECTION OF HIGHER OR LOWER-PRICED MATERIALS OR SYSTEMS OF THE SAME SCOPE AND NATURE AS ORIGINALLY INDICATED.

1.5 CONSTRUCTION CHANGE DIRECTIVE

A. CONSTRUCTION CHANGE DIRECTIVE: WHEN THE OWNER AND THE CONTRACTOR DISAGREE ON THE TERMS OF A PROPOSAL REQUEST, THE ARCHITECT MAY ISSUE A

CONSTRUCTION CHANGE DIRECTIVE ON AIA FORM G714. THE CONSTRUCTION CHANGE DIRECTIVE INSTRUCTS THE CONTRACTOR TO PROCEED WITH A CHANGE IN THE WORK, FOR SUBSEQUENT INCLUSION IN A CHANGE ORDER.

1. THE CONSTRUCTION CHANGE DIRECTIVE CONTAINS A COMPLETE DESCRIPTION OF THE CHANGE IN THE WORK. IT ALSO DESIGNATES THE METHOD TO BE FOLLOWED TO DETERMINE CHANGE IN THE CONTRACT SUM OR 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 THE CHANGE, SUBMIT AN ITEMIZED ACCOUNT AND SUPPORTING DATA NECESSARY TO SUBSTANTIATE COST AND TIME ADJUSTMENTS TO THE CONTRACT.

1.6 CHANGE ORDER PROCEDURES

A. UPON THE OWNER'S APPROVAL OF A PROPOSAL REQUEST, THE ARCHITECT WILL ISSUE A CHANGE ORDER USING AIA DOCUMENT G701 FOR SIGNATURES OF THE OWNER AND THE CONTRACTOR.

PART 2 - PRODUCTS (NOT APPLICABLE)

PART 3 - EXECUTION (NOT APPLICABLE)

END OF SECTION

SECTION 01068 – DEFINITIONS AND STANDARDS

PART 1 - GENERAL

1.01 DEFINITIONS:

A. GENERAL EXPLANATION: A SUBSTANTIAL AMOUNT OF SPECIFICATION LANGUAGE CONSTITUTES DEFINITIONS FOR TERMS FOUND IN OTHER CONTRACT DOCUMENTS, INCLUDING DRAWINGS. CERTAIN TERMS USED IN CONTRACT DOCUMENTS ARE DEFINED GENERALLY IN THIS ARTICLE. DEFINITIONS AND EXPLANATIONS OF THIS SECTION ARE NOT NECESSARILY EITHER COMPLETE OR EXCLUSIVE BUT ARE GENERAL FOR THE WORK TO EXTENT NOT STATED MORE EXPLICITLY IN ANOTHER PROVISION OF CONTRACT DOCUMENTS.

B. GENERAL REQUIREMENTS: THE PROVISIONS OR REQUIREMENTS OF DIVISION-1 SECTIONS. GENERAL REQUIREMENTS APPLY TO ENTIRE WORK OF CONTRACT AND, WHERE SO INDICATED, TO OTHER ELEMENTS WHICH ARE INCLUDED IN PROJECT.

C. INDICATED: THE TERM "INDICATED" IS A CROSS- REFERENCE TO GRAPHICS, NOTES OR SCHEDULES ON DRAWINGS, TO OTHER PARAGRAPHS OR SCHEDULES IN THE SPECIFICATIONS, AND TO SIMILAR MEANS OF RECORDING REQUIREMENTS IN CONTRACT DOCUMENTS. WHERE TERMS SUCH AS "SHOWN", "NOTED", "SCHEDULED", AND "SPECIFIED" ARE USED IN LIEU OF "INDICATED", IT IS FOR PURPOSE OF HELPING READER LOCATE CROSS- REFERENCE, AND NO LIMITATION OF LOCATION IS INTENDED EXCEPT AS SPECIFICALLY NOTED.

D. DIRECTED, REQUESTED, ETC.: WHERE NOT OTHERWISE EXPLAINED, TERMS SUCH AS "DIRECTED", "REQUESTED", "AUTHORIZED", "SELECTED", "APPROVED", "REQUIRED", "ACCEPTED", AND "PERMITTED" MEAN "DIRECTED BY ARCHITECT/ENGINEER", "REQUESTED BY ARCHITECT/ ENGINEER", ETC. HOWEVER, NO SUCH IMPLIED MEANING WILL BE INTERPRETED TO EXTEND ARCHITECT'S/ ENGINEER'S RESPONSIBILITY INTO CONTRACTOR'S AREA OF CONSTRUCTION SUPERVISION.

E. APPROVE: WHERE USED IN CONJUNCTION WITH ARCHITECT'S/ENGINEER'S RESPONSE TO SUBMITTALS, REQUESTS, APPLICATIONS, INQUIRIES, REPORTS AND CLAIMS BY CONTRACTOR, THE MEANING OF TERM "APPROVED" WILL BE HELD TO LIMITATIONS OF ARCHITECT'S/ENGINEER'S RESPONSIBILITIES AND DUTIES AS SPECIFIED IN GENERAL AND SUPPLEMENTARY CONDITIONS. IN NO CASE WILL "APPROVAL" BY ARCHITECT/ENGINEER BE INTERPRETED AS A RELEASE OF CONTRACTOR FROM RESPONSIBILITIES TO FULFILL REQUIREMENTS OF CONTRACT DOCUMENTS.

F. PROJECT SITE: THE SPACE AVAILABLE TO CONTRACTOR FOR PERFORMANCE OF THE WORK, EITHER EXCLUSIVELY OR IN CONJUNCTION WITH OTHERS PERFORMING OTHER WORK AS PART OF THE PROJECT. THE EXTENT OF PROJECT SITE IS SHOWN ON DRAWINGS.

G. FURNISH: EXCEPT AS OTHERWISE DEFINED IN GREATER DETAIL, THE TERM "FURNISH" IS USED TO MEAN SUPPLY AND DELIVER TO PROJECT SITE, READY FOR UNLOADING, UNPACKING, ASSEMBLY, INSTALLATION, ETC., AS APPLICABLE IN EACH INSTANCE.

H. INSTALL: EXCEPT AS OTHERWISE DEFINED IN GREATER DETAIL, TERM "INSTALL"

IS USED TO DESCRIBE OPERATIONS AT PROJECT SITE INCLUDING UNLOADING, UNPACKING, ASSEMBLY, ERECTION, PLACING, ANCHORING, APPLYING, WORKING TO DIMENSION, FINISHING, CURING, PROTECTING, CLEANING AND SIMILAR OPERATIONS, AS APPLICABLE IN EACH INSTANCE.

I. PROVIDE: EXCEPT AS OTHERWISE DEFINED IN GREATER DETAIL, TERM "PROVIDE" MEANS FURNISH AND INSTALL, COMPLETE AND READY FOR INTENDED USE, AS APPLICABLE IN EACH INSTANCE.

J. INSTALLER: THE ENTITY (PERSON OR FIRM) ENGAGED BY CONTRACTOR OR ITS SUBCONTRACTOR OR SUB- SUBCONTRACTOR FOR PERFORMANCE OF A PARTICULAR UNIT OF WORK AT PROJECT SITE, INCLUDING INSTALLATION, ERECTION, APPLICATION AND SIMILAR REQUIRED OPERATIONS. IT IS A GENERAL REQUIREMENT THAT SUCH ENTITIES (INSTALLERS) BE EXPERT IN OPERATIONS THEY ARE ENGAGED TO PERFORM.

K. TESTING LABORATORY: AN INDEPENDENT ENTITY ENGAGED TO PERFORM SPECIFIC INSPECTIONS OR TESTS OR WORK, EITHER AT PROJECT SITE OR ELSEWHERE; AND TO REPORT AND (IF REQUIRED) INTERPRET RESULTS OF THOSE INSPECTIONS OR TESTS.

1.02 FORMAT AND SPECIFICATION EXPLANATIONS:

A. SPECIFICATION PRODUCTION: NONE OF THESE EXPLANATIONS WILL BE INTERPRETED TO MODIFY SUBSTANCE OF REQUIREMENTS. PORTIONS OF THESE SPECIFICATIONS HAVE BEEN PRODUCED BY ARCHITECT'S/ ENGINEER'S STANDARD METHODS OF EDITING MASTER SPECIFICATIONS, AND MAY CONTAIN MINOR DEVIATIONS FROM TRADITIONAL WRITING FORMATS. SUCH DEVIATIONS ARE A NORMAL RESULT OF THIS PRODUCTION TECHNIQUE, AND NO OTHER MEANING WILL BE IMPLIED OR PERMITTED.

B. SPECIFICATION CONTENT: BECAUSE OF METHODS BY WHICH THIS PROJECT SPECIFICATION HAS BEEN PRODUCED, CERTAIN GENERAL CHARACTERISTICS OF CONTENT, AND CONVENTIONS IN USE OF LANGUAGE ARE EXPLAINED AS FOLLOWS:

1. SPECIFYING METHODS: THE TECHNIQUES OF SPECIFYING TO RECORD REQUIREMENTS VARIES THROUGHOUT TEXT, AND MAY INCLUDE "PRESCRIPTIVE", "OPEN GENERIC-DESCRIPTIVE", OR A COMBINATION OF THESE. THE METHOD USED FOR SPECIFYING ONE UNIT OF WORK HAS NO BEARING ON REQUIREMENTS FOR ANOTHER UNIT OF WORK.
2. OVERLAPPING AND CONFLICTING REQUIREMENTS: WHERE COMPLIANCE WITH 2 OR MORE INDUSTRY STANDARDS OR SETS OF REQUIREMENTS IS SPECIFIED, AND OVERLAPPING OF THOSE DIFFERENT STANDARDS OR REQUIREMENTS ESTABLISHES DIFFERENT OR CONFLICTING MINIMUMS OR LEVELS OF QUALITY, MOST STRINGENT REQUIREMENT (WHICH IS GENERALLY RECOGNIZED TO BE ALSO MOST COSTLY) IS INTENDED AND WILL BE ENFORCED, UNLESS SPECIFICALLY DETAILED LANGUAGE WRITTEN INTO CONTRACT DOCUMENTS (NOT BY WAY OF REFERENCE TO AN INDUSTRY STANDARD) CLEARLY INDICATES THAT A LESS STRINGENT REQUIREMENT IS TO BE FULFILLED. REFER APPARENTLY-EQUAL- BUT-

DIFFERENT REQUIREMENTS, AND UNCERTAINTIES AS TO WHICH LEVEL OF QUALITY IS THE MORE STRINGENT, TO ARCHITECT/ENGINEER FOR A DECISION BEFORE PROCEEDING.

A. CONTRACTOR'S OPTIONS: EXCEPT FOR OVERLAPPING OR CONFLICTING REQUIREMENTS, WHERE MORE THAN ONE SET OF REQUIREMENTS ARE SPECIFIED FOR A PARTICULAR UNIT OF WORK, OPTION IS INTENDED TO BE CONTRACTOR'S REGARDLESS OF WHETHER SPECIFICALLY INDICATED AS SUCH.

3. MINIMUM QUALITY/QUANTITY: IN EVERY INSTANCE, QUALITY LEVEL OR QUANTITY SHOWN OR SPECIFIED IS INTENDED AS MINIMUM FOR THE WORK TO BE PERFORMED OR PROVIDED. EXCEPT AS OTHERWISE SPECIFICALLY INDICATED, ACTUAL WORK MAY EITHER COMPLY EXACTLY WITH THAT MINIMUM (WITHIN SPECIFIED TOLERANCES), OR MAY EXCEED THAT MINIMUM WITHIN REASONABLE LIMITS. IN COMPLYING WITH REQUIREMENTS, INDICATED NUMERIC VALUES ARE EITHER MINIMUMS OR MAXIMUMS AS NOTED OR AS APPROPRIATE FOR CONTEXT OF REQUIREMENTS. REFER INSTANCES OF UNCERTAINTY TO ARCHITECT/ENGINEER FOR DECISION BEFORE PROCEEDING.
4. ABBREVIATIONS: THE LANGUAGE OF SPECIFICATIONS AND OTHER CONTRACT DOCUMENTS IS OF THE ABBREVIATED TYPE IN CERTAIN INSTANCES AND IMPLIES WORDS AND MEANINGS WHICH WILL BE APPROPRIATELY INTERPRETED. ACTUAL WORK ABBREVIATIONS OF A SELF- EXPLANATORY NATURE HAVE BEEN INCLUDED IN TEXTS. SPECIFIC ABBREVIATIONS HAVE BEEN ESTABLISHED, PRINCIPALLY FOR LENGTHY TECHNICAL TERMINOLOGY AND PRIMARILY IN CONJUNCTION WITH COORDINATION OF SPECIFICATION REQUIREMENTS WITH NOTATIONS ON DRAWINGS AND IN SCHEDULES. THESE ARE FREQUENTLY DEFINED IN SECTION AT FIRST INSTANCE OF USE. TRADE ASSOCIATION NAMES AND TITLES OF GENERAL STANDARDS ARE FREQUENTLY ABBREVIATED. SINGULAR WORDS WILL BE INTERPRETED AS PLURAL AND PLURAL WORDS WILL BE INTERPRETED AS SINGULAR WHERE APPLICABLE AND WHERE FULL CONTEXT OF THE CONTRACT DOCUMENTS SO INDICATES.

1.03 INDUSTRY STANDARDS:

A. GENERAL APPLICABILITY OF STANDARDS: APPLICABLE STANDARDS OF CONSTRUCTION INDUSTRY HAVE SAME FORCE AND EFFECT (AND ARE MADE A PART OF CONTRACT DOCUMENTS BY REFERENCE) AS IF COPIED DIRECTLY CONTRACT DOCUMENTS, OR AS IF PUBLISHED COPIES WERE BOUND HEREWITH.
1. REFERENCED STANDARDS (REFERENCED DIRECTLY IN CONTRACT DOCUMENTS OR BY GOVERNING REGULATIONS) HAVE PRECEDENCE OVER NON- REFERENCED STANDARDS WHICH ARE RECOGNIZED IN INDUSTRY FOR APPLICABILITY TO WORK.
2. NON-REFERENCED STANDARDS ARE HEREBY DEFINED TO HAVE NO PARTICULAR APPLICABILITY TO THE WORK, EXCEPT AS A GENERAL MEASUREMENT OF WHETHER WORK COMPLIES WITH STANDARDS RECOGNIZED IN CONSTRUCTION INDUSTRY.
3. NON-REFERENCED STANDARDS RECOGNIZED IN THE CONSTRUCTION INDUSTRY ARE HEREBY DEFINED, EXCEPT AS OTHERWISE LIMITED IN

CONTRACT DOCUMENTS, TO HAVE DIRECT APPLICABILITY TO THE WORK, AND WILL BE SO ENFORCED FOR PERFORMANCE OF THE WORK.

B. PUBLICATION DATES: EXCEPT AS OTHERWISE INDICATED, WHERE COMPLIANCE WITH AN INDUSTRY STANDARD IS REQUIRED, COMPLY WITH STANDARD IN EFFECT AS OF DATE OF CONTRACT DOCUMENTS.

C. THE FOLLOWING STANDARDS WERE UTILIZED IN THE DESIGN OF THIS PROJECT:

FLORIDA BUILDING, ACCESSIBILITY, PLUMBING, MECHANICAL AND ENERGY CODES (2017, SIXTH EDITION) OR LATER IF ENACTED

FLORIDA FIRE PREVENTION CODE (FIFTH EDITION) OR LATER IF ENACTED

D. GOVERNING REGULATIONS/AUTHORITIES: GENERAL: THE PROCEDURE FOLLOWED BY ARCHITECT/ENGINEER HAS BEEN TO CONTACT GOVERNING AUTHORITIES WHERE NECESSARY TO OBTAIN INFORMATION NEEDED FOR THE PURPOSE OF PREPARING CONTRACT DOCUMENTS; RECOGNIZING THAT SUCH INFORMATION MAY OR MAY NOT BE OF SIGNIFICANCE IN RELATION TO CONTRACTOR'S RESPONSIBILITIES FOR PERFORMING THE WORK. DIRECTLY CONTACT GOVERNING AUTHORITIES FOR NECESSARY INFORMATION AND DECISIONS HAVING A BEARING ON PERFORMANCE OF WORK.

PART 2 - PRODUCTS (NOT APPLICABLE)

PART 3 - EXECUTION (NOT APPLICABLE)

END OF SECTION

SECTION 01210 - ALLOWANCES

PART 1 - GENERAL

1.1 SUMMARY

A. THIS SECTION INCLUDES ADMINISTRATIVE AND PROCEDURAL REQUIREMENTS GOVERNING ALLOWANCES.

1. CERTAIN MATERIALS, EQUIPMENT AND OR SERVICES ARE SPECIFIED IN THE CONTRACT DOCUMENTS BY ALLOWANCES. THESE ALLOWANCES DO NOT INCLUDE HANDLING, INSTALLATION OR OVERHEAD AND PROFIT. HANDLING, INSTALLATION AND OVERHEAD AND PROFIT SHALL BE INCLUDED IN THE CONTRACT PRICE. ALLOWANCES HAVE BEEN ESTABLISHED IN LIEU OF ADDITIONAL REQUIREMENTS AND TO DEFER SELECTION OF ACTUAL MATERIALS, EQUIPMENT AND OR SERVICES TO A LATER DATE WHEN ADDITIONAL INFORMATION IS AVAILABLE FOR EVALUATION. IF NECESSARY, ADDITIONAL REQUIREMENTS WILL BE ISSUED BY CHANGE ORDER.

2. THE CONTRACTOR SHALL USE THE COST OF THE ALLOWANCES IN THE PREPARATION OF HIS BID.

3. THE DIFFERENCE BETWEEN THE ACTUAL COST OR UNIT PRICE PAID FOR THE PRODUCTS OR SERVICES LISTED IN EACH OF THE ALLOWANCES AND THE COST OR UNIT PRICE LISTED WILL BE ADJUSTED BY CHANGE ORDER WITH NO OVERHEAD AND PROFIT ADDED OR DEDUCTED.

B. TYPES OF ALLOWANCES INCLUDE THE FOLLOWING:

1. LUMP-SUM ALLOWANCES.

1.2 SELECTION AND PURCHASE

A. AT THE EARLIEST PRACTICAL DATE AFTER AWARD OF THE CONTRACT, ADVISE THE ARCHITECT OF THE DATE WHEN FINAL SELECTION AND PURCHASE OF EACH PRODUCT OR SERVICES DESCRIBED BY AN ALLOWANCE MUST BE CONTRACTED FOR IN ORDER TO AVOID DELAYING THE WORK.

B. PURCHASE PRODUCTS AND SYSTEMS SELECTED BY ARCHITECT FROM THE DESIGNATED SUPPLIER.

1.3 ACTION SUBMITTALS

A. SUBMIT PROPOSALS FOR PURCHASE OF PRODUCTS OR SYSTEMS INCLUDED IN ALLOWANCES, IN THE FORM SPECIFIED FOR CHANGE ORDERS.

1.4 INFORMATIONAL SUBMITTALS

A. SUBMIT INVOICES OR DELIVERY SLIPS TO SHOW ACTUAL QUANTITIES OF MATERIALS DELIVERED TO THE SITE FOR USE IN FULFILLMENT OF EACH ALLOWANCE.

B. COORDINATE AND PROCESS SUBMITTALS FOR ALLOWANCE ITEMS IN SAME MANNER AS FOR OTHER PORTIONS OF THE WORK.

1.5 COORDINATION

A. COORDINATE ALLOWANCE ITEMS WITH OTHER PORTIONS OF THE WORK. FURNISH TEMPLATES AS REQUIRED TO COORDINATE INSTALLATION.

1.6 LUMP-SUM AND UNIT-COST ALLOWANCES

A. ALLOWANCE SHALL INCLUDE COST TO CONTRACTOR OF SPECIFIC PRODUCTS AND MATERIALS ORDERED BY OWNER OR SELECTED BY ARCHITECT UNDER ALLOWANCE AND SHALL INCLUDE TAXES, FREIGHT, AND DELIVERY TO PROJECT SITE.

B. UNLESS OTHERWISE INDICATED, CONTRACTOR'S COSTS FOR RECEIVING AND HANDLING AT PROJECT SITE, LABOR, INSTALLATION, OVERHEAD AND PROFIT, AND SIMILAR COSTS RELATED TO PRODUCTS AND MATERIALS UNDER ALLOWANCE SHALL BE INCLUDED AS PART OF THE CONTRACT SUM AND NOT PART OF THE ALLOWANCE.

C. UNUSED MATERIALS: RETURN UNUSED MATERIALS PURCHASED UNDER AN ALLOWANCE TO MANUFACTURER OR SUPPLIER FOR CREDIT TO OWNER, AFTER INSTALLATION HAS BEEN COMPLETED AND ACCEPTED.
   1. IF REQUESTED BY ARCHITECT, RETAIN AND PREPARE UNUSED MATERIAL FOR STORAGE BY OWNER. DELIVER UNUSED MATERIAL TO OWNER'S STORAGE SPACE AS DIRECTED.

1.7 CONTINGENCY ALLOWANCES

A. USE THE CONTINGENCY ALLOWANCE ONLY AS DIRECTED BY ARCHITECT FOR OWNER'S PURPOSES AND ONLY BY CHANGE ORDERS THAT INDICATE AMOUNTS TO BE CHARGED TO THE ALLOWANCE.

B. CONTRACTOR'S OVERHEAD, PROFIT, AND RELATED COSTS FOR PRODUCTS AND EQUIPMENT ORDERED BY OWNER UNDER THE CONTINGENCY ALLOWANCE ARE INCLUDED IN THE ALLOWANCE AND ARE NOT PART OF THE CONTRACT SUM. THESE COSTS INCLUDE DELIVERY, INSTALLATION, TAXES, INSURANCE, EQUIPMENT RENTAL, AND SIMILAR COSTS.

C. CHANGE ORDERS AUTHORIZING USE OF FUNDS FROM THE CONTINGENCY ALLOWANCE WILL INCLUDE CONTRACTOR'S RELATED COSTS AND REASONABLE OVERHEAD AND PROFIT MARGINS.

D. AT PROJECT CLOSEOUT, CREDIT UNUSED AMOUNTS REMAINING IN THE CONTINGENCY ALLOWANCE TO OWNER BY CHANGE ORDER.

1.8 TESTING AND INSPECTING ALLOWANCES

A. TESTING AND INSPECTING ALLOWANCES INCLUDE THE COST OF ENGAGING TESTING AGENCIES, ACTUAL TESTS AND INSPECTIONS, AND REPORTING RESULTS.

B. THE ALLOWANCE DOES NOT INCLUDE INCIDENTAL LABOR REQUIRED TO ASSIST THE TESTING AGENCY OR COSTS FOR RETESTING IF PREVIOUS TESTS AND INSPECTIONS RESULT IN FAILURE. THE COST FOR INCIDENTAL LABOR TO ASSIST THE TESTING AGENCY SHALL BE INCLUDED IN THE CONTRACT SUM.

C. COSTS OF SERVICES NOT REQUIRED BY THE CONTRACT DOCUMENTS ARE NOT INCLUDED IN THE ALLOWANCE.

D. AT PROJECT CLOSEOUT, CREDIT UNUSED AMOUNTS REMAINING IN THE TESTING AND INSPECTING ALLOWANCE TO OWNER BY CHANGE ORDER.

1.9 ADJUSTMENT OF ALLOWANCES

A. ALLOWANCE ADJUSTMENT: TO ADJUST ALLOWANCE AMOUNTS, PREPARE A CHANGE ORDER PROPOSAL BASED ON THE DIFFERENCE BETWEEN PURCHASE AMOUNT AND THE ALLOWANCE, MULTIPLIED BY FINAL MEASUREMENT OF WORK-IN-PLACE WHERE APPLICABLE. IF APPLICABLE, INCLUDE REASONABLE ALLOWANCES FOR CUTTING LOSSES, TOLERANCES, MIXING WASTES, NORMAL PRODUCT IMPERFECTIONS, AND SIMILAR MARGINS.
   1. INCLUDE INSTALLATION COSTS IN PURCHASE AMOUNT ONLY WHERE INDICATED AS PART OF THE ALLOWANCE.
   2. IF REQUESTED, PREPARE EXPLANATION AND DOCUMENTATION TO SUBSTANTIATE DISTRIBUTION OF OVERHEAD COSTS AND OTHER MARGINS CLAIMED.
   3. SUBMIT SUBSTANTIATION OF A CHANGE IN SCOPE OF WORK, IF ANY, CLAIMED IN CHANGE ORDERS RELATED TO UNIT-COST ALLOWANCES.
   4. OWNER RESERVES THE RIGHT TO ESTABLISH THE QUANTITY OF WORK-IN-PLACE BY INDEPENDENT QUANTITY SURVEY, MEASURE, OR COUNT.

B. SUBMIT CLAIMS FOR INCREASED COSTS BECAUSE OF A CHANGE IN SCOPE OR NATURE OF THE ALLOWANCE DESCRIBED IN THE CONTRACT DOCUMENTS, WHETHER FOR THE PURCHASE ORDER AMOUNT OR CONTRACTOR'S HANDLING, LABOR, INSTALLATION, OVERHEAD, AND PROFIT.
   1. DO NOT INCLUDE CONTRACTOR'S OR SUBCONTRACTOR'S INDIRECT EXPENSE IN THE CHANGE ORDER COST AMOUNT UNLESS IT IS CLEARLY SHOWN THAT THE NATURE OR EXTENT OF WORK HAS CHANGED FROM WHAT COULD HAVE BEEN FORESEEN FROM INFORMATION IN THE CONTRACT DOCUMENTS.
   2. NO CHANGE TO CONTRACTOR'S INDIRECT EXPENSE IS PERMITTED FOR SELECTION OF HIGHER- OR LOWER-PRICED MATERIALS OR SYSTEMS OF THE SAME SCOPE AND NATURE AS ORIGINALLY INDICATED.

PART 2 - PRODUCTS (NOT USED)

PART 3 - EXECUTION

3.1 PREPARATION

A. COORDINATE SERVICES AND OR MATERIALS AND THEIR INSTALLATION FOR EACH ALLOWANCE WITH RELATED MATERIALS AND INSTALLATIONS TO ENSURE THAT EACH ALLOWANCE ITEM IS COMPLETELY INTEGRATED AND INTERFACED WITH RELATED WORK.

B. THE CONTRACTOR'S RESPONSIBILITIES SHALL BE THE SAME AS IF THE CONTRACTOR NEGOTIATED THE WORK AND ALL WORK SHALL BE FULLY COORDINATED WITH APPROPRIATE SUBCONTRACTORS.

3.2 SCHEDULE OF ALLOWANCES:

A. ALLOWANCE #1 INCLUDE AN ALLOWANCE OF $15,000 TO COVER THE FOLLWING ITEMS
1. THE ELECTRICAL CONTRACTOR SHALL REMOVE ALL ABANDONED ELECTRICAL MATERIAL ABOVE CEILING WITHIN THE PROJECT AREA
2. THE ELECTRICAL CONTRACTOR SHALL REPAIR EXISTING ABOVE CEILING ELECTRICAL ITEMS AS NECESSARY TO BE COMPLIANT WITH ALL CODES LISTED IN ELECTRICAL SPECIFICATIONS.

B. ALLOWANCE #2 – BASE BID DDC ALLOWANCE
1. UNDER BASE BID, PROVIDE SIEMENS DDC SYSTEMS FOR EXTENSION OF PHASE 'A' TO INCLUDE NEW WORK OF PHASE 'B' IN ACCORDANCE WITH OWNER'S CONTINUING CONTRACT.
2. INCLUDE AN ALLOWANCE COST OF **$**_____ (THIS AMOUNT INCLUDES APPLICABLE TAXES). REFER TO ATTACHMENT FOLLOWING THIS SECTION. (COST TO BE PROVIDED UNDER ADDENDUM 1)

C. ALLOWANCE #3 – BASE BID EQUIPMENT ALLOWANCE
1. UNDER BASE BID, PROVIDE CHILLER, BOILER, PUMP, AIR TERMINAL UNITS, ROOFTOP UNITS, IMI FLOW DESIGN (COIL PACKAGES FOR ATU, MANUAL VENTURI, BALANCING VALVE, AUTOFLOW, AND ETC) AS SPECIFICED IN THE DRAWINGS AND SPECIFICATIONS.
2. INCLUDE AN ALLOWANCE COST OF **$**_____ (THIS AMOUNT INCLUDES APPLICABLE TAXES). REFER TO ATTACHMENT FOLLOWING THIS SECTION. (COST TO BE PROVIDED UNDER ADDENDUM 1)

D. ALLOWANCE #4 – BID ALTERNATE #1 DDC ALLOWANCE
1. UNDER BID ALTERNATE #1, PROVIDE SIEMENS DDC SYSTEMS FOR EXTENSION OF PHASE 'A' TO INCLUDE NEW WORK OF PHASE 'B' IN ACCORDANCE WITH OWNER'S CONTINUING CONTRACT.
2. INCLUDE AN ALLOWANCE COST OF **$**_____ (THIS AMOUNT INCLUDES APPLICABLE TAXES). REFER TO ATTACHMENT FOLLOWING THIS SECTION. (COST TO BE PROVIDED UNDER ADDENDUM 1)

E. ALLOWANCE #5 – BID ALTERNATE #1 EQUIPMENT ALLOWANCE
1. UNDER BID ALTERNATE #1, PROVIDE AIR TERMINAL UNITS, ENERGY RECOVERY ROOFTOP UNIT, FAN COIL UNITS, IMI FLOW DESIGN (COIL PACKAGES FOR ATU, MANUAL VENTURI, BALANCING VALVE, AUTOFLOW, AND ETC) AS SPECIFICED IN THE DRAWINGS AND SPECIFICATIONS.
2. INCLUDE AN ALLOWANCE COST OF **$**_____ (THIS AMOUNT INCLUDES APPLICABLE TAXES). REFER TO ATTACHMENT FOLLOWING THIS SECTION. (COST TO BE PROVIDED UNDER ADDENDUM 1)

END OF SECTION

SECTION 01230 - ALTERNATES

PART 1 - GENERAL

1.1 SUMMARY

A. This Section includes administrative and procedural requirements for alternates.

1.2 DEFINITIONS

A. Alternate: An amount proposed by bidders and stated on the Bid Form for certain work defined in the Bidding Requirements that may be added to or deducted from the Base Bid amount if Owner decides to accept a corresponding change either in the amount of construction to be completed or in the products, materials, equipment, systems, or installation methods described in the Contract Documents.

1. The cost or credit for each alternate is the net addition to or deduction from the Contract Sum to incorporate alternate into the Work. No other adjustments are made to the Contract Sum.

1.3 PROCEDURES

A. Coordination: Modify or adjust affected adjacent work as necessary to completely integrate work of the alternate into Project.

1. Include as part of each alternate, miscellaneous devices, accessory objects, and similar items incidental to or required for a complete installation whether or not indicated as part of alternate.

B. Notification: Immediately following award of the Contract, notify each party involved, in writing, of the status of each alternate. Indicate if alternates have been accepted, rejected, or deferred for later consideration. Include a complete description of negotiated modifications to alternates.

C. Execute accepted alternates under the same conditions as other work of the Contract.

D. Schedule: A Schedule of Alternates is included at the end of this Section. Specification Sections referenced in schedule contain requirements for materials necessary to achieve the work described under each alternate.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION

3.1 SCHEDULE OF ALTERNATES

A. Add Alternate No. 1: (ALL WORK RELATED TO ROOMS 022- 022C, 031-031H, and 057) as shown on the drawings.

END OF SECTION

SECTION 01300 - SUBMITTALS, PRODUCTS, AND SUBSTITUTIONS

PART 1 - GENERAL

1.01 SUMMARY

A. COMPLY WITH PROJECT FORMAT FOR SUBMITTALS.

B. ALLOW FOUR WEEKS FOR DESIGNER REVIEW.

C. PROVIDE TYPES OF SUBMITTALS LISTED IN INDIVIDUAL SECTIONS AND NUMBER OF COPIES DESCRIBED IN PARAGRAPH “B” BELOW.

D. CONTRACTOR IS TO REVIEW SUBMITTALS PRIOR TO SUBMISSION TO THE ARCHITECT FOR REVIEW.

E. IF MORE THAN TWO (2) REVIEWS ARE REQUIRED BY THE ARCHITECT (AND THEIR CONSULTANTS) DUE TO THE FAILURE OF ANY SUBMITTAL TO COMPLY WITH THE CONTRACT DOCUMENTS, THE OWNER WILL DEDUCT THE COSTS INCURRED BY THE ARCHITECT AND THEIR CONSULTANTS FOR SUCH RE-REVIEWES FROM THE CONTRACT AMOUNT.

F. BY PROVIDING SUBMITTALS TO THE REVIEWING AUTHORITY, THE SUBMITTER REPRESENTS THAT THE SUBMITTAL CONFORMS WITH THE CONTRACT DOCUMENTS UNLESS SPECIFICALLY NOTED OTHERWISE.

1. SHOP DRAWINGS, REVIEWED, ANNOTATED AND APPROVED BY THE CONTRACTOR – ONE ELECTRONIC COPY
(ARCHITECT MAY REQUEST A HARD COPY)
2. PRODUCT DATA - ONE ELECTRONIC COPY (ARCHITECT MAY REQUEST A HARD COPY)
3. SAMPLES - 2, PLUS EXTRA SAMPLES AS REQUIRED TO INDICATE FULL RANGE OF COLOR, FINISH, AND TEXTURE TO BE EXPECTED.
4. INSPECTION AND TEST REPORTS – 1 IN EACH O&M PACKAGE
5. WARRANTIES – 1 IN EACH O&M PACKAGE
6. OPERATION AND MAINTENANCE MANUALS - 1 COPY INDEXED AND BOUND IN HARD THREE RING BINDERS AND 1 CD
7. WARRANTIES, TESTS, AND INSPECTIONS - 1 COPY IN EACH O&M PACKAGE.
8. AS BUILT DRAWINGS - 1 HARD COPY
9. AS BUILT DRAWINGS - 1 COMPACT DISK LABELED WITH PROJECT TITLE AND RELEASED FOR BIDDING DATE

G. PROVIDE REQUIRED RE-SUBMITTALS; PROVIDE SAME NUMBER AS INITIAL SUBMITTALS.

H. SAMPLES AND SHOP DRAWINGS SHALL BE PREPARED SPECIFICALLY FOR THIS PROJECT. SHOP DRAWINGS SHALL INCLUDE DIMENSIONS AND DETAILS, INCLUDING ADJACENT CONSTRUCTION.

I. PROVIDE WARRANTIES AS SPECIFIED; WARRANTIES SHALL NOT LIMIT LENGTH OF TIME FOR REMEDY OF DAMAGES OWNER MAY HAVE BY LEGAL STATUTE. WARRANTIES SHALL BE SIGNED BY MANUFACTURER AND CONTRACTOR. WARRANTIES AND GUARANTEES SHALL BEGIN ON THE DATE OF “SUBSTANTIAL COMPLETION”

J. PROVIDE PRODUCTS SELECTED OR PRE-APPROVED EQUAL. PRODUCTS SUBMITTED FOR SUBSTITUTION SHALL BE SUBMITTED WITH ITEM BY ITEM COMPARISON INFORMATION. INCLUDE COSTS OF SUBSTITUTION INCLUDING RELATED WORK.

K. PROPOSED SUBSTITUTIONS SHALL BE SUBMITTED TO THE ARCHITECT NO LATER THAN FOURTEEN (14) DAYS PRIOR TO THE DATE OF THE BID.

PART 2 – PRODUCTS (NOT APPLICABLE)

PART 3 – EXECUTION (NOT APPLICABLE)

END OF SECTION

SECTION 01400 - QUALITY REQUIREMENTS

PART 1 - GENERAL

1.1 SUMMARY

A. SECTION INCLUDES ADMINISTRATIVE AND PROCEDURAL REQUIREMENTS FOR QUALITY ASSURANCE AND QUALITY CONTROL.

B. TESTING AND INSPECTION SERVICES ARE REQUIRED TO VERIFY COMPLIANCE WITH REQUIREMENTS SPECIFIED OR INDICATED. THESE SERVICES DO NOT RELIEVE CONTRACTOR OF RESPONSIBILITY FOR COMPLIANCE WITH THE CONTRACT DOCUMENT REQUIREMENTS.

1. SPECIFIED TESTS, INSPECTIONS, AND RELATED ACTIONS DO NOT LIMIT CONTRACTOR'S OTHER QUALITY-ASSURANCE AND QUALITY-CONTROL PROCEDURES THAT FACILITATE COMPLIANCE WITH THE CONTRACT DOCUMENT REQUIREMENTS.
2. REQUIREMENTS FOR CONTRACTOR TO PROVIDE QUALITY-ASSURANCE AND QUALITY-CONTROL SERVICES REQUIRED BY ARCHITECT, OWNER, OR AUTHORITIES HAVING JURISDICTION ARE NOT LIMITED BY PROVISIONS OF THIS SECTION.

1.2 DEFINITIONS

A. EXPERIENCED: WHEN USED WITH AN ENTITY OR INDIVIDUAL, "EXPERIENCED" UNLESS OTHERWISE FURTHER DESCRIBED MEANS HAVING SUCCESSFULLY COMPLETED A MINIMUM OF **FIVE** PREVIOUS PROJECTS SIMILAR IN NATURE, SIZE, AND EXTENT TO THIS PROJECT; BEING FAMILIAR WITH SPECIAL REQUIREMENTS INDICATED; AND HAVING COMPLIED WITH REQUIREMENTS OF AUTHORITIES HAVING JURISDICTION.

B. FIELD QUALITY-CONTROL TESTS AND INSPECTIONS: TESTS AND INSPECTIONS THAT ARE PERFORMED ON-SITE FOR INSTALLATION OF THE WORK AND FOR COMPLETED WORK.

C. INSTALLER/APPLICATOR/ERECTOR: CONTRACTOR OR ANOTHER ENTITY ENGAGED BY CONTRACTOR AS AN EMPLOYEE, SUBCONTRACTOR, OR SUB-SUBCONTRACTOR, TO PERFORM A PARTICULAR CONSTRUCTION OPERATION, INCLUDING INSTALLATION, ERECTION, APPLICATION, ASSEMBLY, AND SIMILAR OPERATIONS.

1. USE OF TRADE-SPECIFIC TERMINOLOGY IN REFERRING TO A WORK RESULT DOES NOT REQUIRE THAT CERTAIN CONSTRUCTION ACTIVITIES SPECIFIED APPLY EXCLUSIVELY TO SPECIFIC TRADE(S).

D. MOCKUPS: FULL-SIZE PHYSICAL ASSEMBLIES THAT ARE CONSTRUCTED ON-SITE EITHER AS FREESTANDING TEMPORARY BUILT ELEMENTS OR AS PART OF PERMANENT CONSTRUCTION. MOCKUPS ARE CONSTRUCTED TO VERIFY SELECTIONS MADE UNDER SAMPLE SUBMITTALS; TO DEMONSTRATE AESTHETIC EFFECTS AND QUALITIES OF MATERIALS AND EXECUTION; TO REVIEW COORDINATION, TESTING, OR OPERATION; TO SHOW INTERFACE BETWEEN DISSIMILAR MATERIALS; AND TO DEMONSTRATE COMPLIANCE WITH SPECIFIED INSTALLATION TOLERANCES. MOCKUPS ARE NOT

SAMPLES. UNLESS OTHERWISE INDICATED, APPROVED MOCKUPS ESTABLISH THE STANDARD BY WHICH THE WORK WILL BE JUDGED.

1. LABORATORY MOCKUPS: FULL-SIZE PHYSICAL ASSEMBLIES CONSTRUCTED AND TESTED AT TESTING FACILITY TO VERIFY PERFORMANCE CHARACTERISTICS.
2. PRODUCT MOCKUPS: MOCKUPS THAT MAY INCLUDE MULTIPLE PRODUCTS, MATERIALS, OR SYSTEMS SPECIFIED IN A SINGLE SECTION.
3. IN-PLACE MOCKUPS: MOCKUPS CONSTRUCTED ON-SITE IN THEIR ACTUAL FINAL LOCATION AS PART OF PERMANENT CONSTRUCTION.

E. PRECONSTRUCTION TESTING: TESTS AND INSPECTIONS PERFORMED SPECIFICALLY FOR PROJECT BEFORE PRODUCTS AND MATERIALS ARE INCORPORATED INTO THE WORK, TO VERIFY PERFORMANCE OR COMPLIANCE WITH SPECIFIED CRITERIA. UNLESS OTHERWISE INDICATED, COPIES OF REPORTS OF TESTS OR INSPECTIONS PERFORMED FOR OTHER THAN THE PROJECT DO NOT MEET THIS DEFINITION.

F. PRODUCT TESTS: TESTS AND INSPECTIONS THAT ARE PERFORMED BY A NATIONALLY RECOGNIZED TESTING LABORATORY (NRTL) ACCORDING TO 29 CFR 1910.7, BY A TESTING AGENCY ACCREDITED ACCORDING TO NIST'S NATIONAL VOLUNTARY LABORATORY ACCREDITATION PROGRAM (NVLAP), OR BY A TESTING AGENCY QUALIFIED TO CONDUCT PRODUCT TESTING AND ACCEPTABLE TO AUTHORITIES HAVING JURISDICTION, TO ESTABLISH PRODUCT PERFORMANCE AND COMPLIANCE WITH SPECIFIED REQUIREMENTS.

G. SOURCE QUALITY-CONTROL TESTS AND INSPECTIONS: TESTS AND INSPECTIONS THAT ARE PERFORMED AT THE SOURCE; FOR EXAMPLE, PLANT, MILL, FACTORY, OR SHOP.

H. TESTING AGENCY: AN ENTITY ENGAGED TO PERFORM SPECIFIC TESTS, INSPECTIONS, OR BOTH. TESTING LABORATORY SHALL HAVE THE SAME MEANING AS TESTING AGENCY.

I. QUALITY-ASSURANCE SERVICES: ACTIVITIES, ACTIONS, AND PROCEDURES PERFORMED BEFORE AND DURING EXECUTION OF THE WORK TO GUARD AGAINST DEFECTS AND DEFICIENCIES AND SUBSTANTIATE THAT PROPOSED CONSTRUCTION WILL COMPLY WITH REQUIREMENTS.

J. QUALITY-CONTROL SERVICES: TESTS, INSPECTIONS, PROCEDURES, AND RELATED ACTIONS DURING AND AFTER EXECUTION OF THE WORK TO EVALUATE THAT ACTUAL PRODUCTS INCORPORATED INTO THE WORK AND COMPLETED CONSTRUCTION COMPLY WITH REQUIREMENTS. CONTRACTOR'S QUALITY-CONTROL SERVICES DO NOT INCLUDE CONTRACT ADMINISTRATION ACTIVITIES PERFORMED BY ARCHITECT.

1.3 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 AND SYSTEMS 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 ARCHITECT.

B. DELEGATED-DESIGN SERVICES STATEMENT: SUBMIT A STATEMENT, SIGNED AND SEALED BY THE RESPONSIBLE DESIGN PROFESSIONAL, FOR EACH PRODUCT AND SYSTEM SPECIFICALLY ASSIGNED TO CONTRACTOR TO BE DESIGNED OR CERTIFIED BY A DESIGN PROFESSIONAL, INDICATING THAT THE PRODUCTS AND SYSTEMS ARE IN COMPLIANCE WITH PERFORMANCE AND DESIGN CRITERIA INDICATED. INCLUDE LIST OF CODES, LOADS, AND OTHER FACTORS USED IN PERFORMING THESE SERVICES.

1.4 CONFLICTING REQUIREMENTS

A. CONFLICTING STANDARDS AND OTHER REQUIREMENTS: IF COMPLIANCE WITH TWO OR MORE STANDARDS OR REQUIREMENTS IS SPECIFIED AND THE STANDARDS OR REQUIREMENTS ESTABLISH DIFFERENT OR CONFLICTING REQUIREMENTS FOR MINIMUM QUANTITIES OR QUALITY LEVELS, INFORM THE ARCHITECT REGARDING THE CONFLICT AND OBTAIN CLARIFICATION PRIOR TO PROCEEDING WITH THE WORK. REFER CONFLICTING REQUIREMENTS THAT ARE DIFFERENT, BUT APPARENTLY EQUAL, TO ARCHITECT FOR CLARIFICATION BEFORE PROCEEDING.

B. MINIMUM QUANTITY OR QUALITY LEVELS: THE QUANTITY OR QUALITY LEVEL SHOWN OR SPECIFIED SHALL BE THE MINIMUM PROVIDED OR PERFORMED. THE ACTUAL INSTALLATION MAY COMPLY EXACTLY WITH THE MINIMUM QUANTITY OR QUALITY SPECIFIED, OR IT MAY EXCEED THE MINIMUM WITHIN REASONABLE LIMITS. TO COMPLY WITH THESE REQUIREMENTS, INDICATED NUMERIC VALUES ARE MINIMUM OR MAXIMUM, AS APPROPRIATE, FOR THE CONTEXT OF REQUIREMENTS. REFER UNCERTAINTIES TO ARCHITECT FOR A DECISION BEFORE PROCEEDING.

1.5 INFORMATIONAL SUBMITTALS

A. CONTRACTOR'S STATEMENT OF RESPONSIBILITY: WHEN REQUIRED BY AUTHORITIES HAVING JURISDICTION, SUBMIT COPY OF WRITTEN STATEMENT OF RESPONSIBILITY SUBMITTED TO AUTHORITIES HAVING JURISDICTION BEFORE STARTING WORK ON THE FOLLOWING SYSTEMS:

1. MAIN WIND-FORCE-RESISTING SYSTEM OR A WIND-RESISTING COMPONENT LISTED IN THE STATEMENT OF SPECIAL INSPECTIONS.

B. TESTING AGENCY QUALIFICATIONS: FOR TESTING AGENCIES SPECIFIED IN "QUALITY ASSURANCE" ARTICLE TO DEMONSTRATE THEIR CAPABILITIES AND EXPERIENCE. INCLUDE PROOF OF QUALIFICATIONS IN THE FORM OF A RECENT REPORT ON THE INSPECTION OF THE TESTING AGENCY BY A RECOGNIZED AUTHORITY.

C. PERMITS, LICENSES, AND CERTIFICATES: FOR OWNER'S RECORD, SUBMIT COPIES OF PERMITS, LICENSES, CERTIFICATIONS, INSPECTION REPORTS, RELEASES, JURISDICTIONAL SETTLEMENTS, NOTICES, RECEIPTS FOR FEE PAYMENTS, JUDGMENTS, CORRESPONDENCE, RECORDS, AND SIMILAR DOCUMENTS ESTABLISHED FOR COMPLIANCE WITH STANDARDS AND REGULATIONS BEARING ON PERFORMANCE OF THE WORK.

1.6 REPORTS AND DOCUMENTS

A. TEST AND INSPECTION REPORTS: PREPARE AND SUBMIT CERTIFIED WRITTEN REPORTS SPECIFIED IN OTHER SECTIONS. INCLUDE THE FOLLOWING:

1. DATE OF ISSUE.
2. PROJECT TITLE AND NUMBER.
3. NAME, ADDRESS, TELEPHONE NUMBER, AND EMAIL ADDRESS OF TESTING AGENCY.
4. DATES AND LOCATIONS OF SAMPLES AND TESTS OR INSPECTIONS.
5. NAMES OF INDIVIDUALS MAKING TESTS AND INSPECTIONS.
6. DESCRIPTION OF THE WORK AND TEST AND INSPECTION METHOD.
7. IDENTIFICATION OF PRODUCT AND SPECIFICATION SECTION.
8. COMPLETE TEST OR INSPECTION DATA.
9. TEST AND INSPECTION RESULTS AND AN INTERPRETATION OF TEST RESULTS.
10. RECORD OF TEMPERATURE AND WEATHER CONDITIONS AT TIME OF SAMPLE TAKING AND TESTING AND INSPECTION.
11. COMMENTS OR PROFESSIONAL OPINION ON WHETHER TESTED OR INSPECTED WORK COMPLIES WITH THE CONTRACT DOCUMENT REQUIREMENTS.
12. NAME AND SIGNATURE OF LABORATORY INSPECTOR.
13. RECOMMENDATIONS ON RETESTING AND REINSPECTING.

B. MANUFACTURER'S TECHNICAL REPRESENTATIVE'S FIELD REPORTS: PREPARE WRITTEN INFORMATION DOCUMENTING MANUFACTURER'S TECHNICAL REPRESENTATIVE'S TESTS AND INSPECTIONS SPECIFIED IN OTHER SECTIONS. INCLUDE THE FOLLOWING:

1. STATEMENT ON CONDITION OF SUBSTRATES AND THEIR ACCEPTABILITY FOR INSTALLATION OF PRODUCT.
2. STATEMENT THAT PRODUCTS AT PROJECT SITE COMPLY WITH REQUIREMENTS.
3. SUMMARY OF INSTALLATION PROCEDURES BEING FOLLOWED, WHETHER THEY COMPLY WITH REQUIREMENTS AND, IF NOT, WHAT CORRECTIVE ACTION WAS TAKEN.
4. RESULTS OF OPERATIONAL AND OTHER TESTS AND A STATEMENT OF WHETHER OBSERVED PERFORMANCE COMPLIES WITH REQUIREMENTS.
5. OTHER REQUIRED ITEMS INDICATED IN INDIVIDUAL SPECIFICATION SECTIONS.

C. FACTORY-AUTHORIZED SERVICE REPRESENTATIVE'S REPORTS: PREPARE WRITTEN INFORMATION DOCUMENTING MANUFACTURER'S FACTORY-AUTHORIZED SERVICE REPRESENTATIVE'S TESTS AND INSPECTIONS SPECIFIED IN OTHER SECTIONS. INCLUDE THE FOLLOWING:

1. STATEMENT THAT EQUIPMENT COMPLIES WITH REQUIREMENTS.
2. RESULTS OF OPERATIONAL AND OTHER TESTS AND A STATEMENT OF WHETHER OBSERVED PERFORMANCE COMPLIES WITH REQUIREMENTS.
3. OTHER REQUIRED ITEMS INDICATED IN INDIVIDUAL SPECIFICATION SECTIONS.

1.7 QUALITY ASSURANCE

A. QUALIFICATIONS PARAGRAPHS IN THIS ARTICLE ESTABLISH THE MINIMUM QUALIFICATION LEVELS REQUIRED; INDIVIDUAL SPECIFICATION SECTIONS SPECIFY ADDITIONAL REQUIREMENTS.

B. MANUFACTURER QUALIFICATIONS: A FIRM EXPERIENCED IN MANUFACTURING PRODUCTS OR SYSTEMS SIMILAR TO THOSE INDICATED FOR THIS PROJECT AND WITH A RECORD OF SUCCESSFUL IN-SERVICE PERFORMANCE, AS WELL AS SUFFICIENT PRODUCTION CAPACITY TO PRODUCE REQUIRED UNITS. AS APPLICABLE, PROCURE PRODUCTS FROM MANUFACTURERS ABLE TO MEET QUALIFICATION REQUIREMENTS, WARRANTY REQUIREMENTS, AND TECHNICAL OR FACTORY-AUTHORIZED SERVICE REPRESENTATIVE REQUIREMENTS.

C. FABRICATOR QUALIFICATIONS: A FIRM EXPERIENCED IN PRODUCING PRODUCTS SIMILAR TO THOSE INDICATED FOR THIS PROJECT AND WITH A RECORD OF SUCCESSFUL IN-SERVICE PERFORMANCE, AS WELL AS SUFFICIENT PRODUCTION CAPACITY TO PRODUCE REQUIRED UNITS.

D. INSTALLER QUALIFICATIONS: A FIRM OR INDIVIDUAL EXPERIENCED IN INSTALLING, ERECTING, APPLYING, OR ASSEMBLING WORK SIMILAR IN MATERIAL, DESIGN, AND EXTENT TO THAT INDICATED FOR THIS PROJECT, WHOSE WORK HAS RESULTED IN CONSTRUCTION WITH A RECORD OF SUCCESSFUL IN-SERVICE PERFORMANCE.

E. PROFESSIONAL ENGINEER QUALIFICATIONS: A PROFESSIONAL ENGINEER WHO IS LEGALLY QUALIFIED TO PRACTICE IN JURISDICTION WHERE PROJECT IS LOCATED AND WHO IS EXPERIENCED IN PROVIDING ENGINEERING SERVICES OF THE KIND INDICATED. ENGINEERING SERVICES ARE DEFINED AS THOSE PERFORMED FOR INSTALLATIONS OF THE SYSTEM, ASSEMBLY, OR PRODUCT THAT ARE SIMILAR IN MATERIAL, DESIGN, AND EXTENT TO THOSE INDICATED FOR THIS PROJECT.

F. SPECIALISTS: CERTAIN SPECIFICATION SECTIONS REQUIRE THAT SPECIFIC CONSTRUCTION ACTIVITIES SHALL BE PERFORMED BY ENTITIES WHO ARE RECOGNIZED EXPERTS IN THOSE OPERATIONS. SPECIALISTS SHALL SATISFY QUALIFICATION REQUIREMENTS INDICATED AND SHALL BE ENGAGED FOR THE ACTIVITIES INDICATED.

1. REQUIREMENTS OF AUTHORITIES HAVING JURISDICTION SHALL SUPERSEDE REQUIREMENTS FOR SPECIALISTS.

G. TESTING AND INSPECTING AGENCY QUALIFICATIONS: AN NRTL, AN NVLAP, OR AN INDEPENDENT AGENCY WITH THE EXPERIENCE AND CAPABILITY TO CONDUCT TESTING AND INSPECTION INDICATED, AS DOCUMENTED ACCORDING TO **ASTM E329**; AND WITH ADDITIONAL QUALIFICATIONS SPECIFIED IN INDIVIDUAL SECTIONS; AND, WHERE REQUIRED BY AUTHORITIES HAVING JURISDICTION, THAT IS ACCEPTABLE TO AUTHORITIES.

H. MANUFACTURER'S TECHNICAL REPRESENTATIVE QUALIFICATIONS: AN AUTHORIZED REPRESENTATIVE OF MANUFACTURER WHO IS TRAINED AND APPROVED BY MANUFACTURER TO OBSERVE AND INSPECT INSTALLATION OF MANUFACTURER'S PRODUCTS THAT ARE SIMILAR IN MATERIAL, DESIGN, AND EXTENT TO THOSE INDICATED FOR THIS PROJECT.

I. PRECONSTRUCTION TESTING: WHERE TESTING AGENCY IS INDICATED TO PERFORM PRECONSTRUCTION TESTING FOR COMPLIANCE WITH SPECIFIED REQUIREMENTS FOR PERFORMANCE AND TEST METHODS, COMPLY WITH THE FOLLOWING:

1. CONTRACTOR RESPONSIBILITIES INCLUDE THE FOLLOWING:

a. PROVIDE TEST SPECIMENS REPRESENTATIVE OF PROPOSED PRODUCTS AND CONSTRUCTION.
b. SUBMIT SPECIMENS IN A TIMELY MANNER WITH SUFFICIENT TIME FOR TESTING AND ANALYZING RESULTS TO PREVENT DELAYING THE WORK.
c. BUILD LABORATORY MOCKUPS AT TESTING FACILITY USING PERSONNEL, PRODUCTS, AND METHODS OF CONSTRUCTION INDICATED FOR THE COMPLETED WORK.
d. WHEN TESTING IS COMPLETE, REMOVE TEST SPECIMENS AND TEST ASSEMBLIES, **AND** MOCKUPS; DO NOT REUSE PRODUCTS ON PROJECT.

2. TESTING AGENCY RESPONSIBILITIES: SUBMIT A CERTIFIED WRITTEN REPORT OF EACH TEST, INSPECTION, AND SIMILAR QUALITY-ASSURANCE SERVICE TO ARCHITECT **AND COMMISSIONING AUTHORITY** WITH COPY TO CONTRACTOR. INTERPRET TESTS AND INSPECTIONS AND STATE IN EACH REPORT WHETHER TESTED AND INSPECTED WORK COMPLIES WITH OR DEVIATES FROM THE CONTRACT DOCUMENTS.

J. MOCKUPS: BEFORE INSTALLING PORTIONS OF THE WORK REQUIRING MOCKUPS, BUILD MOCKUPS FOR EACH FORM OF CONSTRUCTION AND FINISH REQUIRED TO COMPLY WITH THE FOLLOWING REQUIREMENTS, USING MATERIALS INDICATED FOR THE COMPLETED WORK:

1. BUILD MOCKUPS TO BE MINIMUM OF 8’ LONG X 10’ HIGH.
2. BUILD MOCKUPS IN LOCATION INDICATED OR, IF NOT INDICATED, AS DIRECTED BY ARCHITECT.
3. NOTIFY ARCHITECT **SEVEN** DAYS IN ADVANCE OF DATES AND TIMES WHEN MOCKUPS WILL BE CONSTRUCTED.
4. EMPLOY SUPERVISORY PERSONNEL WHO WILL OVERSEE MOCKUP CONSTRUCTION. EMPLOY WORKERS THAT WILL BE EMPLOYED TO PERFORM SAME TASKS DURING THE CONSTRUCTION AT PROJECT.
5. DEMONSTRATE THE PROPOSED RANGE OF AESTHETIC EFFECTS AND WORKMANSHIP.
6. OBTAIN ARCHITECT'S AND BUILDING ENVELOPE CONSULTANT’S APPROVAL OF MOCKUPS BEFORE STARTING CORRESPONDING WORK, FABRICATION, OR CONSTRUCTION.

    a. ALLOW **SEVEN** DAYS FOR INITIAL REVIEW AND EACH RE-REVIEW OF EACH MOCKUP.

7. PROMPTLY CORRECT UNSATISFACTORY CONDITIONS NOTED BY ARCHITECT'S PRELIMINARY REVIEW, TO THE SATISFACTION OF THE ARCHITECT, BEFORE COMPLETION OF FINAL MOCKUP.
8. APPROVAL OF MOCKUPS BY THE ARCHITECT DOES NOT CONSTITUTE APPROVAL OF DEVIATIONS FROM THE CONTRACT DOCUMENTS CONTAINED IN MOCKUPS UNLESS ARCHITECT SPECIFICALLY APPROVES SUCH DEVIATIONS IN WRITING.
9. MAINTAIN MOCKUPS DURING CONSTRUCTION IN AN UNDISTURBED CONDITION AS A STANDARD FOR JUDGING THE COMPLETED WORK.
10. DEMOLISH AND REMOVE MOCKUPS WHEN DIRECTED UNLESS OTHERWISE INDICATED.

K. INTEGRATED EXTERIOR MOCKUPS: CONSTRUCT INTEGRATED EXTERIOR MOCKUP **ACCORDING TO APPROVED SHOP DRAWINGS AND CONSTRUCTION DOCUMENTS**. COORDINATE INSTALLATION OF EXTERIOR ENVELOPE MATERIALS AND PRODUCTS FOR WHICH MOCKUPS ARE REQUIRED IN INDIVIDUAL SPECIFICATION SECTIONS, ALONG WITH SUPPORTING MATERIALS. COMPLY WITH REQUIREMENTS IN "MOCKUPS" PARAGRAPH.

1. COORDINATE CONSTRUCTION OF THE MOCKUP TO ALLOW OBSERVATION OF AIR BARRIER INSTALLATION, FLASHINGS, AIR BARRIER INTEGRATION WITH FENESTRATION SYSTEMS, AND OTHER PORTIONS OF THE BUILDING AIR/MOISTURE BARRIER AND DRAINAGE ASSEMBLIES, PRIOR TO INSTALLATION OF VENEER, CLADDING ELEMENTS, AND OTHER COMPONENTS THAT WILL OBSCURE THE WORK.

1.8 QUALITY CONTROL

A. OWNER RESPONSIBILITIES: WHERE QUALITY-CONTROL SERVICES ARE INDICATED AS OWNER'S RESPONSIBILITY, OWNER WILL ENGAGE A QUALIFIED TESTING AGENCY TO PERFORM THESE SERVICES.

1. OWNER WILL FURNISH CONTRACTOR WITH NAMES, ADDRESSES, AND TELEPHONE NUMBERS OF TESTING AGENCIES ENGAGED AND A DESCRIPTION OF TYPES OF TESTING AND INSPECTION THEY ARE ENGAGED TO PERFORM.
2. COSTS FOR RETESTING AND REINSPECTING CONSTRUCTION THAT REPLACES OR IS NECESSITATED BY WORK THAT FAILED TO COMPLY WITH THE CONTRACT DOCUMENTS WILL BE CHARGED TO CONTRACTOR.

B. CONTRACTOR RESPONSIBILITIES: TESTS AND INSPECTIONS NOT EXPLICITLY ASSIGNED TO OWNER ARE CONTRACTOR'S RESPONSIBILITY. PERFORM ADDITIONAL QUALITY-CONTROL ACTIVITIES, WHETHER SPECIFIED OR NOT, TO VERIFY AND DOCUMENT THAT THE WORK COMPLIES WITH REQUIREMENTS.

1. ENGAGE A QUALIFIED TESTING AGENCY TO PERFORM QUALITY-CONTROL SERVICES.

a. CONTRACTOR SHALL NOT EMPLOY SAME ENTITY ENGAGED BY OWNER, UNLESS AGREED TO IN WRITING BY OWNER.

2. NOTIFY TESTING AGENCIES AT LEAST **24** HOURS IN ADVANCE OF TIME WHEN WORK THAT REQUIRES TESTING OR INSPECTION WILL BE PERFORMED.
3. WHERE QUALITY-CONTROL SERVICES ARE INDICATED AS CONTRACTOR'S RESPONSIBILITY, SUBMIT A CERTIFIED WRITTEN REPORT, IN DUPLICATE, OF EACH QUALITY-CONTROL SERVICE.
4. TESTING AND INSPECTION REQUESTED BY CONTRACTOR AND NOT REQUIRED BY THE CONTRACT DOCUMENTS ARE CONTRACTOR'S RESPONSIBILITY.
5. SUBMIT ADDITIONAL COPIES OF EACH WRITTEN REPORT DIRECTLY TO AUTHORITIES HAVING JURISDICTION, WHEN THEY SO DIRECT.

C. RETESTING/REINSPECTING: REGARDLESS OF WHETHER ORIGINAL TESTS OR INSPECTIONS WERE CONTRACTOR'S RESPONSIBILITY, PROVIDE QUALITY-CONTROL SERVICES, INCLUDING RETESTING AND REINSPECTING, FOR CONSTRUCTION THAT REPLACED WORK THAT FAILED TO COMPLY WITH THE CONTRACT DOCUMENTS.

D. TESTING AGENCY RESPONSIBILITIES: COOPERATE WITH ARCHITECT**, COMMISSIONING AUTHORITY,** AND CONTRACTOR IN PERFORMANCE OF DUTIES. PROVIDE QUALIFIED PERSONNEL TO PERFORM REQUIRED TESTS AND INSPECTIONS.

1. NOTIFY ARCHITECT**, COMMISSIONING AUTHORITY,** AND CONTRACTOR PROMPTLY OF IRREGULARITIES OR DEFICIENCIES OBSERVED IN THE WORK DURING PERFORMANCE OF ITS SERVICES.
2. DETERMINE THE LOCATIONS FROM WHICH TEST SAMPLES WILL BE TAKEN AND IN WHICH IN-SITU TESTS ARE CONDUCTED.
3. CONDUCT AND INTERPRET TESTS AND INSPECTIONS AND STATE IN EACH REPORT WHETHER TESTED AND INSPECTED WORK COMPLIES WITH OR DEVIATES FROM REQUIREMENTS.
4. SUBMIT A CERTIFIED WRITTEN REPORT, IN DUPLICATE, OF EACH TEST, INSPECTION, AND SIMILAR QUALITY-CONTROL SERVICE THROUGH CONTRACTOR.
5. DO NOT RELEASE, REVOKE, ALTER, OR INCREASE THE CONTRACT DOCUMENT REQUIREMENTS OR APPROVE OR ACCEPT ANY PORTION OF THE WORK.

6. DO NOT PERFORM DUTIES OF CONTRACTOR.

E. MANUFACTURER'S FIELD SERVICES: WHERE INDICATED, ENGAGE A FACTORY-AUTHORIZED SERVICE REPRESENTATIVE TO INSPECT FIELD-ASSEMBLED COMPONENTS AND EQUIPMENT INSTALLATION, INCLUDING SERVICE CONNECTIONS. REPORT RESULTS IN WRITING AS SPECIFIED IN SECTION 013300 "SUBMITTAL PROCEDURES."

F. MANUFACTURER'S TECHNICAL SERVICES: WHERE INDICATED, ENGAGE A MANUFACTURER'S TECHNICAL REPRESENTATIVE TO OBSERVE AND INSPECT THE WORK. MANUFACTURER'S TECHNICAL REPRESENTATIVE'S SERVICES INCLUDE PARTICIPATION IN PREINSTALLATION CONFERENCES, EXAMINATION OF SUBSTRATES AND CONDITIONS, VERIFICATION OF MATERIALS, OBSERVATION OF INSTALLER ACTIVITIES, INSPECTION OF COMPLETED PORTIONS OF THE WORK, AND SUBMITTAL OF WRITTEN REPORTS.

G. CONTRACTOR'S ASSOCIATED REQUIREMENTS AND SERVICES: COOPERATE WITH AGENCIES AND REPRESENTATIVES PERFORMING REQUIRED TESTS, INSPECTIONS, AND SIMILAR QUALITY-CONTROL SERVICES, AND PROVIDE REASONABLE AUXILIARY SERVICES AS REQUESTED. NOTIFY AGENCY SUFFICIENTLY IN ADVANCE OF OPERATIONS TO PERMIT ASSIGNMENT OF PERSONNEL. PROVIDE THE FOLLOWING:

1. ACCESS TO THE WORK.
2. INCIDENTAL LABOR AND FACILITIES NECESSARY TO FACILITATE TESTS AND INSPECTIONS.
3. ADEQUATE QUANTITIES OF REPRESENTATIVE SAMPLES OF MATERIALS THAT REQUIRE TESTING AND INSPECTION. ASSIST AGENCY IN OBTAINING SAMPLES.
4. FACILITIES FOR STORAGE AND FIELD CURING OF TEST SAMPLES.
5. PRELIMINARY DESIGN MIX PROPOSED FOR USE FOR MATERIAL MIXES THAT REQUIRE CONTROL BY TESTING AGENCY.
6. SECURITY AND PROTECTION FOR SAMPLES AND FOR TESTING AND INSPECTION EQUIPMENT AT PROJECT SITE.

H. COORDINATION: COORDINATE SEQUENCE OF ACTIVITIES TO ACCOMMODATE REQUIRED QUALITY-ASSURANCE AND QUALITY-CONTROL SERVICES WITH A MINIMUM OF DELAY AND TO AVOID NECESSITY OF REMOVING AND REPLACING CONSTRUCTION TO ACCOMMODATE TESTING AND INSPECTION.

1. SCHEDULE TIMES FOR TESTS, INSPECTIONS, OBTAINING SAMPLES, AND SIMILAR ACTIVITIES.

1.9 SPECIAL TESTS AND INSPECTIONS

A. SPECIAL TESTS AND INSPECTIONS: OWNER WILL ENGAGE A QUALIFIED **SPECIAL INSPECTOR** TO CONDUCT SPECIAL TESTS AND INSPECTIONS REQUIRED BY AUTHORITIES HAVING JURISDICTION AS THE RESPONSIBILITY OF OWNER**, AS INDICATED IN THE THRESHOLD INSPECTION PLAN.**

PART 2 - PRODUCTS (NOT USED)

PART 3 - EXECUTION

3.1 TEST AND INSPECTION LOG

A. TEST AND INSPECTION LOG: PREPARE A RECORD OF TESTS AND INSPECTIONS. INCLUDE THE FOLLOWING:

1. DATE TEST OR INSPECTION WAS CONDUCTED.
2. DESCRIPTION OF THE WORK TESTED OR INSPECTED.
3. DATE TEST OR INSPECTION RESULTS WERE TRANSMITTED TO ARCHITECT.
4. IDENTIFICATION OF TESTING AGENCY OR SPECIAL INSPECTOR CONDUCTING TEST OR INSPECTION.

B. MAINTAIN LOG AT PROJECT SITE. POST CHANGES AND REVISIONS AS THEY OCCUR. PROVIDE ACCESS TO TEST AND INSPECTION LOG FOR ARCHITECT'S**, COMMISSIONING AUTHORITY'S,** BUILDING ENVELOPE CONSULTANT, THRESHOLD INSPECTOR, **AND AUTHORITIES' HAVING JURISDICTION** REFERENCE DURING NORMAL WORKING HOURS.

1. SUBMIT LOG AT PROJECT CLOSEOUT AS PART OF PROJECT RECORD DOCUMENTS.

3.2 REPAIR AND PROTECTION

A. GENERAL: ON COMPLETION OF TESTING, INSPECTION, SAMPLE TAKING, AND SIMILAR SERVICES, REPAIR DAMAGED CONSTRUCTION AND RESTORE SUBSTRATES AND FINISHES.

1. PROVIDE MATERIALS AND COMPLY WITH INSTALLATION REQUIREMENTS SPECIFIED IN OTHER SPECIFICATION SECTIONS OR MATCHING EXISTING SUBSTRATES AND FINISHES. RESTORE PATCHED AREAS AND EXTEND RESTORATION INTO ADJOINING AREAS WITH DURABLE SEAMS THAT ARE AS INVISIBLE AS POSSIBLE. COMPLY WITH THE CONTRACT DOCUMENT REQUIREMENTS FOR CUTTING AND PATCHING IN SECTION 017300 "EXECUTION."

B. PROTECT CONSTRUCTION EXPOSED BY OR FOR QUALITY-CONTROL SERVICE ACTIVITIES.

C. REPAIR AND PROTECTION ARE CONTRACTOR'S RESPONSIBILITY, REGARDLESS OF THE ASSIGNMENT OF RESPONSIBILITY FOR QUALITY-CONTROL SERVICES.

END OF SECTION

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SECTION 01500 - TEMPORARY FACILITIES, SITE ACCESS AND SAFETY

PART 1 - GENERAL

1.01 SUMMARY

A. PROVIDE AND PAY FOR TEMPORARY SERVICES AND UTILITIES:
   1. WATER (POTABLE): IS AVILABLE AT THE SITE.
   2. SEWER SEDIMENT: PROVIDE PORTABLE TOILETS AS REQUIRED FOR WORKERS.
   3. POWER: POWER IS AVAILABLE AT THE SITE.
   4. PROVIDE TELEPHONE, COMPUTERS, AND INTERNET SERVICE IN THE FIELD OFFICE.

B. IMPACT FEES WILL BE PAID BY THE OWNER

C. PROVIDE CONSTRUCTION FACILITIES:

   1. CONSTRUCTION EQUIPMENT.
   2 CONSTRUCTION OFFICE
   3. TEMPORARY FENCING AND GATES.
   4. HEATING.
   5. LIGHTING.
   6. ACCESS:
      A. **GLOVER LANE - EXACT ROUTING WILL BE DETERMINED AT A LATER DATE.**

      B. THE CONTRACTOR SHALL PHOTO DOCUMENT THE EXISTING CONDITIONS AS THEY RELATE TO THE SITE AND SURROUNDING AREA AND PROVIDE THIS DOCUMENTATION TO THE ARCHITECT UPON REQUEST. FAILURE TO DO SO MAY JEPRODISE THE CONTRACTORS DEFENSE FROM CLAIMS OF CONSTRUCTION RELATED DAMAGES.

D. PROVIDE SECURITY AND PROTECTION REQUIREMENTS:
   1. FIRE EXTINGUISHERS AND COUNTY REQUIRDE FIRE PREVENTION MEASURES INCLUDED WITHIN PERMIT REQUIREMENTS.
      A. SANTA ROSA COUNTY DEVELOPMENT SERVICES HAS REQUIREMENTS FOR FIRE PROTECTION DURING CONSTRUCTION AS PART OF YOUR PERMITTING PROCESS. OFFICE NUMBER: 850-981-7000. THIS INFORMATION IS OFFERED FOR CONVENIENCE AND IS NOT INTENDED TO SPECIFY ALL APPLICABLE JURISDICTIONAL REQUIREMENTS.
   2. SITE ENCLOSURE FENCE, BARRICADES, WARNING SIGNS, AND LIGHTS.
   3. BUILDING ENCLOSURE AND LOCK-UP.
   4. ENVIRONMENTAL PROTECTION.
   5. PEST CONTROL.
   6. PROVIDE FENCES AS INDICATED AND OR AS REQUIRED TO PREVENT ACCESS TO THE CONSTRUCTION AREA BY UNAUTHORIZED PERSONS. FENCING SHALL BE DESCRIBED IN THE CONTRACTOR'S SAFETY PLAN. SEE PARAGRAPH "E" BELOW.
   7. TEMPORARY FIRE ACCESS AND WATER SUPPLY DURING CONSTRUCTION.
      A. REGARDING TEMPORARY FIRE ACCESS AND WATER SUPPLY DURING CONSTRUCTION, THE CONTRACTOR IS DIRECTED TO NFPA 241, 7.5.5.1 AND NFPA 241, 8.7.2.1 RESPECTIVELY. THIS

CLARIFICATION IS OFFERED FOR CONVENIENCE AND IS NOT INTENDED TO SPECIFY ALL APPLICABLE JURISDICTIONAL REQUIREMENTS.

E. PROVIDE PERSONNEL SUPPORT FACILITIES:
   1. CONTRACTOR'S FIELD OFFICE CAPABLE OF ACCOMIDATING THE OAC MEETINGS
   2. SMART PHONE AND COMPUTERS CAPABLE OF RECEIVING AND SENDING EMAILS AND PHOTOGRAPHS
   3. SANITARY FACILITIES.
   4. DRINKING WATER.
   5. CLEANING AND TRASH REMOVAL.

PART 2 – PRODUCTS (NOT APPLICABLE)

PART 3 – EXECUTION (NOT APPLICABLE)

END OF SECTION

SECTION 01710 – CLEANING

PART 1: GENERAL

1.01 CONDITIONS AND REQUIREMENTS:

A. THE GENERAL CONDITIONS, SUPPLEMENTARY CONDITIONS AND DIVISION 0 - GENERAL REQUIREMENTS APPLY.

B. THE CONTRACTOR SHALL PERFORM WORK ACCORDING TO THIS SECTION DURING CONSTRUCTION AND FINAL CLEANING OF ALL SURFACES AND MATERIALS.

1.02 APPLICABLE PUBLICATIONS:

A. THE PUBLICATIONS LISTED BELOW FORM A PART OF THESE SPECIFICATIONS TO THE EXTENT REFERENCED. THE PUBLICATIONS ARE REFERRED TO IN THE TEXT BY THE BASIC DESIGNATION ONLY.

1. CODE OF FEDERAL REGULATIONS (CFR).

40 CFR 260 -268 & 761, HAZARDOUS WASTE MANAGEMENT.

2. FLORIDA ADMINISTRATIVE CODE (FAC).

RULE 17-30, HAZARDOUS WASTE.

1.03 DESCRIPTION:

A. MAINTAIN PREMISES AND PROPERTIES FREE FROM ACCUMULATIONS OF WASTE, DEBRIS, AND RUBBISH CAUSED BY OPERATIONS.

B. AT COMPLETION OF WORK, REMOVE WASTE MATERIALS, RUBBISH, TOOLS, EQUIPMENT, MACHINERY AND SURPLUS MATERIALS, AND CLEAN ALL SIGHT-EXPOSED SURFACES, LEAVE PROJECT CLEAN AND READY FOR OCCUPANCY.

1.04 SAFETY REQUIREMENTS:

A. STANDARDS: MAINTAIN PROJECT IN ACCORDANCE WITH SAFETY AND INSURANCE STANDARDS.

B. HAZARDS CONTROL:

1. STORE VOLATILE WASTES IN COVERED MATERIAL CONTAINERS AND REMOVE FROM PREMISES DAILY.

2. PREVENT ACCUMULATION OF WASTES WHICH CREATE HAZARDOUS CONDITIONS.

3. PROVIDE ADEQUATE VENTILATION DURING USE OF VOLATILE OR NOXIOUS SUBSTANCES.

C. CONTRACTOR SHALL DISPOSE OF ALL HAZARDOUS WASTE IN ACCORDANCE WITH ALL APPLICABLE FEDERAL AND STATE LAWS INCLUDING BUT NOT LIMITED TO 40 CFR 260-268, 761 AND FAC RULE 17.30

1. DO NOT BURN OR BURY RUBBISH AND WASTE MATERIALS ON PROJECT SITE.

2. DO NOT DISPOSE OF VOLATILE WASTES SUCH AS MINERAL SPIRITS, OIL, OR PAINT THINNER IN STORM OR SANITARY DRAINS.

3. DO NOT DISPOSE OF WASTES INTO STREAMS OR WATERWAYS.

4. DO NOT DISPOSE OF HAZARDOUS WASTE CONTAINERS IN DUMPSTERS.

PART 2: PRODUCTS

2.01 MATERIALS:

A. USE ONLY CLEANING MATERIALS RECOMMENDED BY MANUFACTURER OF SURFACE TO BE CLEANED.

PART 3: EXECUTION

3.01 DURING CONSTRUCTION:

A. EXECUTE CLEANING TO ENSURE THAT BUILDINGS, GROUNDS, AND PUBLIC PROPERTIES ARE MAINTAINED FREE FROM ACCUMULATIONS OF WASTE MATERIALS AND RUBBISH.

B. CLEAN SITE AND DISPOSE OF WASTE MATERIALS, DEBRIS, AND RUBBISH ON A DAILY BASIS.

C. REMOVE WASTE MATERIALS, DEBRIS, AND RUBBISH FROM SITE AND LEGALLY DISPOSE.

D. DURING CONSTRUCTION, PERFORM MAGNETIC SWEEP AROUND CONSTRUCTION SITE ON A DAILY BASIS FOR LOOSE NAILS AND METALLIC WASTES.

3.02 FINAL CLEANING:

A. IN PREPARATION FOR SUBSTANTIAL COMPLETION OR OCCUPANCY, CONDUCT FINAL INSPECTION OF SIGHT-EXPOSED INTERIOR AND EXTERIOR SURFACES, AND OF CONCEALED SPACES.

B. REPAIR, PATCH AND TOUCH UP MARRED SURFACES TO SPECIFIED FINISH, TO MATCH ADJACENT SURFACES.

C. MAINTAIN CLEANING UNTIL PROJECT, OR PORTION THEREOF, IS OCCUPIED BY THE OWNER.

END OF SECTION

SECTION 05120 - STRUCTURAL STEEL FRAMING

PART 1 - GENERAL

1.1 SUMMARY

A. SECTION INCLUDES:

1. STRUCTURAL STEEL.
2. GROUT.

1.2 DEFINITIONS

A. STRUCTURAL STEEL: ELEMENTS OF THE STRUCTURAL FRAME INDICATED ON DRAWINGS AND AS DESCRIBED IN AISC 303, "CODE OF STANDARD PRACTICE FOR STEEL BUILDINGS AND BRIDGES."

1.3 ACTION SUBMITTALS

A. PRODUCT DATA: FOR EACH TYPE OF PRODUCT.

B. SHOP DRAWINGS: SHOW FABRICATION OF STRUCTURAL-STEEL COMPONENTS, INCLUDING CONNECTIONS, SPLICES, HOLES, WELDS, AND BOLTS.

1.4 QUALITY ASSURANCE

A. COMPLY WITH APPLICABLE PROVISIONS IN AISC'S "SPECIFICATION FOR STRUCTURAL STEEL BUILDINGS--ALLOWABLE STRESS DESIGN AND PLASTIC DESIGN."

B. WELDING QUALIFICATIONS: QUALIFY PROCEDURES AND PERSONNEL ACCORDING TO AWS D1.1/D1.1M, "STRUCTURAL WELDING CODE - STEEL."

C. COMPLY WITH APPLICABLE PROVISIONS OF THE FOLLOWING SPECIFICATIONS AND DOCUMENTS:

1. AISC 303.
2. AISC 360.
3. RCSC'S "SPECIFICATION FOR STRUCTURAL JOINTS USING ASTM A 325 OR A 490 BOLTS."

1.5 STORAGE AND PROTECTION

A. STORE STEEL MEMBERS OFF GROUND AND PROTECT STEEL MEMBERS AND PACKAGED MATERIALS FROM EROSION AND DETERIORATION.

B. STORE FASTENERS IN A PROTECTED PLACE. CLEAN AND RELUBRICATE BOLTS AND NUTS THAT BECOME DRY OR RUSTY BEFORE USE.

PART 2 - PRODUCTS

2.1 STRUCTURAL-STEEL MATERIALS

A. CHANNELS, ANGLES-SHAPES: ASTM A 36/A 36M OR ASTM A 572, GRADE 50, HIGH-STRENGTH, LOW-ALLOY COLUMBIUM-VANADIUM STEEL.

B. PLATE AND BAR: ASTM A 36/A 36M OR ASTM A 572, GRADE 50, HIGH-STRENGTH, LOW-ALLOY COLUMBIUM-VANADIUM STEEL.

C. COLD-FORMED HOLLOW STRUCTURAL SECTIONS: ASTM A 500/A 500M, GRADE B, STRUCTURAL TUBING.

D. STEEL PIPE: ASTM A 53/A 53M, TYPE E OR TYPE S, GRADE B.

E. WELDING ELECTRODES: COMPLY WITH AWS REQUIREMENTS.

2.2 BOLTS, CONNECTORS, AND ANCHORS

A. TENSION-CONTROL, HIGH-STRENGTH BOLTS-NUT-WASHERS ASSEMBLIES: ASTM F 1852, TYPE 1, HEAVY-HEX HEAD ASSEMBLIES CONSISTING OF STEEL STRUCTURAL BOLTS WITH SPLINED ENDS, HEAVY-HEX CARBON-STEEL NUTS, AND HARDENED CARBON-STEEL WASHERS.

1. FINISH: PLAIN.

B. SHEAR CONNECTORS: ASTM A 108, GRADES 1015 THROUGH 1020, HEADED-STUD TYPE, COLD-FINISHED CARBON STEEL; AWS D1.1/D1.1M, TYPE B.

C. HEADED ANCHOR RODS: ASTM F 1554, GRADE 36 OR ASTM A 307, GRADE A, STRAIGHT; CARBON-STEEL, HEX-HEAD BOLTS, HEAVY HEX CARBON-STEEL NUTS, AND HARDENED CARBON-STEEL WASHERS.

1. FINISH: PLAIN UNLESS OTHERWISE INDICATED ON DRAWINGS.

D. THREADED RODS: ASTM A 36/A 36M OR ASTM A 193/A 193M, GRADE B7.

1. FINISH: PLAIN UNLESS OTHERWISE INDICATED ON DRAWINGS.

2.3 PRIMER

A. PRIMER: FABRICATOR'S STANDARD LEAD- AND CHROMATE-FREE, NONASPHALTIC, RUST-INHIBITING PRIMER COMPLYING WITH MPI#79 AND COMPATIBLE WITH TOPCOAT.

2.4 GROUT

A. NONMETALLIC, SHRINKAGE-RESISTANT GROUT: ASTM C 1107/C 1107M, FACTORY-PACKAGED, NONMETALLIC AGGREGATE GROUT, NONCORROSIVE AND 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 303, "CODE OF STANDARD PRACTICE FOR STEEL BUILDINGS AND BRIDGES," AND TO AISC 360.

B. 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/D1.1M AND MANUFACTURER'S WRITTEN INSTRUCTIONS.

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, UNLESS INDICATED AS SLIP-CRITICAL, DIRECT-TENSION, OR TENSIONED SHEAR/BEARING CONNECTIONS.

B. WELD CONNECTIONS: COMPLY WITH AWS D1.1/D1.1M FOR TOLERANCES, APPEARANCES, WELDING PROCEDURE SPECIFICATIONS, WELD QUALITY, AND METHODS USED IN CORRECTING WELDING WORK.

2.7 SHOP PRIMING

A. SHOP PRIME STEEL SURFACES EXCEPT THE FOLLOWING:

1. SURFACES EMBEDDED IN CONCRETE OR MORTAR. EXTEND PRIMING OF PARTIALLY EMBEDDED MEMBERS TO A DEPTH OF 2 INCHES.
2. SURFACES TO BE FIELD WELDED.
3. SURFACES OF HIGH-STRENGTH BOLTED, SLIP-CRITICAL CONNECTIONS.
4. SURFACES TO RECEIVE SPRAYED FIRE-RESISTIVE MATERIALS (APPLIED FIREPROOFING).
5. GALVANIZED SURFACES.
6. SURFACES ENCLOSED IN INTERIOR CONSTRUCTION.

B. SURFACE PREPARATION: CLEAN SURFACES TO BE PAINTED. REMOVE LOOSE RUST AND MILL SCALE AND SPATTER, SLAG, OR FLUX DEPOSITS. PREPARE SURFACES ACCORDING TO THE FOLLOWING SPECIFICATIONS AND STANDARDS:

1. SSPC-SP 2, "HAND TOOL CLEANING."

C. PRIMING: IMMEDIATELY AFTER SURFACE PREPARATION, APPLY PRIMER ACCORDING TO MANUFACTURER'S WRITTEN INSTRUCTIONS AND AT RATE RECOMMENDED BY SSPC TO PROVIDE A MINIMUM DRY FILM THICKNESS OF 1.5 MILS. USE PRIMING METHODS THAT RESULT IN FULL COVERAGE OF JOINTS, CORNERS, EDGES, AND EXPOSED SURFACES.

PART 3 - EXECUTION

3.1 EXAMINATION

A. VERIFY, WITH CERTIFIED STEEL ERECTOR PRESENT, ELEVATIONS OF CONCRETE- AND MASONRY-BEARING SURFACES AND LOCATIONS OF ANCHOR RODS, BEARING PLATES, AND OTHER EMBEDMENTS FOR COMPLIANCE WITH REQUIREMENTS.

B. PROCEED WITH INSTALLATION ONLY AFTER UNSATISFACTORY CONDITIONS HAVE BEEN CORRECTED.

3.2 ERECTION

A. SET STRUCTURAL STEEL ACCURATELY IN LOCATIONS AND TO ELEVATIONS INDICATED AND ACCORDING TO AISC 303 AND AISC 360.

B. BASEPLATES BEARING PLATES AND LEVELING PLATES: CLEAN CONCRETE- AND MASONRY-BEARING SURFACES OF BOND-REDUCING MATERIALS, AND ROUGHEN SURFACES PRIOR TO SETTING PLATES. CLEAN BOTTOM SURFACE OF PLATES.

1. SET PLATES FOR STRUCTURAL MEMBERS ON WEDGES, SHIMS, OR SETTING NUTS AS REQUIRED.
2. WELD PLATE WASHERS TO TOP OF BASEPLATE.
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 PLATE BEFORE PACKING WITH GROUT.
4. PROMPTLY PACK GROUT SOLIDLY BETWEEN BEARING SURFACES AND 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 WITHIN AISC 303, "CODE OF STANDARD PRACTICE FOR STEEL BUILDINGS AND BRIDGES."

3.3 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: DIRECT-TENSION UNLESS INDICATED AS SLIP-CRITICAL OR TENSIONED SHEAR/BEARING CONNECTIONS.

B. WELD CONNECTIONS: COMPLY WITH AWS D1.1/D1.1M FOR TOLERANCES, APPEARANCES, WELDING PROCEDURE SPECIFICATIONS, WELD QUALITY, AND METHODS USED IN CORRECTING WELDING WORK.

1. COMPLY WITH AISC 303 AND AISC 360 FOR BEARING, ALIGNMENT, ADEQUACY OF TEMPORARY CONNECTIONS, 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 MAINTAIN TRUE ALIGNMENT OF AXES WITHOUT EXCEEDING TOLERANCES IN AISC 303, "CODE OF STANDARD PRACTICE FOR STEEL BUILDINGS AND BRIDGES," FOR MILL MATERIAL.

3.4 FIELD QUALITY CONTROL

A. TESTING AGENCY: CONTRACTOR ENGAGE A QUALIFIED TESTING AGENCY TO PERFORM TESTS AND INSPECTIONS.

B. BOLTED CONNECTIONS: INSPECT BOLTED CONNECTIONS ACCORDING TO RCSC'S "SPECIFICATION FOR STRUCTURAL JOINTS USING ASTM A 325 OR A 490 BOLTS."

C. WELDED CONNECTIONS: VISUALLY INSPECT FIELD WELDS ACCORDING TO AWS D1.1/D1.1M.

END OF SECTION 05120

SECTION 05400 - COLD-FORMED METAL FRAMING

PART 1 - GENERAL

1.1 SUMMARY

A. SECTION INCLUDES:

1. EXTERIOR NON-LOAD-BEARING WALL FRAMING.
2. LOAD-BEARING METAL JOIST FRAMING.

1.2 ACTION SUBMITTALS

A. PRODUCT DATA: FOR EACH TYPE OF COLD-FORMED STEEL FRAMING PRODUCT AND ACCESSORY.

B. SHOP DRAWINGS: SHOW LAYOUT, SPACING, SIZES, THICKNESSES, AND TYPES OF COLD-FORMED METAL FRAMING; FABRICATION; AND FASTENING AND ANCHORAGE DETAILS, INCLUDING MECHANICAL FASTENERS. SHOW REINFORCING CHANNELS, OPENING FRAMING, SUPPLEMENTAL FRAMING, STRAPPING, BRACING, BRIDGING, SPLICES, ACCESSORIES, CONNECTION DETAILS, AND ATTACHMENT TO ADJOINING WORK.

1.3 INFORMATIONAL SUBMITTALS

A. WELDING CERTIFICATES.

B. PRODUCT CERTIFICATES.

C. PRODUCT TEST REPORTS.

D. EVALUATION REPORTS: FOR POST-INSTALLED ANCHORS AND POWER-ACTUATED FASTENERS, FROM ICC-ES OR OTHER QUALIFIED TESTING AGENCY ACCEPTABLE TO AUTHORITIES HAVING JURISDICTION.

1.4 QUALITY ASSURANCE

A. PRODUCT DATA: FOR EACH TYPE OF COLD-FORMED METAL FRAMING PRODUCT AND ACCESSORY INDICATED.

B. WELDING QUALIFICATIONS: QUALIFY PROCEDURES AND PERSONNEL ACCORDING TO THE FOLLOWING:

1. AWS D1.1/D1.1M, "STRUCTURAL WELDING CODE - STEEL."
2. AWS D1.3/D1.3M, "STRUCTURAL WELDING CODE - SHEET STEEL."

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. 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. ALLSTEEL & GYPSUM PRODUCTS, INC.
2. CLARKWESTERN DIETRICH BUILDING SYSTEMS, LLC.
3. CONSOLIDATED FABRICATORS CORP.; BUILDING PRODUCTS DIVISION.
4. NUCONSTEEL; A NUCOR COMPANY.
5. SCAFCO CORPORATION.
6. SOUTHEASTERN STUD & COMPONENTS, INC.
7. STATE BUILDING PRODUCTS, INC.
8. STEEL CONSTRUCTION SYSTEMS.
9. STEEL NETWORK, INC. (THE).
10. STEEL STRUCTURAL SYSTEMS.
11. STEELER, INC.
12. SUPER STUD BUILDING PRODUCTS, INC.
13. TELLING INDUSTRIES, LLC.
14. UNITED METAL PRODUCTS, INC.
15. UNITED STEEL MANUFACTURING.

2.2 COLD-FORMED STEEL FRAMING MATERIALS

A. STEEL SHEET: ASTM A 1003/A 1003M, STRUCTURAL GRADE, TYPE H, METALLIC COATED, OF GRADE AND COATING DESIGNATION AS FOLLOWS:

1. GRADE: AS REQUIRED BY STRUCTURAL PERFORMANCE. 16 GAGE AND HEAVIER: 40,000 PSI MINIMUM YIELD STRENGTH. 18 GAGE AND LIGHTER: 33,000 PSI MINIMUM YIELD STRENGTH.
2. COATING: G90 OR EQUIVALENT.

2.3 EXTERIOR NON-LOAD-BEARING WALL FRAMING AND JOIST FRAMING

A. STEEL STUDS: MANUFACTURER'S STANDARD C-SHAPED STEEL STUDS, OF WEB DEPTHS INDICATED, PUNCHED, WITH STIFFENED FLANGES, AND AS FOLLOWS:

1. MINIMUM BASE-METAL THICKNESS: 0.0538.
2. FLANGE WIDTH: 1-5/8 INCHES.
3. SECTION PROPERTIES: AS REQUIRED.

B. STEEL TRACK: MANUFACTURER'S STANDARD U-SHAPED STEEL TRACK, OF WEB DEPTHS INDICATED, UNPUNCHED, WITH UNSTIFFENED FLANGES, AND MATCHING MINIMUM BASE-METAL THICKNESS OF STEEL STUDS.

C. DRIFT CLIPS: MANUFACTURER'S STANDARD BYPASS OR HEAD CLIPS, CAPABLE OF ISOLATING WALL STUD FROM UPWARD AND DOWNWARD VERTICAL DISPLACEMENT AND LATERAL DRIFT OF PRIMARY STRUCTURE THROUGH POSITIVE MECHANICAL ATTACHMENT TO STUD WEB AND STRUCTURE.

2.4 FRAMING ACCESSORIES

A. FABRICATE STEEL-FRAMING ACCESSORIES FROM ASTM A 1003/A 1003M, STRUCTURAL GRADE, TYPE H, METALLIC COATED STEEL SHEET, OF SAME GRADE AND COATING DESIGNATION USED FOR FRAMING MEMBERS.

B. PROVIDE ACCESSORIES OF MANUFACTURER'S STANDARD THICKNESS AND CONFIGURATION, UNLESS OTHERWISE INDICATED.

2.5 ANCHORS, CLIPS, AND FASTENERS

A. STEEL SHAPES AND CLIPS: ASTM A 36/A 36M, ZINC COATED BY HOT-DIP PROCESS ACCORDING TO ASTM A 123/A 123M.

B. ANCHOR BOLTS: ASTM F 1554, GRADE 36, THREADED CARBON-STEEL HEX-HEADED BOLTS, CARBON-STEEL NUTS, AND FLAT, HARDENED-STEEL WASHERS; ZINC COATED BY HOT-DIP PROCESS ACCORDING TO ASTM A 153/A 153M, CLASS C.

C. POST-INSTALLED ANCHORS: FASTENER SYSTEMS WITH BOLTS OF SAME BASIC METAL AS FASTENED METAL, IF VISIBLE, UNLESS OTHERWISE INDICATED; WITH WORKING CAPACITY GREATER THAN OR EQUAL TO THE DESIGN LOAD, ACCORDING TO AN EVALUATION REPORT ACCEPTABLE TO AUTHORITIES HAVING JURISDICTION, BASED ON ICC-ES AC01 ICC-ES AC193 ICC-ES AC58 OR ICC-ES AC308 AS APPROPRIATE FOR THE SUBSTRATE.

1. USES: SECURING COLD-FORMED STEEL FRAMING TO STRUCTURE.

D. POWER-ACTUATED ANCHORS: FASTENER SYSTEMS WITH WORKING CAPACITY GREATER THAN OR EQUAL TO THE DESIGN LOAD, ACCORDING TO AN EVALUATION REPORT ACCEPTABLE TO AUTHORITIES HAVING JURISDICTION, BASED ON ICC-ES AC70.

E. MECHANICAL FASTENERS: ASTM C 1513, CORROSION-RESISTANT-COATED, SELF-DRILLING, SELF-TAPPING, STEEL DRILL SCREWS.

1. HEAD TYPE: LOW-PROFILE HEAD BENEATH SHEATHING; MANUFACTURER'S STANDARD ELSEWHERE.

2.6 MISCELLANEOUS MATERIALS

A. GALVANIZING REPAIR PAINT: MIL-P-21035B OR SSPC-PAINT 20.

B. SEALER GASKETS: CLOSED-CELL NEOPRENE FOAM, 1/4-INCH THICK, SELECTED FROM MANUFACTURER'S STANDARD WIDTHS TO MATCH WIDTH OF BOTTOM TRACK OR RIM TRACK MEMBERS AS REQUIRED.

PART 3 - EXECUTION

3.1 PREPARATION

A. BEFORE SPRAYED FIRE-RESISTIVE MATERIALS ARE APPLIED, ATTACH CONTINUOUS ANGLES, SUPPLEMENTARY FRAMING, OR TRACKS TO STRUCTURAL MEMBERS INDICATED TO RECEIVE SPRAYED FIRE-RESISTIVE MATERIALS.

B. AFTER APPLYING SPRAYED FIRE-RESISTIVE MATERIALS, REMOVE ONLY AS MUCH OF THESE MATERIALS AS NEEDED TO COMPLETE INSTALLATION OF COLD-FORMED FRAMING WITHOUT REDUCING THICKNESS OF FIRE-RESISTIVE MATERIALS BELOW THAT REQUIRED TO OBTAIN FIRE-RESISTANCE RATINGS INDICATED. PROTECT REMAINING FIRE-RESISTIVE MATERIALS FROM DAMAGE.

C. INSTALL SEALER GASKETS AT THE UNDERSIDE OF WALL BOTTOM TRACK OR RIM TRACK AND AT THE TOP OF FOUNDATION WALL OR SLAB AT STUD OR JOIST LOCATIONS.

3.2 INSTALLATION, GENERAL

A. COLD-FORMED STEEL FRAMING MAY BE SHOP OR FIELD FABRICATED FOR INSTALLATION, OR IT MAY BE FIELD ASSEMBLED.

B. INSTALL COLD-FORMED STEEL FRAMING ACCORDING TO AISI S200, AISI S202, AND MANUFACTURER'S WRITTEN INSTRUCTIONS UNLESS MORE STRINGENT REQUIREMENTS ARE INDICATED.

C. INSTALL COLD-FORMED STEEL FRAMING AND ACCESSORIES PLUMB, SQUARE, AND TRUE TO LINE, AND WITH CONNECTIONS SECURELY FASTENED.

D. INSTALL FRAMING MEMBERS IN ONE-PIECE LENGTHS UNLESS SPLICE CONNECTIONS ARE INDICATED FOR TRACK OR TENSION MEMBERS.

E. INSTALL TEMPORARY BRACING AND SUPPORTS TO SECURE FRAMING AND SUPPORT LOADS EQUAL TO THOSE FOR WHICH STRUCTURE WAS DESIGNED. MAINTAIN BRACES AND SUPPORTS IN PLACE, UNDISTURBED, UNTIL ENTIRE INTEGRATED SUPPORTING STRUCTURE HAS BEEN COMPLETED AND PERMANENT CONNECTIONS TO FRAMING ARE SECURED.

F. DO NOT BRIDGE BUILDING EXPANSION JOINTS WITH COLD-FORMED STEEL FRAMING. INDEPENDENTLY FRAME BOTH SIDES OF JOINTS.

G. INSTALL INSULATION, SPECIFIED IN SECTION 072100 "THERMAL INSULATION," IN FRAMING-ASSEMBLY MEMBERS, SUCH AS HEADERS, SILLS, BOXED JOISTS, AND MULTIPLE STUDS AT OPENINGS, THAT ARE INACCESSIBLE ON COMPLETION OF FRAMING WORK.

H. FASTEN HOLE-REINFORCING PLATE OVER WEB PENETRATIONS THAT EXCEED SIZE OF MANUFACTURER'S APPROVED OR STANDARD PUNCHED OPENINGS.

3.3 EXTERIOR NON-LOAD-BEARING WALL INSTALLATION

A. INSTALL CONTINUOUS TRACKS SIZED TO MATCH STUDS. ALIGN TRACKS ACCURATELY AND SECURELY ANCHOR TO SUPPORTING STRUCTURE.

B. FASTEN BOTH FLANGES OF STUDS TO TOP AND BOTTOM TRACK UNLESS OTHERWISE INDICATED. SPACE STUDS AS FOLLOWS:

1. STUD SPACING: AS INDICATED ON DRAWINGS.

C. SET STUDS PLUMB, EXCEPT AS NEEDED FOR DIAGONAL BRACING OR REQUIRED FOR NONPLUMB WALLS OR WARPED SURFACES AND SIMILAR REQUIREMENTS.

D. ISOLATE NON-LOAD-BEARING STEEL FRAMING FROM BUILDING STRUCTURE TO PREVENT TRANSFER OF VERTICAL LOADS WHILE PROVIDING LATERAL SUPPORT.

1. INSTALL SINGLE DEEP-LEG DEFLECTION TRACKS AND ANCHOR TO BUILDING STRUCTURE.
2. INSTALL DOUBLE DEEP-LEG DEFLECTION TRACKS AND ANCHOR OUTER TRACK TO BUILDING STRUCTURE.
3. CONNECT VERTICAL DEFLECTION CLIPS TO INFILL STUDS AND ANCHOR TO BUILDING STRUCTURE.
4. CONNECT DRIFT CLIPS TO COLD-FORMED STEEL FRAMING AND ANCHOR TO BUILDING STRUCTURE.

E. INSTALL HORIZONTAL BRIDGING IN WALL STUDS, SPACED VERTICALLY IN ROWS INDICATED ON SHOP DRAWINGS BUT NOT MORE THAN 48 INCHES APART. FASTEN AT EACH STUD INTERSECTION.

1. CHANNEL BRIDGING: COLD-ROLLED STEEL CHANNEL, WELDED OR MECHANICALLY FASTENED TO WEBS OF PUNCHED STUDS.
2. STRAP BRIDGING: COMBINATION OF FLAT, TAUT, STEEL SHEET STRAPS OF WIDTH AND THICKNESS INDICATED AND STUD-TRACK SOLID BLOCKING OF WIDTH AND THICKNESS TO MATCH STUDS. FASTEN FLAT STRAPS TO STUD FLANGES AND SECURE SOLID BLOCKING TO STUD WEBS OR FLANGES.
3. BAR BRIDGING: PROPRIETARY BRIDGING BARS INSTALLED ACCORDING TO MANUFACTURER'S WRITTEN INSTRUCTIONS.

F. INSTALL MISCELLANEOUS FRAMING AND CONNECTIONS, INCLUDING STUD KICKERS, WEB STIFFENERS, CLIP ANGLES, CONTINUOUS ANGLES, ANCHORS, AND FASTENERS, TO PROVIDE A COMPLETE AND STABLE WALL-FRAMING SYSTEM.

3.4 ERECTION TOLERANCES

A. INSTALL COLD-FORMED STEEL FRAMING LEVEL, PLUMB, AND TRUE TO LINE TO A MAXIMUM ALLOWABLE TOLERANCE VARIATION OF 1/8 INCH IN 10 FEET AND AS FOLLOWS:

1. SPACE INDIVIDUAL FRAMING MEMBERS NO MORE THAN PLUS OR MINUS 1/8 INCH FROM PLAN LOCATION. CUMULATIVE ERROR SHALL NOT EXCEED MINIMUM FASTENING REQUIREMENTS OF SHEATHING OR OTHER FINISHING MATERIALS.

3.5 FIELD QUALITY CONTROL

A. TESTING: CONTRACTOR ENGAGE A QUALIFIED INDEPENDENT TESTING AND INSPECTING AGENCY TO PERFORM FIELD TESTS AND INSPECTIONS AND PREPARE TEST REPORTS.

B. FIELD AND SHOP WELDS WILL BE SUBJECT TO TESTING AND INSPECTING.

C. TESTING AGENCY WILL REPORT TEST RESULTS PROMPTLY AND IN WRITING TO CONTRACTOR AND ARCHITECT.

D. COLD-FORMED STEEL FRAMING WILL BE CONSIDERED DEFECTIVE IF IT DOES NOT PASS TESTS AND INSPECTIONS.

E. ADDITIONAL TESTING AND INSPECTING, AT CONTRACTOR'S EXPENSE, WILL BE PERFORMED TO DETERMINE COMPLIANCE OF REPLACED OR ADDITIONAL WORK WITH SPECIFIED REQUIREMENTS.

3.6 REPAIRS AND PROTECTION

A. GALVANIZING REPAIRS: PREPARE AND REPAIR DAMAGED GALVANIZED COATINGS ON FABRICATED AND INSTALLED COLD-FORMED STEEL FRAMING WITH GALVANIZED REPAIR PAINT ACCORDING TO ASTM A 780/A 780M AND MANUFACTURER'S WRITTEN INSTRUCTIONS.

B. B. PROVIDE FINAL PROTECTION AND MAINTAIN CONDITIONS, IN A MANNER ACCEPTABLE TO MANUFACTURER AND INSTALLER, THAT ENSURE THAT COLD-FORMED STEEL FRAMING IS WITHOUT DAMAGE OR DETERIORATION AT TIME OF SUBSTANTIAL COMPLETION.

END OF SECTION 05400

SECTION 06400 - ARCHITECTURAL WOODWORK

PART 1 - GENERAL

1.01 SUMMARY

A. Provide shop-fabricated exposed woodwork and casework:
   1. Plastic laminate casework and countertops as indicated.

1.02 SUBMITTALS

A. Submit for approval samples, shop drawings, and product data.

1.03 QUALITY ASSURANCE

A. Comply with governing codes and regulations. Provide products of acceptable manufacturers which have been in satisfactory use in similar service for three years. Use experienced installers with minimum five years experience. Deliver, handle, and store materials in accordance with manufacturer's instructions.

PART 2 - PRODUCTS

2.01 MATERIALS

A. Quality standard for fabrication and products: Architectural Woodwork Institute Quality Standards, Custom grade unless noted otherwise.
B. Plastic laminate: NEMA LD-3, glued-on melamine paper is not allowed. Panel surfaces scheduled to receive plastic laminate shall also receive laminate, liner, or backer on the reverse face. Panels with unbalanced or unfinished faces will not be accepted regardless of location.
C. Base cabinets and wall cabinets:
   1. Reveal overlay construction: Minimum Grade M-2 medium-density particleboard substrate, ANSI A 208.1, ¾" thickness unless specified otherwise:
      a. Sink cabinet bodies shall have water-resistant plywood substrate.
      b. Wall cabinets shall have a clear inside depth of 12 inches.
      c. Cabinet backs shall be minimum ½" thick.
      d. Drawer boxes shall be of minimum ½" wood construction including drawer bottom, separate front panel attached to drawer box, no staples allowed.
      e. Paper storage drawers shall be fitted with full width hood at back.
      f. Large flat file drawer boxes shall have laminate clad plywood bottoms.
   2. Exposed surfaces: High-pressure decorative laminate as follows:
      a. Horizontal surfaces other than tops: GP-50.
      b. Vertical surfaces: GP-28.
      c. Body edges: 0.5 mm PVC edge banding, color matched.

d. Door/drawer edges: 3 mm PVC edge banding, machine applied, all four edges.

Semi-exposed surfaces:

a. Surfaces other than drawer bodies: High-pressure decorative laminate, Grade CL-20.

b. Drawer bottoms, sides, and backs: Thermally fused melamine, color white.

4. Countertops: Countertops shall be built in lengths that will facilitate ease of replacement. Provide mechanical fasteners at splines and joints. Joint shall not be located over open space without support. Joints shall not be located closer than 24 inches either side of sink cutouts. Unsupported spans shall not exceed 48" without support bracket. Exposed corners shall have rounded corners for student safety. Radius for exposed corners is indicated on drawings.
   a. Core: Plywood, provide with backer sheet for balanced construction, water-resistant plywood shall be used where a sink is installed.
   b. Laminate: GP-50.
   c. Edge: 1" minimum, 3 mm PVC edge banding, machine applied.
   d. Backsplash: ¾" x 4", butted to countertop.
5. Adjustable shelving: ¾" thick up to 36 inches in length, 1" thick over 36 inches in length; 32 mm in-line boring; double-pin reinforced clear plastic shelf supports with anti-tip locking tabs to restrain shelves.
   a. Edge: 0.5 mm PVC, color matched, all four edges.

D. Hardware: Steel or brass with satin-chromium plate finish. Comply with BHMA A156.9 for items indicated by referencing BHMA numbers.
1. Drawer slides: BHMA B05091; zinc-plated, ball bearing side-mount full-extension, minimum 100-lbf rating; provide 150-lbf rating at file drawers.
2. Hinges: BHMA B01521; 2-3/4" x .095" semi-concealed, 5-knuckle.
3. Catches: BHMA B03091; heavy duty, metal spring-loaded, single roller catch with molded plastic bumper; Amerock BP97452G or approved equal.
4. Pulls: BHMA B02011; 4" back-mounted steel or brass wire pulls.
5. Locks: BHMA E07261; cam lock, key removable in locked and unlocked positions, all locks shall be keyed alike.
6. L-brackets: Powder coated 1/8" steel, 3"x3" 45-degree notch at wall for cable routing through bracket, A&M Hardware, Inc. or approved equal.
7. Grommets: 2" diameter molded black plastic countertop grommet with opening for wire/cable passage and matching removable plastic cap; provide one grommet at each open knee space.

E. Standing and running trim solid wood fir or poplar, AWI custom Grade.

PART 3 - EXECUTION

3.01 INSTALLATION

A. Comply with AWI quality standards. Comply with details shown for profile and construction features.
1. Casework: AWI Custom grade, laminate covered reveal overlay construction,

institutional hardware quality level.

2. Countertops: AWI Premium grade, butted backsplash and machine applied PVC edge at front lip.

B. Do not deliver or install architectural woodwork and casework until building is enclosed, wet work is complete, and HVAC system is operating and maintaining temperature and relative humidity at design occupancy levels during the remainder of the construction period.

C. Where architectural woodwork and casework is indicated to fit to other construction, verify dimensions of other construction by field measurements before fabrication and indicate measurements on Shop Drawings. Coordinate fabrication schedule with construction progress to avoid delaying the Work.

D. Install work plumb, level, true and straight, scribe to fit. Align and secure all adjoining cabinets to each other, and to wall construction. Anchor securely with concealed fasteners.

E. Seal all joints between countertops, backsplashes, and walls with clear acrylic caulk.

F. Repair or replace damaged work, clean, lubricate and adjust hardware; protect work until final acceptance.

END OF SECTION 06400

SECTION 07210 – SPRAY FOAM INSULATION

1. GENERAL:

   A. THE CONTRACTOR SHALL FURNISH ALL LABOR, MATERIALS, TOOLS, EQUIPMENT, AND PERFORM ALL WORK SERVICES FURNISHING AND INSTALLATION, COMPLETE, OF ALL FOAM INSULATION AS SHOWN ON DRAWINGS AND AS SPECIFIED, IN ACCORDANCE WITH PROVISIONS OF THE CONTRACT DOCUMENTS, AND COMPLETELY COORDINATED WITH WORK OF ALL OTHER TRADES.

   B. ALTHOUGH SUCH WORK IS NOT SPECIFICALLY INDICATED, FURNISH AND INSTALL ALL SUPPLEMENTARY OR MISCELLANEOUS ITEMS, APPURTENANCES AND DEVICES INCIDENTAL TO OR NECESSARY FOR A SOUND, SECURE AND COMPLETE INSTALLATION.

2. SUBMITTALS:

   A. INSTALLATION INSTRUCTIONS AND RECOMMENDATIONS FROM MATERIALS MANUFACTURER. INCLUDE CERTIFICATION OR DATA SUBSTANTIATING THAT MATERIALS COMPLY WITH REQUIREMENTS.

   B. ACTUAL SAMPLES WHEN ARCHITECT DIRECTS.

3. SCOPE OF WORK

   A. WALL FOAM INSULATION:

      1) INSTALL 3 1/2" OF CLOSED CELL FOAM INSULATION IN EXTERIOR STUD WALL CAVITY FROM THE INTERIOR WHERE INDICATED ON FLOOR PLAN AND WALL SECTIONS.
      2) DRILL HOLES IN STUD WALLS FROM THE INTERIOR, PRESSURE INJECT FOAM INTO OPEN CELLS. INSTALL PER MANUFACTURERS INSTALLATION INSTRUCTIONS. CLEAN AND SEAL ALL DRILLED HOLES AFTER INSULATION INSTALLATION IS COMPLETE FOR UNIFORM WALL FINISH. (SEE SECTION 07216) - FOAMED-IN-PLACE INSULATION.
      3) COMPLETE APPROXIMATELY 20' OF INSULATION AND EXAMINE WITH ARCHITECT AND OBTAIN APPROVAL PRIOR TO PROCEEDING WITH BALANCE OF PROJECT.
      4) SEE WALL SECTIONS FOR GENERAL INFORMATION.

   A. UPPER WALL AND ROOF DECK FOAM INSTALLATION
      1) REMOVE EXISTING SPRAY FOAM INSULATION FROM INTERIOR SURFACE OF METAL WALL PANELS AS INDICATED ON DEMOLIITON FLOOR PLAN AND WALL SECTIONS.
      2) INSTALL 3 ½" OF CLOSED CELL FOAM INSULATION ON INTERIOR SURFACE OF METAL WALL PANELS AS INDICATED ON FLOOR PLAN AND WALL SECTIONS.
      3) INSTALL 3 ½" OF CLOSED CELL SPRAY FOAM INSULATION ON BOTTOM OF ROOF DECK AS INDICATED ON FLOOR PLAN AND WALL SECTIONS
      4) INSTALL SPRAY APPLIED INTUMESCENT IGNITION BARRIER TO EXPOSED WALL AND ROOF DECK INSULATION.

   B. ALL MATERIALS USED SHALL BE APPROVED BY THE O.E.F. (STATE DEPARTMENT OF EDUCATION) BEFORE USING.

D. COAT ALL VISIBLE AND OR EXPOSED SURFACES OF SPRAY FOAM INSULATION ON THE INTERIOR OF THE BUILDING WITH ITFI DC315 THERMAL AND IGNITION BARRIER. APPLY IN ACCORDANCE WITH MANUFACTURES REQUIREMENTS, CODES AND TESTING. **THIS INCLUDES SPRAY FOAM INSULATION ABOVE CEILINGS.**

E. PROVIDE PRESCRIPTIVE THERMAL BARRIERS, PRESCRIPTIVE IGNITION BARRIERS AND INTUMESCENT COATINGS WHERE REQUIRED BY CODES OR MANUFACTURERS INSTRUCTIONS

4. MATERIALS:

A. SPRAY FOAM INSULATION SHALL BE: NEXSEAL 2.0 OPEN AND CLOSED CELL SPRAY FOAM INSULATION OR APPROVED EQUAL.

B. THERMAL AND IGNITION BARRIERS: ITFI DC 315

C. PROVIDE PRESCRIPTIVE THERMAL BARRIERS, PRESCRIPTIVE IGNITION BARRIERS AND INTUMESCENT COATINGS WHERE REQUIRED BY CODES OR MANUFACTURERS INSTRUCTIONS

END OF SECTION

SECTION 07270 – FIRESTOPPING

PART 1 - GENERAL

1.01 SUMMARY

A. PROVIDE FIRE STOPPING INSULATION, CERAMIC BLANKET FIRE BARRIER ASSEMBLIES, FIRESTOP JOINT SPRAY, AND CAULKING TO PREVENT PASSAGE OF FLAME AND PRODUCTS OF COMBUSTION THROUGH CONCEALED SPACES, OPENINGS BETWEEN AND AROUND WALLS, AND IN FIRE-RATED ASSEMBLIES.

B. ALL PENETRATIONS THROUGH FIRE-RATED CONSTRUCTION SHALL BE FIRE STOPPED USING A THROUGH PENETRATION FIRE STOP SYSTEM (XHEZ) AND THOSE LISTED IN THE UNDERWRITERS LABORATORY FIRE RESISTANCE DIRECTORY.

C. RELATED WORK:

1. SECTION 05500 - MISCELLANEOUS METALS FOR ALUMINUM EXPANSION JOINT COVERS
2. SECTION 07810 – SPRAY APPLIED AND INTUMESCENT FIRE RESISTIVE MATERIALS
3. 07900 JOINT SEALANTS FOR FIRE RATED EXPANSION JOINT SEALANTS

1.02 SUBMITTALS

A. SUBMIT FOR APPROVAL PRODUCT DATA, TEST REPORTS.

A. SHOP DRAWINGS – SUBMIT TYPICAL FIRE BARRIER AND EXPANSION JOINT DRAWINGS(S) INDICATING PERTINENT DIMENSIONS, PLANS INDICATING LOCATIONS OF EACH TYPE, GENERAL CONSTRUCTION, JOINT OPENING DIMENSIONS, LOCATIONS, DETAILS, TRANSITIONS, INTERSECTION DETAILS, AND PRODUCT INFORMATION.

1.03 QUALITY ASSURANCE

A. COMPLY WITH GOVERNING CODES AND REGULATIONS. PROVIDE PRODUCTS OF ACCEPTABLE MANUFACTURERS WHICH HAVE BEEN IN SATISFACTORY USE IN SIMILAR SERVICE FOR THREE YEARS. USE EXPERIENCED INSTALLERS. DELIVER, HANDLE, AND STORE MATERIALS IN ACCORDANCE WITH MANUFACTURER'S INSTRUCTIONS.

B. WARRANTY AGAINST MATERIAL AND MANUFACTURING DEFECTS FOR A PERIOD OF NOT LESS THAN FIVE (5) YEARS WHEN INSTALLED IN ACCORDANCE WITH MANUFACTURER’S RECOMMENDATIONS

PART 2 - PRODUCTS

2.01 MATERIALS

A. FIRE STOPPING INSULATION:

1. BLANKET FIRE STOPPING, MINERAL FIBER TYPE; THERMAFIBER SAFING INSULATION BY U. S. GYPSUM OR APPROVED EQUAL.
2. CERAMIC BLANKET: CERAMIC WOOL WITH 2300 DEGREE TEMPERATURE RATING.

C. FIRE JOINT SPRAY: HILTI CFS-SP WB, SPECIFIED TECHNOLOGIES, INC. AS200 (SUBJECT TO STRICT COMPLIANCE WITH CONTRACT DOCUMENTS), OR APPROVED EQUAL.

D. CAULKING; CP-25 FIRE BARRIER CAULK BY 3M, SPECIFIED TECHNOLOGIES, INC. LCI (SUBJECT TO STRICT COMPLIANCE WITH CONTRACT DOCUMENTS), OR APPROVED EQUAL.

D. CERAMIC FIBER BLANKET: MM SYSTEMS PYROFLEX SERIES FIRE BARRIER – MATERIAL SHALL BE A FLEXIBLE, HIGH PURITY CERAMIC FIBER BLANKET. INCLUDES STAINLESS STEEL FOIL, INTUMESCENT MATRIX AND FIRE RESISTIVE CLOTH AS REQUIRED TO ACHIEVE DESIRED PROTECTION AND ENDURANCE RATING, PROVIDE NECESSARY ASSEMBLY AND ATTACHMENT HARDWARE, SPLICE TRANSITION PIECES AND ANCHORS REQUIRED FOR COMPLETE INSTALLATION, OR APPROVED EQUAL.

PART 3 - EXECUTION

3.01 INSTALLATION

A. REVIEW EXTENT OF WORK WITH AUTHORITIES HAVING JURISDICTION AND OBTAIN APPROVAL OF INSTALLATION THICKNESSES AND METHODS.

B. SEQUENCE WORK TO AVOID NEED FOR REMOVAL OF FIRE STOPPING BY WORK OF OTHER TRADES.

C. COMPLY WITH MANUFACTURERS' INSTRUCTIONS AND RECOMMENDATIONS. SECURELY ANCHOR INSULATIONS WITH SAFING CLIPS. INSTALL FIRE STOPS WITHOUT GAPS OR VOIDS.

D. REFER TO UL SYSTEM DESIGN DRAWINGS FOR SPECIFIC INSTALLATION REQUIREMENTS. EQUIVALENT PRODUCTS FROM OTHER MANUFACTURERS ARE ACCEPTABLE SUBJECT TO COMPLIANCE WITH SPECIFICATIONS.

E. PROTECT, INSPECT AND REPAIR WORK UNTIL FINAL ACCEPTANCE.

END OF SECTION

SECTION: 07530 - THERMOPLASTIC MEMBRANE ROOF

PART 1 - GENERAL

1.1 SUMMARY

A. This Section includes the following:

1. Adhered membrane roofing system.
2. Roof insulation.
3. Flashings and other accessories as indicated on drawings.

1.2 PERFORMANCE REQUIREMENTS

A. General: Provide installed roofing membrane and base flashings that remain watertight; do not permit the passage of water; and resist specified uplift pressures, thermally induced movement, and exposure to weather without failure.

B. Material Compatibility: Provide roofing materials that are compatible with one another under conditions of service and application required, as demonstrated by roofing membrane manufacturer based on testing and field experience.

C. Roofing System Design: Provide a membrane roofing system that is identical to systems that have been successfully tested by a qualified testing and inspecting agency to resist uplift pressure calculated according to latest edition of ASCE 7.

1. Design wind velocity shall be 154 mph 3 second gust. Ultimate wind speed per ASCE- 7-10, FBC 2010 as indicated on structural drawings.
2. Design pressures for components and cladding shall be as indicated on structural drawings.

D. FMG Listing: Provide roofing membrane, base flashings, and component materials that comply with requirements in FMG 4450 and FMG 4470 as part of a membrane roofing system and that are listed in FMG's "Approval Guide" for Class 1 or noncombustible construction, as applicable. Identify materials with FMG markings.

1.3 SUBMITTALS

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

B. Shop Drawings: For roofing system. Include plans, elevations, sections, details, and attachments to other Work Indicate attachment methods to meet design pressures.

1. Flashings and membrane terminations.

C. Installer Certificates: Signed by roofing system manufacturer certifying that Installer is approved, authorized, or licensed by manufacturer to install roofing system.

D. Manufacturer Certificates: Signed by roofing manufacturer certifying that roofing system complies with requirements specified in "Performance Requirements" Article.

1. Submit evidence of meeting performance requirements.

E. Maintenance Data: For roofing system to include in maintenance manuals.

F. Warranties: Special warranties specified in this Section.

G. Inspection Report: Copy of roofing system manufacturer's inspection report of completed roofing installation.

1.4 QUALITY ASSURANCE

A. Installer Qualifications: A qualified firm that is approved, authorized, or licensed by roofing system manufacturer to install manufacturer's product and that is eligible to receive manufacturer's warranty.

B. Manufacturer Qualifications: A qualified manufacturer that has FMG approval for membrane roofing system identical to that used for this Project.

C. Source Limitations: Obtain components for membrane roofing system from roofing membrane manufacturer.

D. Fire-Test-Response Characteristics: Provide membrane roofing materials with the fire-test-response characteristics indicated as determined by testing identical products per test method below by UL, FMG, or another testing and inspecting agency acceptable to authorities having jurisdiction. Materials shall be identified with appropriate markings of applicable testing and inspecting agency.

1. Exterior Fire-Test Exposure: Class A; ASTM E 108, for application and roof slopes indicated.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Deliver roofing materials to Project site in original containers with seals unbroken and labeled with manufacturer's name, product brand name and type, date of manufacture, and directions for storing and mixing with other components.

B. Store liquid materials in their original undamaged containers in a clean, dry, protected location and within the temperature range required by roofing system manufacturer. Protect stored liquid material from direct sunlight.

1. Discard and legally dispose of liquid material that cannot be applied within its stated shelf life.

C. Protect roof insulation materials from physical damage and from deterioration by sunlight, moisture, soiling, and other sources. Store in a dry location. Comply with insulation manufacturer's written instructions for handling, storing, and protecting during installation

D. Handle and store roofing materials and place equipment in a manner to avoid permanent deflection of deck.

1.6 PROJECT CONDITIONS

A. Weather Limitations: Proceed with installation only when existing and forecasted weather conditions permit roofing system to be installed according to manufacturer's written instructions and warranty requirements.

1.7 WARRANTY

A. Special Warranty: Manufacturer's standard form, without monetary limitation, in which manufacturer agrees to repair or replace components of membrane roofing system that fail in materials or workmanship within specified warranty period. Failure includes roof leaks.

1. Special warranty includes roofing membrane, base flashings, roofing membrane accessories, roof insulation, fasteners, and other components of membrane roofing system.
2. Warranty Period: 15 years from date of Substantial Completion.
3. Warranty shall be provided in writing prior to Final Payment.

PART 2 - PRODUCTS

2.1 PVC ROOFING MEMBRANE

Subject to compliance with requirements, provide products by one of the following manufacturers:

A. PVC Sheet: ASTM D 4434, Type II, Grade 1, fiber reinforced, and fabric backed, as follows:

1. Product: Provide "Sarnafil G410 Felt back" by Sarnafil Inc.
2. Thickness: 60 mils, minimum.

3. Exposed Face Color: White.

B. PVC Sheet: ASTM D 4434, Type III, fabric reinforced, and fabric backed, as follows:

1. Product: Provide "UltraGard PVC" by Johns Manville International, Inc.
2. Thickness: 60 mils, minimum.
3. Exposed Face Color: White.

C. KEE Sheet: ASTM D 6754, fabric reinforced, and fabric backed, as follows:

1. Product: Provide "FiberTite-FB" by Seaman Corporation.
2. Thickness: 60 mils, minimum.
3. Exposed Face Color: Beige.

2.2 AUXILIARY MATERIALS

A. General: Auxiliary materials recommended by roofing system manufacturer for intended use and compatible with membrane roofing.

1. Liquid-type auxiliary materials shall meet VOC limits of authorities having jurisdiction.

B. Sheet Flashing: Manufacturer's standard sheet flashing of same material, type, reinforcement, thickness, and color as PVC sheet membrane.

C. Bonding Adhesive: Manufacturer's standard water-based bonding adhesive for membrane, and solvent-based bonding adhesive for base flashings.

D. Metal Termination Bars: Manufacturer's standard predrilled stainless-steel or aluminum bars, approximately 1 by 1/8 inch-thick; with anchors.

E. Miscellaneous Accessories: Provide pourable sealers, preformed cone, and vent sheet flashings, preformed inside and outside corner sheet flashings, T-joint covers, termination reglets, cover strips, and other accessories.

F. Roof Sheathing Board: ½” Fiber glass Mat covered gypsum board is Dens Deck by Georgia pacific or equal. Weight 1.95 psf. Provide fasteners of proper length to penetrate through existing insulation board and existing metal roof deck.

G. Walk mat /Splash block: A polyester reinforced, 0.096 inch (96 mil/2.4 mm), weld-able membrane with surface embossment. Used as a protection layer from rooftop traffic.

H. Polyisocyanurate Board Insulation: ASTM C 1289, Type II, felt or glass-fiber mat facer on both major surfaces. This insulation is to be tapered to the slope(s) indication on the Roof Plan and Details.

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 manufacturers specified.

a. Apache Products Company.
b. Atlas Roofing Corporation.
c. Carlisle SynTec Incorporated.
d. Celotex Corporation.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates, areas, and conditions, with Installer present, for compliance with the following requirements and other conditions affecting performance of roofing system:

1. Verify that roof openings and penetrations are in place and set and braced and that roof drains are securely clamped in place.
2. Verify that wood blocking, curbs, and nailers are securely anchored to roof deck at penetrations and terminations and that nailers match thicknesses of insulation.
3. Verify that existing tapered insulation is in place and undamaged by water instruction. Notify architect of any damaged insulation to be replaced before removing it.
4. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Clean substrate of dust, debris, moisture, and other substances detrimental to roofing installation according to roofing system manufacturer's written instructions. Remove sharp projections.

B. Prevent materials from entering and clogging roof drains and conductors and from spilling or migrating onto surfaces of other construction. Remove roof-drain plugs when no work is taking place or when rain is forecast.

C. Complete terminations and base flashings and provide temporary seals to prevent water from entering completed sections of roofing system at the end of the workday or when

rain is forecast. Remove and discard temporary seals before beginning work on adjoining roofing.

3.3 ADHERED ROOFING MEMBRANE INSTALLATION

A. Install roofing membrane over area to receive roofing according to membrane roofing system manufacturer's written instructions. Unroll roofing membrane and allow to relax before installing.

1. Install sheet according to ASTM D 5036.

B. Start installation of roofing membrane in presence of membrane roofing system manufacturer's technical personnel.

C. Accurately align roofing membrane and maintain uniform side and end laps of minimum dimensions required by manufacturer. Stagger end laps.

D. Bonding Adhesive: Apply water-based bonding adhesive to substrate at rate required by manufacturer and immediately install roofing membrane. Do not apply bonding adhesive to splice area of roofing membrane.

E. Mechanically or adhesively fasten roofing membrane securely at terminations, penetrations, and perimeter of roofing.

F. Apply roofing membrane with side laps shingled with slope of roof deck where possible.

G. Seams: Clean seam areas, overlap roofing membrane, and hot-air weld side and end laps of roofing membrane according to manufacturer's written instructions to ensure a watertight seam installation.

1. Test lap edges with probe to verify seam weld continuity. Apply lap sealant to seal cut edges of roofing membrane.
2. Verify field strength of seams a minimum of twice daily and repair seam sample areas.
3. Repair tears, voids, and lapped seams in roofing membrane that does not meet requirements.

H. Spread sealant or mastic bed over deck drain flange at deck drains and securely seal roofing membrane in place with clamping ring.

3.4 BASE FLASHING INSTALLATION

A. Install sheet flashings and preformed flashing accessories and adhere to substrates according to membrane roofing system manufacturer's written instructions.

B. Apply solvent-based bonding adhesive to substrate and underside of sheet flashing at required rate and allow to partially dry. Do not apply bonding adhesive to seam area of flashing.

C. Flash penetrations and field-formed inside and outside corners with sheet flashing.

D. Clean seam areas and overlap and firmly roll sheet flashings into the adhesive. Weld side and end laps to ensure a watertight seam installation.

E. Terminate and seal top of sheet flashings and mechanically anchor to substrate through termination bars.

F. FIELD QUALITY CONTROL

G. Final Roof Inspection: Arrange for roofing system manufacturer's technical personnel to inspect roofing installation on completion and submit report to Architect.

1. Notify Architect or Owner 48 hours in advance of date and time of inspection.

2. Contractor shall provide Architect a Final Statement of Compliance which states that the finished roof membrane complies with the Contract Documents.

H. Repair or remove and replace components of membrane roofing system where test results or inspections indicate that they do not comply with specified requirements.

I. Additional testing and inspecting, at Contractor's expense, will be performed to determine compliance of replaced or additional work with specified requirements.

1. The manufacturer’s representative shall inspect the roof membrane within one year of acceptance of the roof membrane by the Board.

3.5 PROTECTING AND CLEANING

A. Protect membrane roofing system from damage and wear during remainder of construction period. When remaining construction will not affect or endanger roofing, inspect roofing for deterioration and damage, describing its nature and extent in a written report, with copies to Architect and Owner.

B. Correct deficiencies in or remove membrane roofing system that does not comply with requirements, repair substrates, and repair or reinstall membrane roofing system to a condition free of damage and deterioration at time of Substantial Completion and according to warranty requirements.

C. Clean overspray and spillage from adjacent construction using cleaning agents and procedures recommended by manufacturer of affected construction.

END OF SECTION 07530

SECTION 07620 - SHEET METAL FLASHING AND TRIM

PART 1 - GENERAL

1.1 SUMMARY

A. THIS SECTION INCLUDES THE FOLLOWING:
   1. MANUFACTURED REGLETS.
   2. FORMED ROOF FLASHING AND TRIM.

B. RELATED SECTIONS:
   1. COORDINATE WITH FLASHING BEING PROVIDED IN THE FOLLOWING SECTIONS TO VERIFY MATCHING MATERIALS:
      A. 07410 MANUFACTURED PREFORMED WALL PANELS
      B. 07413 METAL SOFFIT PANELS
      C. 07414 FACTORY FORMED BUR EDGE AND COPING SYSTEM
      D. 07717 CONTINUOUS GUTTER SYSTEM, DOWNSPOUTS AND DOWNSPOUT BOOTS
      E. 01813 – SUSTAINABLE DESIGN REQUIREMENTS

1.2 PERFORMANCE REQUIREMENTS

A. GENERAL: SHEET METAL FLASHING AND TRIM ASSEMBLIES AS SPECIFIED IN THIS AND OTHER SECTIONS, 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. ALL ROOF EDGE SYSTEMS AND COPINGS SHALL MEET ANSI/SPRI/FM 4435/ ES-1 STANDARDS FOR EDGE SYSTEMS USED WITH LOW-SLOPE ROOFING SYSTEMS.

C. ALL SHEET METAL FLASHING AND TRIM COMPONENTS SHALL BE DESIGNED COMPLIANT WITH WIND PRESSURES SHOWN ON STRUCTURAL DRAWINGS ACCORDING TO FLORIDA BUILDING CODE 2017, 6TH EDITION.

1.3 SUBMITTALS

A. PRODUCT DATA: FOR EACH PRODUCT INDICATED.
B. SHOP DRAWINGS: SHOW LAYOUTS, PROFILES, SHAPES, SEAMS, DIMENSIONS, AND DETAILS FOR FASTENING, JOINING, SUPPORTING, AND ANCHORING SHEET METAL FLASHING AND TRIM. SUBMITTAL SHALL INCLUDE VERIFICATION OF DOWNSPOUT SIZES WITH DRAINAGE CALCULATIONS.
C. SAMPLES: FOR EACH TYPE OF SHEET METAL FLASHING AND TRIM FROM FULL RANGE OF COLORS FOR SELECTION
D. PROVIDE MANUFACTURER'S DOCUMENTATION INDICATING SEPARATE PERCENTAGES, BY WEIGHT, OF POST-CONSUMER AND PRE-CONSUMER RECYCLED CONTENT. ALSO INCLUDE MATERIAL COSTS, EXCLUDING COST OF INSTALLATION.
E. PROVIDE MANUFACTURER'S DOCUMENTATION INDICATING LOCATION OF MANUFACTURING FACILITY AND LOCATION WHERE THE BASE MATERIALS WERE EXTRACTED, MINED, QUARRIED, HARVESTED, ETC. INCLUDE ADDRESS AND DISTANCE TO THE PROJECT SITE FOR BOTH MANUFACTURE AND HARVEST. ALSO INCLUDE MATERIAL COSTS, EXCLUDING COST OF INSTALLATION.

1.4 QUALITY ASSURANCE

A. SHEET METAL FLASHING AND TRIM STANDARD: COMPLY WITH SMACNA'S "ARCHITECTURAL SHEET METAL MANUAL." CONFORM TO DIMENSIONS AND PROFILES SHOWN UNLESS MORE STRINGENT REQUIREMENTS ARE INDICATED.
B. PREINSTALLATION CONFERENCE: CONDUCT CONFERENCE AT PROJECT SITE.

PART 2 - PRODUCTS

2.1 SHEET METALS

A. ALUMINUM SHEET: ASTM B 209 (ASTM B 209M), ALLOY 3003, 3004, 3105, OR 5005, TEMPER SUITABLE FOR FORMING AND STRUCTURAL PERFORMANCE REQUIRED, BUT NOT LESS THAN H14, FINISHED AS FOLLOWS:
   1. HIGH-PERFORMANCE ORGANIC FINISH: THREE-COAT, THERMOCURED SYSTEM CONTAINING NOT LESS THAN 70 PERCENT POLYVINYLIDENE FLUORIDE RESIN BY WEIGHT; COMPLYING WITH AAMA 2605.
      A. COLOR: AS SELECTED BY ARCHITECT FROM MANUFACTURER'S FULL RANGE.
   2. PROVIDE PRETREATMENT: ALL ALUMINUM SHALL BE PRETREATED AND DIPPED PRIOR TO THE KYNAR FINISH.
B. STAINLESS-STEEL SHEET: ASTM A 240/A 240M, TYPE 304, NO. 4 FINISH.

2.2 MISCELLANEOUS MATERIALS

A. GENERAL: PROVIDE MATERIALS AND TYPES OF FASTENERS, SOLDER, WELDING RODS, PROTECTIVE COATINGS, SEPARATORS, SEALANTS, AND OTHER MISCELLANEOUS ITEMS AS REQUIRED FOR COMPLETE SHEET METAL FLASHING AND TRIM INSTALLATION.
B. FELT UNDERLAYMENT: ASTM D 226, TYPE II (NO. 30), ASPHALT-SATURATED ORGANIC FELT, NONPERFORATED.
   1. SLIP SHEET: ROSIN-SIZED PAPER, MINIMUM 3 LB/100 SQ. FT. (0.16 KG/SQ. M).
C. FASTENERS: WOOD SCREWS, ANNULAR THREADED NAILS, SELF-TAPPING SCREWS, SELF-LOCKING RIVETS AND BOLTS, AND OTHER SUITABLE FASTENERS DESIGNED TO WITHSTAND DESIGN LOADS.
   1. EXPOSED FASTENERS: HEADS MATCHING COLOR OF SHEET METAL BY MEANS OF PLASTIC CAPS OR FACTORY-APPLIED COATING.
   2. FASTENERS FOR FLASHING AND TRIM: BLIND FASTENERS OR SELF-DRILLING SCREWS, GASKETED, WITH HEX WASHER HEAD.
   3. BLIND FASTENERS: HIGH-STRENGTH STAINLESS-STEEL RIVETS.
D. SEALING TAPE: PRESSURE-SENSITIVE, 100 PERCENT SOLIDS, POLYISOBUTYLENE COMPOUND SEALING TAPE WITH RELEASE-PAPER BACKING. PROVIDE PERMANENTLY ELASTIC, NONSAG, NONTOXIC, NONSTAINING TAPE.
E. ELASTOMERIC SEALANT: ASTM C 920, ELASTOMERIC POLYURETHANE POLYMER SEALANT; OF TYPE, GRADE, CLASS, AND USE CLASSIFICATIONS REQUIRED TO SEAL JOINTS IN SHEET METAL FLASHING AND TRIM AND REMAIN WATERTIGHT.
F. BUTYL SEALANT: ASTM C 1311, SINGLE-COMPONENT, SOLVENT-RELEASE BUTYL RUBBER SEALANT, POLYISOBUTYLENE PLASTICIZED, HEAVY BODIED FOR HOOKED-TYPE EXPANSION JOINTS WITH LIMITED MOVEMENT.
G. EPOXY SEAM SEALER: TWO-PART, NONCORROSIVE, ALUMINUM SEAM-CEMENTING COMPOUND.
H. BITUMINOUS COATING: COLD-APPLIED ASPHALT MASTIC, SSPC-PAINT 12, COMPOUNDED FOR 15-MIL (0.4-MM) DRY FILM THICKNESS PER COAT.

2.3 REGLETS

A. REGLETS: UNITS OF TYPE, MATERIAL, AND PROFILE INDICATED, FORMED TO PROVIDE SECURE INTERLOCKING OF SEPARATE REGLET AND COUNTERFLASHING PIECES, AND COMPATIBLE WITH FLASHING INDICATED WITH FACTORY- MITERED AND -WELDED CORNERS AND JUNCTIONS.
   1. GENERAL: REGLETS SHALL BE COMPATIBLE WITH COUNTERFLASHING AND ROOFING MATERIAL.
   2. MANUFACTURERS:
      A. FRY REGLET CORPORATION.
      B. HICKMAN, W. P. COMPANY.
      C. O' KEEFE'S INC.
   3. MATERIAL:
      A. STAINLESS STEEL, TYPE 304, 0.020 INCH THICK
   4. TYPE:
      A. CONCRETE: MANUFACTURED CHANNEL WITH TEMPORARY CLOSURE TAPE TO KEEP REGLET FREE OF CONCRETE MATERIALS, FASTENERS FOR ATTACHING REGLET TO CONCRETE FORMS, AND GUIDES TO ENSURE ALIGNMENT OF REGLET SECTION ENDS.
         1) PRODUCT: CW (O'KEEFE INC); CO (FRY REGLET CORP.)
      B. MASONRY: MANUFACTURED REGLET WITH OFFSET TOP FLANGE FOR EMBEDMENT IN MASONRY MORTAR JOINT.
         1) PRODUCT: MI (O'KEEFE INC); MA (FRY REGLET CORP.)
      C. STUCCO/SIDING: MANUFACTURED REGLET INSTALLED PRIOR TO LATHING. USE WIND CLIPS AS REQUIRED TO COMPLY WITH THE FLORIDA BUILDING CODE.
         1) PRODUCT: SS (O'KEEFE INC); ST OR STX (FRY REGLET CORP.)
      D. EXISTING/SURFACE MOUNTED: MANUFACTURED SURFACE APPLIED REGLET WITH SLOTTED HOLES FOR FASTENING TO SUBSTRATE, WITH NEOPRENE OR OTHER SUITABLE WEATHERPROOFING WASHERS, AND WITH CHANNEL FOR SEALANT AT TOP EDGE.
         1) PRODUCT: EN (O'KEEFE INC); SM (FRY REGLET CORP.)

2.4 FABRICATION, GENERAL

A. GENERAL: CUSTOM FABRICATE SHEET METAL FLASHING AND TRIM TO COMPLY WITH RECOMMENDATIONS IN SMACNA'S "ARCHITECTURAL SHEET METAL MANUAL" THAT APPLY TO DESIGN, DIMENSIONS, METAL, AND OTHER CHARACTERISTICS OF ITEM INDICATED. SHOP FABRICATE ITEMS WHERE PRACTICABLE. OBTAIN FIELD MEASUREMENTS FOR ACCURATE FIT BEFORE SHOP FABRICATION.

B. FABRICATE SHEET METAL FLASHING AND TRIM WITHOUT EXCESSIVE OIL CANNING, BUCKLING, AND TOOL MARKS AND TRUE TO LINE AND LEVELS INDICATED, WITH EXPOSED EDGES FOLDED BACK TO FORM HEMS.
   1. SEAMS FOR ALUMINUM: FABRICATE NONMOVING SEAMS WITH FLAT-LOCK SEAMS. FORM SEAMS AND SEAL WITH EPOXY SEAM SEALER. RIVET JOINTS FOR ADDITIONAL STRENGTH.
   2. SEAMS FOR OTHER THAN ALUMINUM: FABRICATE NONMOVING SEAMS IN ACCESSORIES WITH FLAT-LOCK SEAMS. TIN EDGES TO BE SEAMED, FORM SEAMS, AND SOLDER.

C. SEALED JOINTS: FORM NONEXPANSION BUT MOVABLE JOINTS IN METAL TO ACCOMMODATE ELASTOMERIC SEALANT TO COMPLY WITH SMACNA RECOMMENDATIONS.

D. EXPANSION PROVISIONS: WHERE LAPPED OR BAYONET-TYPE EXPANSION PROVISIONS IN THE WORK CANNOT BE USED, FORM EXPANSION JOINTS OF INTERMESHING HOOKED FLANGES, NOT LESS THAN 1 INCH (25 MM) DEEP, FILLED WITH ELASTOMERIC SEALANT CONCEALED WITHIN JOINTS.

E. CONCEAL FASTENERS AND EXPANSION PROVISIONS WHERE POSSIBLE ON EXPOSED-TO-VIEW SHEET METAL FLASHING AND TRIM, UNLESS OTHERWISE INDICATED.

F. FABRICATE CLEATS AND ATTACHMENT DEVICES FROM SAME MATERIAL AS ACCESSORY BEING ANCHORED OR FROM COMPATIBLE, NONCORROSIVE METAL, AND IN THICKNESS NOT LESS THAN THAT OF METAL BEING SECURED.

2.5 ROOF SHEET METAL FABRICATIONS

A. BASE AND STEP FLASHING: FABRICATE FROM THE FOLLOWING MATERIAL:
   1. ALUMINUM: MINIMUM 0.040 INCH (1.0 MM) THICK.

B. COUNTERFLASHING AND FLASHING RECEIVERS: FABRICATE FROM THE FOLLOWING MATERIAL:
   1. ALUMINUM: MINIMUM 0.0320 INCH (0.8 MM) THICK.

C. DRIP EDGES: FABRICATE FROM THE FOLLOWING MATERIAL:
   1. ALUMINUM: MINIMUM 0.0320 INCH (0.8 MM) THICK.

D. COPINGS: COPINGS FOR WALL WIDTHS 16” TO 24” WIDE SHALL BE METAL-ERA (.050 INCH) ALUMINUM “PERMA-TITE COPING” SYSTEM WITH PROVIDED 120 MPH WIND WARRANTY AND INSTALLED TO MEET WARRANTY REQUIREMENTS

2.6 WALL SHEET METAL FABRICATIONS

A. THROUGH-WALL FLASHING: FABRICATE CONTINUOUS FLASHINGS IN MINIMUM 96-INCH- (2400-MM-) LONG, BUT NOT EXCEEDING 12-FOOT- (3.6-M-) LONG, SECTIONS, UNDER COPINGS, AT SHELF ANGLES, AND WHERE INDICATED. FABRICATE DISCONTINUOUS LINTEL, SILL, AND SIMILAR FLASHINGS TO EXTEND 6 INCHES (150 MM) BEYOND EACH SIDE OF WALL OPENINGS. FORM WITH 2-INCH- (50-MM-) HIGH, END DAMS WHERE FLASHING IS DISCONTINUOUS. FABRICATE FROM THE FOLLOWING MATERIALS:
   1. STAINLESS STEEL: 0.016 INCH (0.40 MM) THICK.

B. OPENING FLASHINGS IN WALL CONSTRUCTION: FABRICATE HEAD, SILL, AND SIMILAR FLASHINGS TO EXTEND 4 INCHES (100 MM) BEYOND WALL OPENINGS. FORM HEAD AND SILL FLASHING WITH 2-INCH- (50-MM-) HIGH, END DAMS. FABRICATE FROM THE FOLLOWING MATERIALS:
   1. STAINLESS STEEL: 0.016 INCH (0.40 MM) 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, WELDING RODS, PROTECTIVE COATINGS, SEPARATORS, SEALANTS, AND OTHER MISCELLANEOUS ITEMS AS REQUIRED TO COMPLETE SHEET METAL FLASHING AND TRIM SYSTEM.
   1. TORCH CUTTING OF SHEET METAL FLASHING AND TRIM IS NOT PERMITTED.

B. METAL PROTECTION: WHERE DISSIMILAR METALS WILL CONTACT EACH OTHER OR CORROSIVE SUBSTRATES, PROTECT AGAINST GALVANIC ACTION BY PAINTING CONTACT SURFACES WITH BITUMINOUS COATING OR BY OTHER PERMANENT SEPARATION AS RECOMMENDED BY FABRICATOR OR MANUFACTURERS OF DISSIMILAR METALS.

C. INSTALL EXPOSED SHEET METAL FLASHING AND TRIM WITHOUT EXCESSIVE OIL CANNING, BUCKLING, AND TOOL MARKS.

D. INSTALL SHEET METAL FLASHING AND TRIM TRUE TO LINE AND LEVELS INDICATED. PROVIDE UNIFORM, NEAT SEAMS WITH MINIMUM EXPOSURE OF SOLDER, WELDS, AND ELASTOMERIC SEALANT.

E. 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.
   1. SPACE CLEATS NOT MORE THAN 12 INCHES (300 MM) APART. ANCHOR EACH CLEAT WITH TWO FASTENERS. BEND TABS OVER FASTENERS.

F. EXPANSION PROVISIONS: PROVIDE FOR THERMAL EXPANSION OF EXPOSED FLASHING AND TRIM. SPACE MOVEMENT JOINTS AT A MAXIMUM OF 10 FEET (3 M) WITH NO JOINTS ALLOWED WITHIN 24 INCHES (600 MM) OF CORNER OR INTERSECTION. WHERE LAPPED OR BAYONET-TYPE EXPANSION PROVISIONS CANNOT BE USED OR WOULD NOT BE SUFFICIENTLY WATERTIGHT, FORM EXPANSION JOINTS OF INTERMESHING HOOKED FLANGES, NOT LESS THAN 1 INCH (25 MM) DEEP, FILLED WITH ELASTOMERIC SEALANT CONCEALED WITHIN JOINTS.

G. FASTENERS: USE STAINLESS STEEL FASTENERS OF SIZES THAT WILL PENETRATE SUBSTRATE NOT LESS THAN 1-1/4 INCHES (32 MM) FOR NAILS AND NOT LESS THAN 3/4 INCH (19 MM) FOR SCREWS.

H. SEAL JOINTS AS SHOWN AND AS REQUIRED FOR WATERTIGHT CONSTRUCTION.
   1. WHERE SEALANT-FILLED JOINTS ARE USED, EMBED HOOKED FLANGES OF JOINT MEMBERS NOT LESS THAN 1 INCH (25 MM) INTO SEALANT. FORM JOINTS TO COMPLETELY CONCEAL SEALANT. WHEN AMBIENT TEMPERATURE AT TIME OF INSTALLATION IS MODERATE, BETWEEN 40 AND 70 DEG F (4 AND 21 DEG C), SET JOINT MEMBERS FOR 50 PERCENT MOVEMENT EACH WAY. ADJUST SETTING PROPORTIONATELY FOR INSTALLATION AT HIGHER AMBIENT TEMPERATURES. DO NOT INSTALL SEALANT-TYPE JOINTS AT TEMPERATURES BELOW 40 DEG F (4 DEG C).
   2. PREPARE JOINTS AND APPLY SEALANTS TO COMPLY WITH REQUIREMENTS IN DIVISION 07 SECTION "JOINT SEALANTS."

I. SOLDERED JOINTS: CLEAN SURFACES TO BE SOLDERED, REMOVING OILS AND FOREIGN MATTER. PRETIN EDGES OF SHEETS TO BE SOLDERED TO A WIDTH OF 1-1/2 INCHES (38 MM) EXCEPT WHERE PRETINNED SURFACE WOULD SHOW IN FINISHED WORK.
   1. DO NOT SOLDER ALUMINUM SHEET.

3.2 ROOF DRAINAGE SYSTEM INSTALLATION

A. GENERAL: INSTALL SHEET METAL ROOF DRAINAGE ITEMS TO PRODUCE COMPLETE ROOF DRAINAGE SYSTEM ACCORDING TO SMACNA RECOMMENDATIONS AND AS INDICATED. COORDINATE INSTALLATION OF ROOF PERIMETER FLASHING WITH INSTALLATION OF ROOF DRAINAGE SYSTEM.

B. SCUPPERS: JOIN SECTIONS WITH RIVETED AND SOLDERED JOINTS OR WITH LAPPED JOINTS SEALED WITH ELASTOMERIC SEALANT. PROVIDE FOR THERMAL EXPANSION.

C. DOWNSPOUTS: JOIN SECTIONS WITH 1-1/2-INCH (38-MM) TELESCOPING JOINTS. PROVIDE FASTENERS DESIGNED TO HOLD DOWNSPOUTS SECURELY 1 INCH (25 MM) AWAY FROM WALLS; LOCATE FASTENERS AT TOP AND BOTTOM AND AT APPROXIMATELY 60 INCHES (1500 MM) O.C. IN BETWEEN.

D. SPLASH PANS: INSTALL CONCRETE SPLASH PANS AT EVERY DOWNSPOUT UNLESS SHOWN CONNECTED TO STORM SYSTEM.

3.3 ROOF FLASHING INSTALLATION

A. GENERAL: INSTALL SHEET METAL ROOF FLASHING AND TRIM TO COMPLY WITH PERFORMANCE REQUIREMENTS AND SMACNA'S "ARCHITECTURAL SHEET METAL MANUAL." PROVIDE CONCEALED FASTENERS WHERE POSSIBLE, SET UNITS TRUE TO LINE, AND LEVEL AS INDICATED. INSTALL WORK WITH LAPS, JOINTS, AND SEAMS THAT WILL BE PERMANENTLY WATERTIGHT.

B. ROOF EDGE FLASHING: ANCHOR TO RESIST UPLIFT AND OUTWARD FORCES ACCORDING TO RECOMMENDATIONS IN FMG LOSS PREVENTION DATA SHEET 1-49.
   1. INTERLOCK BOTTOM EDGE OF ROOF EDGE FLASHING WITH CONTINUOUS CLEATS ANCHORED TO SUBSTRATE AT SPACING REQUIRED TO ACCOMMODATE WIND SPEEDS AND THE FLORIDA BUILDING CODE.

C. COPINGS: REFER TO DIVISION 07 SECTION 07714 “FACTORY FORMED BUR EDGE AND COPING SYSTEM.”

D. COUNTERFLASHING: COORDINATE INSTALLATION OF COUNTERFLASHING WITH INSTALLATION OF BASE FLASHING. INSERT COUNTERFLASHING IN REGLETS OR RECEIVERS AND FIT TIGHTLY TO BASE FLASHING. SECURE IN A WATERPROOF MANNER. EXTEND COUNTERFLASHING 4 INCHES (100 MM) OVER BASE FLASHING. LAP COUNTERFLASHING JOINTS A MINIMUM OF 4 INCHES (100 MM) AND BED WITH ELASTOMERIC SEALANT.

E. METAL BASE FLASHING: LOCATE OVER MEMBRANE BASE FLASHING AND SECURE WITH CONTINUOUS CLEAT FORM COMPRESSION SEAL. FASTEN CLEAT AT MAXIMUM 4 INCHES ON CENTER. EXTEND BOTTOM FLANGE OF METAL BASE FLASHING OVER ROOFING ASSEMBLY AND HOLD IN PLACE WITH INSULATION. FILL TOP WELL OF CLEAT SERVING AS METAL BASE FLASHING TERMINATION BAR WITH JOINT SEALANT.

F. ROOF-PENETRATION FLASHING: COORDINATE INSTALLATION OF ROOF-PENETRATION FLASHING WITH INSTALLATION OF ROOFING AND OTHER ITEMS PENETRATING ROOF. INSTALL FLASHING AS REQUIRED TO PROVIDE WEATHER AND WATERTIGHT ROOF ASSEMBLY. ALL PIPING PENETRATIONS SHALL BE PAINTED TO MATCH ROOFING.

G. REGLETS: SHALL BE FASTEN, A MAXIMUM OF 12-INCHES O.C., UNLESS OTHERWISE RECOMMENDED PER MANUFACTURERS WRITTEN INSTRUCTIONS.
   1. INSERT COUNTERFLASHING INTO REGLET TO FORM TIGHT FIT. SECURE IN PLACE WITH WEDGES AT MAXIMUM OF 12-INCHES O.C. SEAL FLASHING INTO REGLETS WITH SEALANT.

END OF SECTION

SECTION 07900 - JOINT SEALANTS

PART 1 - GENERAL

1.1 SUMMARY

A. SECTION INCLUDES:
1. NONSTAINING SILICONE JOINT SEALANTS.
2. URETHANE JOINT SEALANTS.
3. MILDEW-RESISTANT JOINT SEALANTS.
4. LATEX JOINT SEALANTS.
5. SILICONE FACED FIRE RATED SEALANT SYSTEMS

B. RELATED SECTIONS:
1. SECTION 07270 - FIRESTOPPING

1.2 PREINSTALLATION MEETINGS

A. PREINSTALLATION CONFERENCE: CONDUCT CONFERENCE AT PROJECT SITE.

1.3 ACTION SUBMITTALS

A. PRODUCT DATA: FOR EACH JOINT-SEALANT PRODUCT.

B. SAMPLES: FOR EACH KIND AND COLOR OF JOINT SEALANT REQUIRED.

C. JOINT-SEALANT SCHEDULE: INCLUDE THE FOLLOWING INFORMATION:

1. JOINT-SEALANT APPLICATION, JOINT LOCATION, AND DESIGNATION.
2. JOINT-SEALANT MANUFACTURER AND PRODUCT NAME.
3. JOINT-SEALANT FORMULATION.
4. JOINT-SEALANT COLOR.
5. STANDARD DRAWINGS – SUBMIT TYPICAL FIRE BARRIER AND EXPANSION JOINT DRAWINGS(S) INDICATING PERTINENT DIMENSIONS, GENERAL CONSTRUCTION, JOINT OPENING DIMENSIONS AND PRODUCT INFORMATION.

1.4 INFORMATIONAL SUBMITTALS

A. PRODUCT TEST REPORTS.

B. PRECONSTRUCTION LABORATORY TEST REPORTS.

C. PRECONSTRUCTION FIELD-ADHESION-TEST REPORTS.

D. FIELD-ADHESION-TEST REPORTS.

E. SAMPLE WARRANTIES.

1.5 QUALITY ASSURANCE

A. TESTING AGENCY QUALIFICATIONS: QUALIFIED ACCORDING TO ASTM C 1021 TO CONDUCT THE TESTING INDICATED.

1.6 PRECONSTRUCTION TESTING

A. PRECONSTRUCTION LABORATORY TESTING: SUBMIT TO JOINT-SEALANT MANUFACTURERS, FOR TESTING INDICATED BELOW, SAMPLES OF MATERIALS THAT WILL CONTACT OR AFFECT JOINT SEALANTS.

1. ADHESION TESTING: USE ASTM C 794 TO DETERMINE WHETHER PRIMING AND OTHER SPECIFIC JOINT PREPARATION TECHNIQUES ARE REQUIRED TO OBTAIN RAPID, OPTIMUM ADHESION OF JOINT SEALANTS TO JOINT SUBSTRATES.
2. COMPATIBILITY TESTING: USE ASTM C 1087 TO DETERMINE SEALANT COMPATIBILITY WHEN IN CONTACT WITH GLAZING AND GASKET MATERIALS.
3. STAIN TESTING: USE ASTM C 1248 TO DETERMINE STAIN POTENTIAL OF SEALANT WHEN IN CONTACT WITH MASONRY SUBSTRATES.

B. PRECONSTRUCTION FIELD-ADHESION TESTING: BEFORE INSTALLING SEALANTS, FIELD TEST THEIR ADHESION TO PROJECT JOINT SUBSTRATES. TEST JOINT SEALANTS ACCORDING TO METHOD A, FIELD-APPLIED SEALANT JOINT HAND PULL TAB, IN APPENDIX X1.1 IN ASTM C 1193 OR METHOD A, TAIL PROCEDURE, IN ASTM C 1521.

1.7 WARRANTY

A. SPECIAL INSTALLER'S WARRANTY: INSTALLER AGREES TO REPAIR OR REPLACE JOINT SEALANTS THAT DO NOT COMPLY WITH PERFORMANCE AND OTHER REQUIREMENTS SPECIFIED IN THIS SECTION WITHIN SPECIFIED WARRANTY PERIOD.

1. WARRANTY PERIOD: TWO YEARS FROM DATE OF SUBSTANTIAL COMPLETION.

B. SPECIAL MANUFACTURER'S WARRANTY: MANUFACTURER AGREES TO FURNISH JOINT SEALANTS TO REPAIR OR REPLACE THOSE JOINT SEALANTS THAT DO NOT COMPLY WITH PERFORMANCE AND OTHER REQUIREMENTS SPECIFIED IN THIS SECTION WITHIN SPECIFIED WARRANTY PERIOD.

1. WARRANTY PERIOD: FIVE YEARS FROM DATE OF SUBSTANTIAL COMPLETION.

PART 2 - PRODUCTS

2.1 JOINT SEALANTS, GENERAL

A. COLORS OF EXPOSED JOINT SEALANTS: AS SELECTED BY ARCHITECT FROM MANUFACTURER'S FULL RANGE.

2.2 NONSTAINING SILICONE JOINT SEALANTS

A. NONSTAINING JOINT SEALANTS: NO STAINING OF SUBSTRATES WHEN TESTED ACCORDING TO ASTM C 1248.

B. SILICONE, NONSTAINING, S, NS, 50, NT: NONSTAINING, SINGLE-COMPONENT, NONSAG, PLUS 50 PERCENT AND MINUS 50 PERCENT MOVEMENT CAPABILITY, NONTRAFFIC-USE, NEUTRAL-CURING SILICONE JOINT SEALANT; ASTM C 920, TYPE S, GRADE NS, CLASS 50, USE NT.

1. BASIS OF DESIGN: DOW CORNING 795 SILICONE BUILDING SEALANT.

2.3 URETHANE JOINT SEALANTS

A. URETHANE, S, P, 25, T, NT: SINGLE-COMPONENT, POURABLE, PLUS 25 PERCENT AND MINUS 25 PERCENT MOVEMENT CAPABILITY, TRAFFIC- AND NONTRAFFIC-USE, URETHANE JOINT SEALANT; ASTM C 920, TYPE S, GRADE P, CLASS 25, USES T AND NT.
1. TREMCO VULKEM 45SSL OR APPROVED EQUAL.

2.4 MILDEW-RESISTANT JOINT SEALANTS

A. MILDEW-RESISTANT JOINT SEALANTS: FORMULATED FOR PROLONGED EXPOSURE TO HUMIDITY WITH FUNGICIDE TO PREVENT MOLD AND MILDEW GROWTH.

B. SILICONE, MILDEW RESISTANT, ACID CURING, S, NS, 25, NT: MILDEW-RESISTANT, SINGLE-COMPONENT, NONSAG, PLUS 25 PERCENT AND MINUS 25 PERCENT MOVEMENT CAPABILITY, NONTRAFFIC-USE, ACID-CURING SILICONE JOINT SEALANT; ASTM C 920, TYPE S, GRADE NS, CLASS 25, USE NT.
1. DOW CORNING 786 OR APPROVED EQUAL.

C. ACRYLIC LATEX: ACRYLIC LATEX OR SILICONIZED ACRYLIC LATEX, ASTM C 834, TYPE OP, GRADE NF.
1. TREMCO- TREMFLEX 834 OR APPROVED EQUAL.

2.5 JOINT-SEALANT BACKING

A. CYLINDRICAL SEALANT BACKINGS: ASTM C 1330, TYPE C (CLOSED-CELL MATERIAL WITH A SURFACE SKIN), AND OF SIZE AND DENSITY TO CONTROL SEALANT DEPTH AND OTHERWISE CONTRIBUTE TO PRODUCING OPTIMUM SEALANT PERFORMANCE.

1. BASF MSTERSEAL 920 CLOSED CELL BACKER ROD OR APPROVED EQUAL VERIFY COMPATIBILITY WITH SEALANT.

B. BOND-BREAKER TAPE: POLYETHYLENE TAPE OR OTHER PLASTIC TAPE RECOMMENDED BY SEALANT MANUFACTURER.

2.6 MISCELLANEOUS MATERIALS

A. PRIMER: MATERIAL RECOMMENDED BY JOINT-SEALANT MANUFACTURER WHERE REQUIRED FOR ADHESION OF SEALANT TO JOINT SUBSTRATES INDICATED, AS DETERMINED FROM PRECONSTRUCTION JOINT-SEALANT-SUBSTRATE TESTS AND FIELD TESTS.

B. CLEANERS FOR NONPOROUS SURFACES: CHEMICAL CLEANERS ACCEPTABLE TO MANUFACTURERS OF SEALANTS AND SEALANT BACKING MATERIALS.

C. MASKING TAPE: NONSTAINING, NONABSORBENT MATERIAL COMPATIBLE WITH JOINT SEALANTS AND SURFACES ADJACENT TO JOINTS.

2.7 SILICONE FACED WATERPROOF EXPANSION JOINT SYSTEMS: PREFORMED, PRE-COMPRESSED, SELF-EXPANDING, SEALANT SYSTEM WITH MULTIPLE SILICONE-COATED SEALING FACES. WATERTIGHT, ENERGY-EFFICIENT, EXTERIOR, AND INTERIOR ABOVE-GRADE WALL JOINTS, 100% MOVEMENT.

A. PROVIDE SEISMIC COLORSEAL-DS AS MANUFACTURED BY EMSEAL JOINT SYSTEMS LTD AS INDICATED ON DRAWINGS FOR VERTICAL EXPANSION JOINT LOCATIONS, OR APPROVED EQUAL.

2.8 SILICONE FACED FIRE RATED EXPANSION JOINT SYSTEMS: PREFORMED, PRE-COMPRESSED, SELF-EXPANDING, FIRE RATED SEALANT SYSTEM WITH TENSIONLESS SILICONE PRE-COATED SURFACE, WATERTIGHT, 1 HOUR UL2079 RATED, 100% MOVEMENT, FOR VERTICAL EXPANSION JOINTS FOR INTERIOR AND EXTERIOR WALLS.

A. EMSHIELD WFR1 AS MANUFACTURED BY EMSEAL JOINT SYSTEMS LTD OR APPROVED EQUAL.

PART 3 - EXECUTION

3.1 PREPARATION

A. SURFACE CLEANING OF JOINTS: CLEAN OUT JOINTS IMMEDIATELY BEFORE INSTALLING JOINT SEALANTS TO COMPLY WITH JOINT-SEALANT MANUFACTURER'S WRITTEN INSTRUCTIONS AND THE FOLLOWING REQUIREMENTS:

1. REMOVE LAITANCE AND FORM-RELEASE AGENTS FROM CONCRETE.
2. CLEAN NONPOROUS JOINT SUBSTRATE SURFACES WITH CHEMICAL CLEANERS OR OTHER MEANS THAT DO NOT STAIN, HARM SUBSTRATES, OR LEAVE RESIDUES CAPABLE OF INTERFERING WITH ADHESION.

B. JOINT PRIMING: PRIME JOINT SUBSTRATES WHERE RECOMMENDED BY JOINT-SEALANT MANUFACTURER OR AS INDICATED BY PRECONSTRUCTION JOINT-SEALANT-SUBSTRATE TESTS OR PRIOR EXPERIENCE.

C. MASKING TAPE: USE MASKING TAPE WHERE REQUIRED TO PREVENT CONTACT OF SEALANT OR PRIMER WITH ADJOINING SURFACES.

3.2 INSTALLATION OF JOINT SEALANTS

A. GENERAL: COMPLY WITH ASTM C 1193 AND JOINT-SEALANT MANUFACTURER'S WRITTEN INSTALLATION INSTRUCTIONS FOR PRODUCTS AND APPLICATIONS INDICATED, UNLESS MORE STRINGENT REQUIREMENTS APPLY.

B. INSTALL SEALANT BACKINGS OF KIND INDICATED TO SUPPORT SEALANTS DURING APPLICATION AND AT POSITION REQUIRED TO PRODUCE CROSS-SECTIONAL SHAPES AND DEPTHS OF INSTALLED SEALANTS RELATIVE TO JOINT WIDTHS THAT ALLOW OPTIMUM SEALANT MOVEMENT CAPABILITY.

C. INSTALL BOND-BREAKER TAPE BEHIND SEALANTS WHERE SEALANT BACKINGS ARE NOT USED BETWEEN SEALANTS AND BACKS OF JOINTS.

D. INSTALL SEALANTS USING PROVEN TECHNIQUES THAT COMPLY WITH THE FOLLOWING AND AT THE SAME TIME BACKINGS ARE INSTALLED:

1. PLACE SEALANTS SO THEY DIRECTLY CONTACT AND FULLY WET JOINT SUBSTRATES.
2. COMPLETELY FILL RECESSES IN EACH JOINT CONFIGURATION.
3. PRODUCE UNIFORM, CROSS-SECTIONAL SHAPES AND DEPTHS RELATIVE TO JOINT WIDTHS THAT ALLOW OPTIMUM SEALANT MOVEMENT CAPABILITY.

E. TOOLING OF NONSAG SEALANTS: IMMEDIATELY AFTER SEALANT APPLICATION AND BEFORE SKINNING OR CURING BEGINS, TOOL SEALANTS TO FORM SMOOTH, UNIFORM BEADS OF CONFIGURATION INDICATED. USE TOOLING AGENTS THAT ARE APPROVED IN WRITING BY SEALANT MANUFACTURER AND THAT DO NOT DISCOLOR SEALANTS OR ADJACENT SURFACES.

1. PROVIDE CONCAVE JOINT PROFILE PER FIGURE 8A IN ASTM C 1193 UNLESS OTHERWISE INDICATED.

3.3 FIELD QUALITY CONTROL

A. FIELD-ADHESION TESTING: FIELD TEST JOINT-SEALANT ADHESION TO JOINT SUBSTRATES AS FOLLOWS:

1. EXTENT OF TESTING: TEST COMPLETED AND CURED SEALANT JOINTS AS FOLLOWS:

a. PERFORM 10 TESTS FOR THE FIRST 1000 FEET (300 M) OF JOINT LENGTH FOR EACH KIND OF SEALANT AND JOINT SUBSTRATE.
b. PERFORM ONE TEST FOR EACH 1000 FEET (300 M)] OF JOINT LENGTH THEREAFTER OR ONE TEST PER EACH FLOOR PER ELEVATION.

2. TEST METHOD: TEST JOINT SEALANTS ACCORDING TO METHOD A, FIELD-APPLIED SEALANT JOINT HAND PULL TAB, IN APPENDIX X1 IN ASTM C 1193 OR METHOD A, TAIL PROCEDURE, IN ASTM C 1521.

B. EVALUATION OF FIELD-ADHESION-TEST RESULTS: SEALANTS NOT EVIDENCING ADHESIVE FAILURE FROM TESTING OR NONCOMPLIANCE WITH OTHER INDICATED REQUIREMENTS WILL BE CONSIDERED SATISFACTORY. REMOVE SEALANTS THAT FAIL TO ADHERE TO JOINT SUBSTRATES DURING TESTING OR TO COMPLY WITH OTHER REQUIREMENTS. RETEST FAILED APPLICATIONS UNTIL TEST RESULTS PROVE SEALANTS COMPLY WITH INDICATED REQUIREMENTS.

3.4 JOINT-SEALANT SCHEDULE

A. JOINT-SEALANT APPLICATION: EXTERIOR JOINTS IN VERTICAL SURFACES AND HORIZONTAL NONTRAFFIC SURFACES <JS-1>.

1. JOINT LOCATIONS:
   a. CONTROL AND EXPANSION JOINTS IN UNIT MASONRY.
   b. CONTROL AND EXPANSION JOINTS IN EIFS.

c. JOINT PENETRATIONS THROUGH EXTERIOR WALLS.
d. OTHER JOINTS AS INDICATED ON DRAWINGS.

2. JOINT SEALANT: SILICONE, NONSTAINING, S, NS, 50, NT- DOW CORNING 795 SILICONE BUILDING SEALANT.
3. JOINT-SEALANT COLOR: AS SELECTED BY ARCHITECT FROM MANUFACTURER'S FULL RANGE OF COLORS.

B. JOINT-SEALANT APPLICATION: INTERIOR JOINTS IN HORIZONTAL TRAFFIC SURFACES.

1. JOINT LOCATIONS:

a. ISOLATION JOINTS IN CAST-IN-PLACE CONCRETE SLABS.
b. OTHER JOINTS AS INDICATED ON DRAWINGS.

2. JOINT SEALANT: URETHANE, S, P, 25, T, NT- TREMCO VULKEM 45SSL.
3. JOINT-SEALANT COLOR: AS SELECTED BY ARCHITECT FROM MANUFACTURER'S FULL RANGE OF COLORS.

C. JOINT-SEALANT APPLICATION: INTERIOR JOINTS IN VERTICAL SURFACES AND HORIZONTAL NONTRAFFIC SURFACES NOT SUBJECT TO SIGNIFICANT MOVEMENT.

1. JOINT LOCATIONS:

a. CONTROL JOINTS ON EXPOSED INTERIOR SURFACES OF EXTERIOR WALLS.
b. PERIMETER JOINTS BETWEEN INTERIOR WALL SURFACES AND FRAMES OF INTERIOR DOORS AND WINDOWS.
c. OTHER JOINTS AS INDICATED ON DRAWINGS.

2. JOINT SEALANT: ACRYLIC LATEX- TREMCO TREMFLEX 834 JOINT SEALANT.
3. JOINT-SEALANT COLOR: AS SELECTED BY ARCHITECT FROM MANUFACTURER'S FULL RANGE OF COLORS.

D. JOINT-SEALANT APPLICATION: MILDEW-RESISTANT INTERIOR JOINTS IN VERTICAL SURFACES AND HORIZONTAL NONTRAFFIC SURFACES.

1. JOINT LOCATIONS:

a. JOINTS BETWEEN PLUMBING FIXTURES AND ADJOINING WALLS, FLOORS, AND COUNTERS.
b. TILE CONTROL AND EXPANSION JOINTS WHERE INDICATED.
c. OTHER JOINTS AS INDICATED ON DRAWINGS.

2. JOINT SEALANT: SILICONE, MILDEW RESISTANT, ACID CURING, S, NS, 25, NT- DOW CORNING 786.
3. JOINT-SEALANT COLOR: AS SELECTED BY ARCHITECT FROM MANUFACTURER'S FULL RANGE OF COLORS.

E. JOINT-SEALANT APPLICATION: CONCEALED MASTICS <JS-5>.

1. JOINT LOCATIONS:

a. ALUMINUM THRESHOLDS.
b. SILL PLATES.
c. SILL FLASHING.
d. OTHER JOINTS AS INDICATED ON DRAWINGS.

2. JOINT SEALANT: BUTYL-RUBBER BASED- TREMCO BUTYL SEALANT.
3. JOINT-SEALANT COLOR: AS SELECTED BY ARCHITECT FROM MANUFACTURER'S FULL RANGE OF COLORS.

F. JOINT-SEALANT APPLICATION: INTERIOR/EXTERIOR EXPANSION JOINT/SEALANT GREATER THAN 5/8" WIDE

1. JOINT LOCATIONS:

   a. EXPANSION JOINTS BETWEEN MASONRY AND STEEL.
   b. OTHER JOINTS AS INDICATED ON DRAWINGS.

2. JOINT SEALANT: SILICONE FACED, PREFORMED SYSTEM: - SEISMIC COLORSEAL-DS BY EMSEAL

3. JOINT-SEALANT COLOR: AS SELECTED BY ARCHITECT FROM MANUFACTURER'S FULL RANGE OF COLORS.

G. JOINT-SEALANT APPLICATION: INTERIOR/EXTERIOR FIRE RATED EXPANSION JOINT/SEALANT GREATER THAN 5/8" WIDE.

1. JOINT LOCATIONS:

   a. EXPANSION JOINTS BETWEEN MASONRY AND STEEL.
   b. OTHER JOINTS AS INDICATED ON DRAWINGS.

2. JOINT SEALANT: SILICONE FACED, PREFORMED SYSTEM: EMSHIELD WFR1
3. JOINT-SEALANT COLOR: AS SELECTED BY ARCHITECT FROM MANUFACTURER'S FULL RANGE OF COLORS.

END OF SECTION 079200

SECTION 08110 - STEEL DOORS AND FRAMES

PART 1 GENERAL

1.01 SECTION INCLUDES

A. STEEL DOORS

B. STEEL FRAMES

C. STEEL ARCHITECTURAL STICK SYSTEMS

1.02 RELATED SECTIONS

A. SECTION 08210 - WOOD DOORS
B. SECTION 08710 - DOOR HARDWARE
C. SECTION 08800 - GLAZING
D. SECTION 09900 - PAINTS AND COATINGS

1.03 REFERENCES

A. ASTM - AMERICAN SOCIETY FOR TESTING AND MATERIALS
   1. ASTM A 653/A 653M - STANDARD SPECIFICATION FOR STEEL SHEET, ZINC-COATED (GALVANIZED) OR ZINC-IRON ALLOY-COATED (GALVANNEALED) BY THE HOT-DIP PROCESS.
   2. ASTM A 924 - SPECIFICATION FOR GENERAL REQUIREMENTS FOR STEEL SHEET, METALLIC COATED BY THE HOT DIP PROCESS.

B. ANSI - AMERICAN NATIONAL STANDARDS INSTITUTE
   1. ANSI/DHI A115 - SPECIFICATIONS FOR HARDWARE PREPARATIONS IN STANDARD STEEL DOORS AND FRAMES.
   2. ANSI/DHI A115.IG - INSTALLATION GUIDE FOR DOORS AND HARDWARE.
   3. ANSI A156.7 - HINGE TEMPLATE DIMENSIONS.
   4. ANSI A250.4 – TEST PROCEDURE AND ACCEPTANCE CRITERIA FOR PHYSICAL ENDURANCE FOR STEEL DOORS AND HARDWARE REINFORCING.
   5. ANSI A 250.10 - TEST PROCEDURE AND ACCEPTANCE CRITERIA FOR PRIME PAINTED STEEL SURFACES FOR STEEL DOORS AND FRAMES.
   6. ANSI/SDI 250.11 - RECOMMENDED ERECTION INSTRUCTIONS FOR STEEL FRAMES

C. SDI - STEEL DOOR INSTITUTE
   1. SDI 105 - RECOMMENDED ERECTION INSTRUCTIONS FOR STEEL FRAMES.
   2. SDI 111 - RECOMMENDED DETAILS AND GUIDELINES FOR STANDARD STEEL DOORS AND FRAMES AND ACCESSORIES.
   3. SDI 117 - MANUFACTURING TOLERANCES FOR STANDARD STEEL DOORS AND FRAMES.
   4. SDI 122 - INSTALLATION AND TROUBLESHOOTING GUIDE FOR STANDARD STEEL DOORS AND FRAMES.
   5. SDI 124 - MAINTENANCE OF STANDARD STEEL DOORS AND FRAMES.

D. NAAMM/HMMA - HOLLOW METAL MANUFACTURERS ASSOCIATION
   1. HMMA 840 - GUIDE SPECIFICATION FOR INSTALLATION AND STORAGE OF HOLLOW METAL DOORS AND FRAMES
   2. HMMA 820 TN01- GROUTING HOLLOW METAL FRAMES
   3. HMMA 820 TN03 – GUIDELINES FOR GLAZING OF HOLLOW METAL TRANSOM, SIDELIGHT AND WINDOWS

E. BUILDING CODE REFERENCES
   1. NFPA 80 - STANDARD FOR FIRE DOORS AND OTHER OPENING PROTECTIVES.
   2. NFPA 105 - STANDARD FOR THE INSTALLATION OF SMOKE DOOR ASSEMBLIES AND OTHER OPENING PROTECTIVES
   3. NFPA 252 – STANDARD METHOD OF FIRE TESTS OF DOOR ASSEMBLIES
   4. ANSI/UL 10C - STANDARD FOR SAFETY FOR POSITIVE PRESSURE FIRE TESTS OF DOOR ASSEMBLIES
   5. MIAMI - DADE COUNTY TEST PROTOCOLS PA 201, PA 202, AND PA 203.
   6. FLORIDA BUILDING CODE TEST PROTOCOLS TAS 201, TAS 202 AND TAS 203

1.04 REQUIREMENTS OF REGULATORY AGENCIES:

A. DOORS AND FRAMES: CONFORM TO APPLICABLE CODES FOR FIRE RATINGS. IT IS THE INTENT OF THIS SPECIFICATION THAT DOOR HARDWARE AND ITS APPLICATION COMPLY OR EXCEED THE STANDARDS FOR LABELED OPENINGS. IN CASE OF CONFLICTS IN REQUIRED FIRE PROTECTION RATINGS, PROVIDE FIRE RATINGS AS REQUIRED BY NFPA AND UL.

   1. FIRE DOOR ASSEMBLIES IN EXIT ENCLOSURES AND EXIT PASSAGEWAYS: MAXIMUM TRANSMITTED TEMPERATURE END POINT OF NOT MORE THAN 450°F (121°C) ABOVE AMBIENT AT THE END OF 30 MINUTES OF THE STANDARD FIRE TEST EXPOSURE.

1.05 SUBMITTALS

A. SUBMIT FOR REVIEW SIX (1) COMPLETE ELECTRONIC COPY OF THE HOLLOW METAL SHOP DRAWINGS COVERING COMPLETE IDENTIFICATION OF ITEMS REQUIRED FOR THE PROJECT. INCLUDE MANUFACTURER'S NAMES AND IDENTIFICATION OF PRODUCT. INCLUDED SIX (1) COMPLETE ELECTRONIC COPY OF CATALOG CUTS AND/OR TECHNICAL DATA SHEETS AND OTHER PERTINENT DATA AS REQUIRED TO INDICATE COMPLIANCE WITH THESE SPECIFICATIONS.
SUBMIT HARD COPIES ONLY UPON REQUEST.

   1. SHOP DRAWINGS: SUBMIT COMPLETE AND DETAILED WITH RESPECT TO QUANTITIES, DIMENSIONS, SPECIFIED PERFORMANCE, AND DESIGN CRITERIA, MATERIALS AND SIMILAR DATA TO ENABLE THE ARCHITECT TO REVIEW THE INFORMATION AS REQUIRED.

   2. INCLUDE NOA OR FBC NUMBERS VALIDATING COMPLIANCE WITH MIAMI-DADE COUNTY PRODUCT CONTROL APPROVAL SYSTEM OF THE FLORIDA BUILDING CODE APPROVAL SYSTEM.

B. INDICATE FRAMES CONFIGURATION, ANCHOR TYPES AND SPACING, LOCATION OF CUTOUTS FOR HARDWARE, REINFORCEMENT, TO ENSURE DOORS AND FRAMES ARE PROPERLY PREPARED AND COORDINATED TO RECEIVE HARDWARE.

C. INDICATE DOOR ELEVATIONS, INTERNAL REINFORCEMENT, CLOSURE METHOD, AND CUTOUTS FOR GLASS LIGHTS AND LOUVERS.

D. SUBMIT MANUFACTURER'S INSTALLATION INSTRUCTIONS, INCLUDING A CURRENT COPY OF ANSI A250.11 AS PART OF THE SHOP DRAWING SUBMITTAL.

E. SHOP DRAWINGS, PRODUCT DATA, AND SAMPLES: STAMP WITH CONTRACTOR'S STAMP VERIFYING THEY HAVE BEEN COORDINATED AND REVIEWED FOR COMPLETENESS AND COMPLIANCE WITH THE CONTRACT DOCUMENTS.

F. SHOP DRAWINGS SUBMITTED WITHOUT THE ABOVE REQUIREMENTS WILL BE CONSIDERED INCOMPLETE, WILL NOT BE REVIEWED, AND WILL BE RETURNED DIRECTLY TO THE CONTRACTOR.

G. FOLLOW THE SAME PROCEDURES FOR RE-SUBMITTAL AS THE INITIAL SUBMITTAL WITH THE APPROPRIATE DATES REVISED.

H. PROVIDE EVIDENCE OF MANUFACTURER'S MEMBERSHIP IN THE STEEL DOOR INSTITUTE.

I. ALL SCHEDULES SHALL BE IN THE SDI 111-D FORMAT AND THAT OF THE BID DOCUMENTS OR THEY SHALL BE REJECTED.

1.06 QUALITY ASSURANCE

A. SELECT A QUALIFIED HOLLOW METAL DISTRIBUTOR WHO IS A DIRECT ACCOUNT OF THE MANUFACTURER OF THE PRODUCTS FURNISHED. IN ADDITION, THAT DISTRIBUTOR MUST HAVE IN THEIR REGULAR EMPLOYMENT AN ARCHITECTURAL HARDWARE CONSULTANT (AHC), A CERTIFIED DOOR CONSULTANT (CDC) OR AN ARCHITECTURAL OPENINGS CONSULTANT (AOC), WHO WILL BE AVAILABLE TO CONSULT WITH THE ARCHITECT AND CONTRACTOR REGARDING MATTERS AFFECTING THE DOOR AND FRAME OPENING.

B. CONFORM TO REQUIREMENTS OF THE ABOVE REFERENCE STANDARDS. SUBMIT TEST REPORTS UPON REQUEST BY THE OWNER OR ARCHITECT.

C. UNDERWRITERS' LABORATORIES AND INTERTEK TESTING SERVICES / WARNOCK HERSEY, LABELED FIRE DOORS AND FRAMES:

1. LABEL FIRE DOORS AND FRAMES LISTED IN ACCORDANCE WITH UNDERWRITERS LABORATORIES STANDARD UL10C, AND POSITIVE PRESSURE FIRE TESTS OF DOOR ASSEMBLIES.

2. CONSTRUCT AND INSTALL DOORS AND FRAMES TO COMPLY WITH APPLICABLE ISSUE OF ANSI/NFPA 80.

3. MANUFACTURE UNDERWRITERS' LABORATORIES LABELED DOORS AND FRAMES UNDER THE UL FACTORY INSPECTION PROGRAM AND IN STRICT COMPLIANCE TO UL PROCEDURES, AND PROVIDE THE DEGREE OF FIRE PROTECTION, HEAT TRANSMISSION AND PANIC LOADING CAPABILITY INDICATED BY THE OPENING CLASS.

4. MANUFACTURE INTERTEK TESTING SERVICES / WARNOCK HERSEY LABELED DOORS AND FRAMES UNDER THE ITS/WH FACTORY INSPECTION PROGRAM AND IN STRICT COMPLIANCE TO ITS/WH PROCEDURES AND PROVIDE THE DEGREE OF FIRE PROTECTION CAPABILITY INDICATED BY THE OPENING CLASS.

5. AFFIXED PHYSICAL LABEL OR APPROVED MARKING TO FIRE DOORS AND/OR FIRE DOOR FRAMES, AT AN AUTHORIZED FACILITY AS EVIDENCE OF COMPLIANCE WITH PROCEDURES OF THE LABELING AGENCY. LABELS TO BE METAL, PAPER OR PLASTIC. STAMPED OR DIE CAST LABELS ARE NOT PERMITTED. LABELS ARE NOT

TO BE REMOVED, DEFACED OR MADE ILLEGIBLE WHILE THE DOOR IS IN SERVICE AS COVERED IN NFPA 80.

6. CONFORM TO APPLICABLE CODES FOR FIRE RATINGS. IT IS THE INTENT OF THIS SPECIFICATION THAT HARDWARE AND ITS APPLICATION COMPLY OR EXCEED THE STANDARDS FOR LABELED OPENINGS. IN CASE OF CONFLICT BETWEEN TYPES REQUIRED FOR FIRE PROTECTION, FURNISH TYPE REQUIRED BY NFPA AND UL.

D. SEVERE STORM PRODUCTS:

1. HURRICANE DOORS: DOOR SYSTEMS REQUIRED TO COMPLY WITH THE MIAMI-DADE COUNTY PRODUCT CONTROL APPROVAL SYSTEM OR THE FLORIDA BUILDING CODE APPROVAL SYSTEM MEETING THE REQUIREMENTS OF MIAMI-DADE COUNTY TEST PROTOCOLS PA 201, PA 202, PA 203 AND FLORIDA BUILDING CODE TEST PROTOCOLS TAS 201, TAS 202 AND TAS 203.

E. MANUFACTURER QUALIFICATIONS: MEMBER OF THE STEEL DOOR INSTITUTE.

F. INSTALLER: MINIMUM FIVE YEARS DOCUMENTED EXPERIENCE INSTALLING PRODUCTS SPECIFIED IN THIS SECTION.

1.07 SAMPLES:

A. IF REQUESTED BY THE ARCHITECT, SUBMIT A 18” X 24” CUT-AWAY SAMPLE DOOR WITH PROVISIONS FOR LOCKSET, HINGE AND CORNER SECTION OF FRAME.

1. CONSTRUCT DOOR SAMPLE TO SHOW VERTICAL EDGE CONSTRUCTION, TOP AND BOTTOM CONSTRUCTION, INSULATION, FACE STIFFENERS, HINGE, AND OTHER APPLIED HARDWARE REINFORCEMENTS. INCLUDE LOUVER SECTIONS AND GLAZING STOP WHERE APPLICABLE.

2. CONSTRUCT FRAME SAMPLE TO SHOW FRAME PROFILE, WELDED CORNER JOINT, WELDED HINGE REINFORCEMENT, DUST COVER BOXES, FLOOR ANCHORS AND WALL ANCHORS. INCLUDE PANEL AND LOUVER SECTIONS AND GLAZING STOPS WHERE APPLICABLE.

1.08 DELIVERY, STORAGE, AND HANDLING

A. STORAGE OF DOORS

1. STORE DOORS VERTICALLY IN A DRY AREA, UNDER PROPER COVER. PLACE THE UNITS ON AT LEAST 4" HIGH WOOD SILLS ON FLOORS IN A MANNER THAT WILL PREVENT RUST AND DAMAGE. AVOID STORAGE IN NON-VENTED PLASTIC OR CANVAS SHELTERS, WHICH CREATE A HUMIDITY CHAMBER AND PROMOTE RUSTING. IF THE DOOR BECOMES WET, OR MOISTURE APPEARS, REMOVE PROTECTIVE WRAPPING IMMEDIATELY. PROVIDE A 4" SPACE BETWEEN THE DOORS TO PERMIT AIR CIRCULATION. PROPER STORAGE IS REQUIRED TO MEET THE REQUIREMENTS OF ANSI/SDI A250.10 AND HMMA 840.

B. STORAGE OF FRAMES

1. STORE FRAMES IN AN UPRIGHT POSITION WITH HEADS UPPERMOST UNDER COVER ON 4" WOOD SILLS ON FLOORS IN A MANNER THAT WILL PREVENT RUST AND DAMAGE. DO NOT USE NON-VENTED PLASTIC OR CANVAS SHELTERS, WHICH

CREATE A HUMIDITY CHAMBER AND PROMOTE RUSTING. STORE ASSEMBLED FRAMES IN A VERTICAL POSITION, FIVE UNITS MAXIMUM IN A STACK. PROVIDE A 2" SPACE BETWEEN FRAMES TO PERMIT AIR CIRCULATION.

2. PROVIDE PROPER STORAGE FOR DOORS AND FRAMES, TO MAINTAIN THE QUALITY AND INTEGRITY OF THE FACTORY APPLIED PAINT AND MAINTAIN THE REQUIREMENTS OF ANSI/SDI A250.10 AND HMMA 840.

3. SAND TOUCH UP AND CLEAN PRIME PAINTED SURFACES PRIOR TO FINISH PAINTING IN ACCORDANCE WITH THE MANUFACTURER'S INSTRUCTIONS.

1.09 COORDINATION

A. COORDINATE WORK WITH OTHER DIRECTLY AFFECTED SECTIONS INVOLVING MANUFACTURE OR FABRICATION OF INTERNAL CUTOUTS AND REINFORCEMENT FOR DOOR HARDWARE, ELECTRIC DEVICES AND RECESSED ITEMS.

B. COORDINATE WORK WITH FRAME OPENING CONSTRUCTION, DOOR AND HARDWARE INSTALLATION.

C. SEQUENCE INSTALLATION TO ACCOMMODATE REQUIRED DOOR HARDWARE.

D. VERIFY FIELD DIMENSIONS FOR FACTORY ASSEMBLED FRAMES PRIOR TO FABRICATION.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. ACCEPTABLE MANUFACTURERS FOR DOORS AND FRAMES SPECIFIED ARE LISTED BELOW. ONLY THE PRODUCTS OF THE LISTED MANUFACTURERS WILL BE ACCEPTED. NO ALTERNATES WILL BE ACCEPTED.

1. STEELCRAFT, CINCINNATI, OHIO

B. PROVIDE STEEL DOORS AND FRAMES FROM A SINGLE MANUFACTURER.

2.02 DOORS:

A. HURRICANE DOORS: DESIGNED TO RESIST THE CYCLIC PRESSURES, STATIC PRESSURES AND MISSILE IMPACT LOADS AS DETAILED IN THE MIAMI-DADE COUNTY PRODUCT CONTROL APPROVAL SYSTEM OF THE FLORIDA BUILDING CODE APPROVAL SYSTEM AND MEETS THE REQUIREMENTS OF MIAMI – DADE COUNTY TEST PROTOCOLS PA 201, PA 202, PA 203 AND FLORIDA BUILDING CODE TEST PROTOCOLS TAS 201, TAS 202 AND TAS 203.

B. CONSTRUCT EXTERIOR/INTERIOR DOORS TO THESE DESIGNS AND GAGES:

1. EXTERIOR DOORS: ASTM A 123, CLASS G90, 16 GAUGE [0.053" (1.3MM) GALVANIZED STEEL. WITH CLOSED AND SEALED TOPS.

A. INCLUDE GALVANIZED COMPONENTS AND INTERNAL REINFORCEMENTS WITH GALVANIZED DOORS.

B. CLOSE TOPS OF EXTERIOR SWING-OUT DOORS TO ELIMINATE MOISTURE PENETRATION. GALVANIZED STEEL TOP CAPS ARE PERMITTED.

2. FACTORY PRIME PAINTED DOORS INDICATED ON DOOR SCHEDULE AS HM.

3. HARDWARE REINFORCEMENTS:

   A. HINGE REINFORCEMENTS FOR FULL MORTISE HINGES: MINIMUM 7 GAGE [0.180" (4.7MM)].

   B. LOCK REINFORCEMENTS: MINIMUM 16 GAGE [0.053" (1.3MM)].

   C. CLOSER REINFORCEMENTS: MINIMUM 14 GAGE [0.067" (1.7MM)], 20” LONG.

   D. GALVANIZED DOORS: INCLUDE GALVANIZED HARDWARE REINFORCEMENTS.

   E. PROJECTION WELDED HINGE AND LOCK REINFORCEMENTS TO THE EDGE OF THE DOOR.

   F. PROVIDED ADEQUATE REINFORCEMENTS FOR OTHER HARDWARE AS REQUIRED.

4. GLASS MOLDINGS AND STOPS (BOTH LABELED AND NON-LABELED DOORS):

   A. FABRICATE GLASS TRIM FROM 24 GAGE [.6MM] STEEL CONFORMING TO:
      1 INTERIOR OPENINGS ASTM DESIGNATION A 366 COLD ROLLED STEEL

      2 EXTERIOR OPENINGS ASTM DESIGNATION A 123, GALVANIZED STEEL WITH A ZINC COATING OF 0.90 OUNCES PER SQUARE FOOT (G90) FOR EXTERIOR OPENINGS.

   B. INSTALL TRIM INTO THE DOOR AS A FOUR-SIDED WELDED ASSEMBLY WITH MITERED, REINFORCED AND WELDED CORNERS.

   C. TRIM: IDENTICAL ON BOTH SIDES OF THE DOOR.

   D. EXPOSED FASTENERS ARE NOT PERMITTED. LABELED AND NON-LABELED DOORS: USE THE SAME TRIM.

   E. ACCEPTABLE MOUNTING METHODS:

      1 FIT INTO A FORMED AREA OF THE DOOR FACE, NOT EXTENDING BEYOND THE DOOR FACE, AND INTERLOCKING INTO THE RECESSED AREA

      2 CAP THE CUTOUT NOT EXTEND MORE THAN 1/16” [1.6MM] FROM THE DOOR FACE.

C. FULL FLUSH TYPE DOORS CONSTRUCTION

1. ANSI-A250.4 CRITERIA AND TESTED TO 5,000,000 OPERATING CYCLES.

2. APPROVED DOOR CORE CONSTRUCTIONS:

A. HONEYCOMB: INTERIOR DOORS SHALL BE REINFORCED, STIFFENED, SOUND DEADENED AND INSULATED WITH IMPREGNATED KRAFT HONEYCOMB CORE COMPLETELY FILLING THE INSIDE OF THE DOORS AND LAMINATED TO INSIDE FACES OF BOTH PANELS USING CONTACT ADHESIVE APPLIED TO BOTH PANELS AND HONEYCOMB CORE.

B. POLYSTYRENE: EXTERIOR DOORS SHALL BE REINFORCED, STIFFENED, SOUND DEADENED AND INSULATED WITH A RIGID POLYSTYRENE CORE BONDED TO THE INSIDE FACES OF BOTH PANELS WITH CONTACT ADHESIVE. FILL VOIDS AROUND THE PERIMETER OF THE DOOR WITH HONEYCOMB. MAX. U -FACTOR 0.45, MIN. R VALUE- 2.3.

C. STEEL STIFFENED WHERE REQUIRED BY CODE: VERTICALLY STIFFENED WITH STEEL STIFFENERS AND SOUND DEADENED WITH FIBERGLASS BATT INSULATION. FABRICATE HAT SHAPED STIFFENERS FROM 20 GAGE (.8 MM). LOCATE VERTICAL INTERIOR WEBS 6" (152 MM) APART, WELDED TO THE INSIDE OF THE FACE SHEETS 5" (127 MM) ON CENTER. WELD THE HAT SHAPE STIFFENERS TOGETHER AT THE TOP AND BOTTOM OF THE DOOR. FILL AREAS BETWEEN STIFFENERS WITH FIBERGLASS.

3. VERTICAL EDGE SEAMS: PROVIDE DOORS WITH CONTINUOUS VERTICAL MECHANICAL INTER-LOCKING JOINTS AT LOCK AND HINGE EDGES WITH VISIBLE EDGE SEAMS. APPLY A CONTINUOUS BEAD OF STRUCTURAL EPOXY IN THE INTERNAL VERTICAL CONNECTION.

A. VISIBLE EDGE SEAM: CONTINUOUS VERTICAL MECHANICAL INTERLOCKING JOINT WITH INTERNAL EPOXY SEAL.

4. BEVEL HINGE AND LOCK DOOR EDGES 1/8 INCH (3 MM) IN 2 INCHES (50 MM). SQUARE EDGES ON HINGE AND/OR LOCK STILES ARE NOT ACCEPTABLE.

5. REINFORCE TOP AND BOTTOM OF DOORS WITH GALVANNEALED 14 GAGE, WELDED TO BOTH PANELS.

2.03 DOOR FRAMES:

A. CONSTRUCT EXTERIOR AND METAL DOOR FRAMES TO THESE PROFILES, DESIGNS AND GAGES.

1. EXTERIOR FRAMES: ASTM A 123, CLASS G90 14 GAGE [0.067” (1.7MM)] GALVANIZED STEEL.

2. INCLUDE GALVANIZED COMPONENTS AND INTERNAL REINFORCEMENTS WITH GALVANIZED FRAMES.

B. FLUSH FRAMES: SET-UP AND WELDED WITH TEMPORARY SHIPPING BARS. UNLESS OTHERWISE INDICATED, FRAME WILL HAVE 2" FACES AND 5/8" STOPS. FRAME DEPTHS PER THE CONTRACT DOCUMENTS.

1. PROVIDE FRAMES WITH A MINIMUM OF SIX WALL ANCHORS AND TWO ADJUSTABLE BASE ANCHORS OF MANUFACTURER'S STANDARD DESIGN. ACCEPTABLE PRODUCTS:

2. PROVIDE WELDED 3-SIDED FRAMES AS FOLLOWS:

A. FULL PROFILE WELDED:
1 WELD MITER JOINTS BETWEEN HEAD AND JAMB FACES COMPLETELY ALONG THEIR LENGTH EITHER INTERNALLY OR EXTERNALLY.

2 INTERNALLY WELD PERIMETER PROFILE JOINTS FULL LENGTH OF SOFFIT AND RABBETS WITH HAIRLINE SEAMS ON EXTERNAL MEETING SURFACES. GRIND AND FINISH FACE JOINTS SMOOTH.

C. PREPARE FRAMES TO RECEIVE INSERTED TYPE DOOR SILENCERS (3) PER STRIKE JAMB ON SINGLE DOORS, AND (2) PER HEAD FOR PAIR OF DOORS. STICK-ON SILENCERS ARE NOT PERMITTED.

D. FRAME HARDWARE REINFORCEMENTS
:

1. MORTISE HINGE REINFORCEMENT: MINIMUM 7 GAGE [0.180" (4.7MM)].
A. PROVIDE HIGH FREQUENCY HINGE REINFORCEMENT FOR TOP HINGE ON ALL EXTERIOR, CROSS CORRIDOR, AND STAIRWELL FRAMES, IN ACCORDANCE WITH SDI 111-H, EXAMPLE "A" APPLICATION, WHERE FULL MORTISE HINGES ARE SPECIFIED.

2. STRIKE REINFORCEMENTS: MINIMUM 16 GAGE [0.053" (1.3MM)] AND PREPARED FOR AN ANSI-A115.1-2 STRIKE.

3. CLOSER REINFORCEMENT: MINIMUM 14 GAGE [0.067" (1.7MM)] STEEL.

4. PROJECTION WELD HINGE AND STRIKE REINFORCEMENTS TO THE DOOR FRAME.

5. PROVIDE METAL PLASTER GUARDS FOR ALL MORTISED CUTOUTS.

6. PROVIDE ADEQUATE REINFORCEMENTS FOR OTHER HARDWARE AS REQUIRED.

7. INCLUDE GALVANIZED HARDWARE REINFORCEMENTS IN ALL GALVANIZED FRAMES.

2.04 CONSTRUCTION OF ARCHITECTURAL STICK COMPONENTS:

A. FABRICATE ARCHITECTURAL STICK FRAME ASSEMBLIES FROM STANDARD FRAME COMPONENTS, FABRICATED FROM 14 GAGE GALVANIZED STEEL G90 FOR EXTERIOR, AND 16 GAUGE COLD ROLLED STEEL FOR INTERIOR.

B. CONSTRUCT ARCHITECTURAL STICK FRAME ASSEMBLIES OF STANDARD FRAME COMPONENTS FABRICATED AS SPECIFIED.

1. EXTERIOR FRAMES: GALVANIZED STEEL, ASTM A 123, CLASS G90,14 GAGE [0.067" (1.7MM)] GALVANIZED STEEL.

2. INCLUDE GALVANIZED COMPONENTS AND INTERNAL REINFORCEMENTS WITH GALVANIZED FRAMES.

C. FRAME COMPONENT REQUIREMENTS:

1. PREPARE REQUIRED STICKS AT DOOR OPENINGS AND FRAME ASSEMBLIES FOR HARDWARE AS SPECIFIED.

2. FABRICATE FRAME ASSEMBLIES FROM THREE BASIC COMPONENTS:

A. OPEN SECTIONS (PERIMETER MEMBERS) IDENTICAL IN CONFIGURATION TO STANDARD FRAMES

B. CLOSED SECTIONS (INTERMEDIATE MEMBERS) WITH IDENTICAL JAMB DEPTH, FACE DIMENSIONS, AND STOPS AS OPEN SECTIONS.

C. SILL SECTIONS: FABRICATED FROM GALVANIZED STEEL, FLUSH WITH BOTH FACES OF ADJACENT VERTICAL MEMBERS. CUT INDIVIDUAL COMPONENTS TO LENGTH AND NOTCHED TO ASSURE SQUARE JOINTS AND CORNERS.

3. EXTERNALLY WELDED FACE JOINTS AT MEETING MULLIONS OR BETWEEN MULLIONS AND OTHER FRAME MEMBERS ON THE FACE SURFACES ONLY. GRIND AND FINISH FACE JOINTS SMOOTH.

4. SHIP FRAME ASSEMBLIES TO THE JOBSITE COMPLETELY WELDED. FIELD JOINTS PERMISSIBLE ONLY WHEN THE SIZE OF THE TOTAL ASSEMBLY EXCEEDS SHIPPING LIMITATIONS. FABRICATE OVERSIZED FRAMES IN SECTIONS DESIGNATED FOR SPLICING IN THE FIELD. PROVIDE FRAMES WITH JOINT REINFORCEMENTS 14 GAGE, 8" LONG. FIELD WELD JOINT REINFORCEMENT INSIDE AND TACK WELD OUTSIDE JOINT AT BOTH FACES, GRIND, AND FINISH SMOOTH AND UNIFORM IN APPEARANCE, AFTER INSTALLATION.

5. PIERCED AND DIMPLED GLAZING BEADS FOR USE WITH MANUFACTURERS' STANDARD FASTENERS.

6. PROVIDE NECESSARY ANCHORS FOR JAMBS, HEADS, AND SILLS OF ASSEMBLIES.

D. VERIFICATION OF FIELD DIMENSIONS AS REQUIRED. DO NOT BEGIN FABRICATION UNTIL THESE DIMENSIONS HAVE BEEN VERIFIED, SUBMITTED, AND APPROVED.

2.05 FABRICATION:

A. FACE WELDED FRAMES:

1. CONTINUOUS FACE WELD THE JOINT BETWEEN THE HEAD AND JAMB FACES ALONG THEIR LENGTH EITHER INTERNALLY OR EXTERNALLY. GRIND, PRIME PAINT, AND FINISH SMOOTH FACE JOINTS WITH NO VISIBLE FACE SEAMS.

2. EXTERNALLY WELD, GRIND, PRIME PAINT, AND FINISH SMOOTH FACE JOINTS AT MEETING MULLIONS OR BETWEEN MULLIONS AND OTHER FRAME MEMBERS PER A CURRENT COPY OF ANSI/SDI A250.8.

3. PROVIDE TWO TEMPORARY STEEL SPREADERS (WELDED TO THE JAMBS AT EACH RABBET OF DOOR OPENINGS) ON WELDED FRAMES DURING SHIPMENT. REMOVE TEMPORARY STEEL SPREADERS PRIOR TO INSTALLATION OF THE FRAME.

2.06 FINISH:

A. DOORS, FRAMES AND FRAME COMPONENTS ARE REQUIRED TO BE CLEANED, PHOSPHATIZED, AND FINISHED WITH ONE COAT OF BAKED-ON RUST INHIBITING PRIME PAINT IN ACCORDANCE WITH THE ANSI/SDI A250.10 “TEST PROCEDURES AND ACCEPTANCE CRITERIA FOR PRIME PAINTED STEEL SURFACES FOR STEEL DOORS AND FRAMES.”

PART 3 EXECUTION:

3.01 INSTALLATION:

A. INSTALL DOORS AND FRAMES IN ACCORDANCE WITH STEEL DOOR INSTITUTE’S RECOMMENDED ERECTION INSTRUCTIONS FOR STEEL FRAMES ANSI A250.11.

B. INSTALL LABEL DOORS AND FRAMES IN ACCORDANCE WITH NFPA-80.

C. REMOVE TEMPORARY STEEL SPREADERS PRIOR TO INSTALLATION OF FRAMES.

D. SET FRAMES ACCURATELY IN POSITION; PLUMB, ALIGN AND BRACE UNTIL PERMANENT ANCHORS ARE SET. AFTER WALL CONSTRUCTION IS COMPLETE, REMOVE TEMPORARY WOOD SPREADERS.

1. FIELD SPLICE ONLY AT APPROVED LOCATIONS INDICATED ON THE SHOP DRAWINGS. WELD, GRIND, AND FINISH AS REQUIRED TO CONCEAL EVIDENCE OF SPLICING ON EXPOSED FACES.

E. PROVIDE FULL HEIGHT 3/8” TO 1-1/2” THICK STRIP OF POLYSTYRENE FOAM BLOCKING AT FRAMES REQUIRING GROUTING WHERE CONTINUOUS HINGES ARE SPECIFIED. APPLY THE STRIP TO THE BACK OF THE FRAME, WHERE THE HINGE IS TO BE INSTALLED, TO FACILITATE FIELD DRILLING OR TAPPING.

F. WHERE GROUTING IS REQUIRED IN MASONRY, PROVIDE, AND INSTALL TEMPORARY BOTTOM AND INTERMEDIATE WOOD SPREADERS TO MAINTAIN PROPER WIDTH AND AVOID BOWING OR DEFORMING OF FRAME MEMBERS. REFER TO ANSI A250.11-2001, STANDARD.

2. HOLLOW METAL FRAMES TO RECEIVE GROUTING: COMPLY WITH A CURRENT COPY OF ANSI/SDI STANDARD A250.8, PARAGRAPH 4.2.2, WHEREBY GROUT WILL BE MIXED TO PROVIDE A 4" MAXIMUM SLUMP

CONSISTENCY AND HAND TROWELED INTO PLACE. DO NOT USE GROUT MIXED TO A THINNER, PUMPABLE CONSISTENCY; THIS PRACTICE IS NOT RECOMMENDED AND NOT PERMISSIBLE. REFER TO HMMA 820 TN01 GROUTING HOLLOW METAL FRAMES.

G. PROVIDE A VERTICAL WOOD BRACE DURING GROUTING OF FRAME AT OPENINGS OVER 4’0” WIDE, TO PREVENT SAGGING OF FRAME HEADER.

H. GLAZE AND SEAL EXTERIOR TRANSOM, SIDELIGHT AND WINDOW FRAMES IN ACCORDANCE WITH HMMA-820 TN03.

I. APPLY HARDWARE IN ACCORDANCE WITH HARDWARE MANUFACTURERS’ INSTRUCTIONS AND SECTION 08710 FINISH HARDWARE OF THESE SPECIFICATIONS. INSTALL HARDWARE WITH ONLY FACTORY-PROVIDED FASTENERS. ADJUST DOOR INSTALLATION TO PROVIDE UNIFORM CLEARANCE AT HEAD AND JAMBS, TO ACHIEVE MAXIMUM OPERATIONAL EFFECTIVENESS AND APPEARANCE.

3.02 ADJUSTING:

A. FINAL ADJUSTMENTS: ADJUST OPERATING DOORS AND HARDWARE ITEMS JUST PRIOR TO FINAL INSPECTION AND ACCEPTANCE BY THE OWNER AND ARCHITECT. LEAVE WORK IN COMPLETE AND PROPER OPERATING CONDITION. REMOVE AND REPLACE DEFECTIVE WORK, INCLUDING DOORS OR FRAMES THAT ARE DAMAGED, BOWED OR OTHERWISE UNACCEPTABLE.

B. PRIME COAT TOUCH-UP: IMMEDIATELY AFTER ERECTION, SAND SMOOTH RUSTED OR DAMAGED AREAS OF PRIME COAT, AND APPLY TOUCH-UP OF COMPATIBLE AIR-DRYING PRIMER.

3.03 PROTECTION

A. PROVIDE PROTECTIVE MEASURES REQUIRED THROUGHOUT THE CONSTRUCTION PERIOD TO ENSURE THAT DOOR AND FRAME UNITS WILL BE WITHOUT DAMAGE OR DETERIORATION, OTHER THAN NORMAL WEATHERING, AT TIME OF ACCEPTANCE.

END OF SECTION

SECTION 08210 - WOOD DOORS

PART 1 - GENERAL

1.01 SUMMARY

A. PROVIDE FACTORY FINISHED WOOD DOORS

1.02 SUBMITTALS

A. PRODUCT DATA: SUBMIT MANUFACTURER'S DESCRIPTIVE LITERATURE, SPECIFICATIONS, INSTALLATION INSTRUCTIONS, WARRANTY FORM AND OTHER DATA REQUIRED TO INDICATE COMPLIANCE WITH SPECIFIED REQUIREMENTS.

B. SHOP DRAWINGS:

1. SUBMIT A LINIER DOOR SCHEDULE INDICATING OPENING IDENTIFYING NUMBER, DOOR TYPE, GRADE, SIZE THICKNESS, SWING, LABEL REQUIREMENTS AND UNDERCUTS.
2. INCLUDE DOOR ELEVATIONS INDICATING TYPE OF CONSTRUCTION CONDITIONS AT CUTOUTS FOR VISION PANELS AND LOUVERS.
3. DETAIL FULL SIZE MOLDING SECTIONS.
4. INDICATE PRE-FITTING AND PRE-MACHINING REQUIREMENTS INCLUDING HARDWARE LOCATIONS.
5. USE SAME REFERENCE NUMBER FOR OPENINGS AND DETAILS AS CONTRACT DRAWINGS.

C. SAMPLES: SUBMIT SAMPLES SHOWING SPECIFIED WOOD VENEER AND COLORS FOR SELECTION.

D. CERTIFICATES: SUBMIT TO INDICATE COMPLIANCE WITH SPECIFIED FABRICATION AND TEST REQUIREMENTS SIGNED BY AUTHORIZED REPRESENTATIVE OF DOOR MANUFACTURER.

1.03 QUALITY ASSURANCE

A. COMPLY WITH GOVERNING CODES AND REGULATIONS. USE EXPERIENCED INSTALLERS. DELIVER, HANDLE, AND STORE MATERIALS IN ACCORDANCE WITH MANUFACTURER'S INSTRUCTIONS.

B. MANUFACTURER QUALIFICATIONS:

1. ALL PRODUCTS COVERED UNDER THIS SECTION SHALL BE PRODUCED BY A SINGLE MANUFACTURER UNLESS OTHER SPECIFIED.

2. MANUFACTURER SHALL SUBMIT EVIDENCE OF HAVING NOT LESS THAN TEN (10) YEARS SUCCESSFUL PRODUCTION OF THIS PRODUCT.

C. SOURCE QUALITY CONTROL: AWI QUALITY STANDARDS OF ARCHITECTURAL WOODWORK INSTITUTE, SECTION 01300.

D. TO THE GREATEST EXTENT POSSIBLE, OBTAIN ALL DOORS AND FRAMES FROM

ONE MANUFACTURER. WOOD DOOR SUPPLIER SHALL MAINTAIN AN OFFICE AND WAREHOUSE WITHIN 50 MILES FROM THE JOB SITE TO PROPERLY MAINTAIN AND SERVICE THE PROJECT DURING AND AFTER CONSTRUCTION IS COMPLETE.

1.04 DELIVERY, STORAGE AND HANDLING

A. PROTECT DURING TRANSIT, STORAGE AND HANDLING TO PREVENT DAMAGE, SOILING AND DETERIORATION.

B. COMPLY WITH MANUFACTURER'S INSTRUCTIONS AND WITH "ON-SITE-CARE" REQUIREMENTS OF AWI PAMPHLET "CARE AND FINISHING OF WOOD DOORS".

C. DELIVER COMPONENTS IN MANUFACTURER'S ORIGINAL UNOPENED PROTECTIVE COVERING OR CONTAINER, CLEARLY MARKED WITH MANUFACTURER'S NAME, BRAND NAME AND IDENTIFYING NUMBER ON COVERING.

D. STORAGE:

1. STORE IN CLEAN, DRY, WELL VENTILATED AREA PROTECTED FROM SUNLIGHT.
2. AVOID EXTREME HEAT, COLD, DRYNESS OR HUMIDITY.
3. THE RELATIVE HUMIDITY IN THE STORAGE AREA SHALL NOT BE LESS THAN 10% NOR GREATER THAN 50%.
4. STORE FLAT OVER LEVEL SURFACE ABOVE FLOOR ON WOOD BLOCKING.
5. UNDER BOTTOM DOOR AND OVER TOP OF STACK, FURNISH PLYWOOD OR CORRUGATED CARDBOARD FOR PROTECTION.

E. HANDLING: DO NOT DRAG DOORS ACROSS ONE ANOTHER OR ACROSS OTHER SURFACES.

1.05 WARRANTY

A. SUBMIT WRITTEN WARRANTY ON MANUFACTURER'S STANDARD FORM SIGNED BY OFFICIAL OF DOOR MANUFACTURER AGREEING TO REPAIR OR REPLACE DEFECTIVE DOORS WHICH HAVE:

1. DELAMINATED IN ANY DEGREE.
2. WARP OR TWIST OF 1/4" OR MORE IN PLANE OF DOOR FACE.
3. TELEGRAPHING OF STILE, RAIL OR CORE THROUGH FACE TO CAUSE SURFACE VARIATION IN EXCESS OF 1/100" IN ANY 1" SPAN.
4. WHEN HANGING DOORS, DO NOT SUBJECT THEM TO EXTREMES OF HEAT AND/OR HUMIDITY CONDITIONS. RELATIVE HUMIDITY SHALL NOT BE LESS THAN 30% NOR MORE THAN 50%.

B. WARRANTY SHALL ALSO INCLUDE REFINISHING AND REINSTALLATION WHICH MAY BE REQUIRED DUE TO REPAIR OR REPLACEMENT OF THE DEFECTIVE DOORS.

C. WARRANTY SHALL BE IN EFFECT FOR LIFE OF ORIGINAL INSTALLATION (INTERIOR USE).

1.06 ACCEPTABLE MANUFACTURERS

A. A SPECIFIC PRODUCT OR MATERIAL MANUFACTURED BY ANY OF THE FOLLOWING LISTED MANUFACTURERS IS "ACCEPTABLE" (NOT "APPROVED")

ONLY IF THE SPECIFIC PRODUCT OR MATERIAL CAN EVIDENCE EXACT COMPLIANCE WITH THE CONTRACT DOCUMENTS.

1. VT ARCHITECTURAL WOOD DOORS
   1000 INDUSTRIAL PARK
   HOLSTEIN, IA 51025
   PHONE: 800-827-1615

2. ALGOMA HARDWOODS, INC.
   1001 PERRY STREET
   ALGOMA, WISCONSIN 54201
   PHONE TOLL FREE: 800-558-0155

3. EGGERS INDUSTRIES, ARCHITECTURAL DOOR DIVISION
   164 NORTH LAKE STREET
   NEENAH, WISCONSIN 54956
   PHONE: 414-722-6444

4. MARSHFIELD DOOR SYSTEMS, INC.
   1401 EAST FOURTH STREET
   MARSHFIELD, WI 54449-7780
   PHONE: 800-869-3667

PART 2 - PRODUCTS

2.01 MATERIALS

A. WOOD DOORS FOR TRANSPARENT FINISH: SOLID CORE FLUSH WOOD DOOR FOR INTERIOR USE; AWI PREMIUM GRADE.

1. SOLID CORE: ARCHITECTURAL GRADE OF 5-PLY CONSTRUCTION.
2. MODEL: AWI TYPE SCLC-5 (SCLC-7 NOT ACCEPTABLE).
3. STYLE: FLUSH, OR AS INDICATED ON DOOR SCHEDULE.
4. FACE: AWI PREMIUM GRADE RED OAK VENEER, PLAIN SLICED.
5. CORE: STRUCTURAL COMPOSITE LUMBER.
6. STILE EDGES: MATCHING HARDWOOD STILE EDGES BONDED TO CORE, 1 1/8" MINIMUM AFTER TRIM.
7. CROSSBAND: MINIMUM 1/16" KILN DRIED POPLAR.
8. RAIL EDGES: MILL OPTION SOFTWOOD BONDED TO CORE, 1 1/18" MINIMUM AFTER TRIM.
9. ADHESIVE: EXTERIOR OR WET/DAMP INTERIOR USE, TYPE I - INTERIOR USE, TYPE II.

B. WOOD DOORS FOR LABELED FIRE DOORS: SOLID CORE FLUSH WOOD DOOR FOR INTERIOR USE; AWI PREMIUM GRADE.

1. MODEL: AWI TYPE FD.
2. STYLE: FLUSH, OR AS INDICATED ON DOOR SCHEDULE.
3. FACE: AWI PREMIUM GRADE RED OAK VENEER, PLAIN SLICED.
4. CORE: NON-COMBUSTIBLE MINERAL (NO ASBESTOS).
5. STILE EDGES: 5/8" AFTER TRIMMING TREATED HARDWOOD.
6. RAIL EDGES: TOP, 1/2" MINIMUM TREATED. BOTTOM, 1 1/2" MINIMUM TREATED.
7. RATING: AS INDICATED ON DOOR SCHEDULE.

PART 3 - EXECUTION

3.01 INSTALLATION

A. FABRICATION:

1. GENERAL:
   A. COMPLY WITH AWI QUALITY STANDARDS SECTION 1300 EXCEPT TO MEET OR EXCEED REQUIREMENTS HEREIN SPECIFIED.

   B. COMPLETELY FACTORY PREFIT TO REQUIRE SIZE READY FOR INSTALLATION AT PROJECT SITE, NO ON-JOBSITE TRIMMING PERMITTED.

   C. PREPARE IN ACCORDANCE WITH FRAME SHOP DRAWINGS AND SCHEDULE, HARDWARE SCHEDULE, AND TEMPLATES.

   D. PROVIDE 1” A. F. F. UNDERCUT FOR ALL DOORS BEING USED FOR RETURN AIR. SEE MECHANICAL DRAWINGS FOR LOCATIONS.

   E. VIEW WINDOW FRAMES SHALL BE WRAP AROUND METAL.

2. THICKNESS: 1 3/4" THICK UNLESS INDICATED OTHERWISE ON DOOR SCHEDULE.

3. FABRICATING TOLERANCES:
   A. PREFIT SIZE + OR -1/32" OVERALL DIMENSIONS.
   B. SQUARENESS: LENGTH OR DIAGONAL MEASURED ON FACE OF DOOR FROM UPPER LEFT CORNER TO LOWER RIGHT CORNER WITH MAXIMUM DIFFERENCE OF 1/8".
   C. MAXIMUM WARP 1/4".
   D. SHOW-THROUGH (TELEGRAPHING): 1/100" DEVIATION FROM TRUE PLANE IN ANY 3" SPAN ON DOOR FACE.

B. PREPARATION:

1. EXAMINE DOOR FRAMES AND VERIFY FRAMES ARE OF CORRECT TYPE AND HAVE BEEN INSTALLED FOR PROPER HANGING OF CORRESPONDING DOORS.

C. INSTALLATION:

1. INSTALL IN ACCORDANCE WITH MANUFACTURER'S WRITTEN INSTRUCTIONS.
2. INSTALL FIRE RATED DOORS IN ACCORDANCE WITH NFPA 80.
3. INSTALL ACCURATELY IN FRAME, WITHIN CLEARANCES SPECIFIED. INSTALL HARDWARE IN ACCORDANCE WITH MANUFACTURER'S WRITTEN INSTRUCTIONS AND ASSOCIATED TEMPLATES. REFER TO GENERAL INSTALLATIONS REQUIREMENTS.
4. DO NOT FIELD CUT DOORS DOWN TO OPENING SIZES SMALLER THAN THOSE FOR WHICH DOORS WERE MANUFACTURED. DO NOT INSTALL

DOORS IN FRAMES SET OUT OF PLUMB.

5. INSTALL TO OPERATE FREELY, BUT NOT LOOSELY, FREE FROM HINGE BOUND CONDITIONS, STRIKING OR BINDING. DO NOT INSTALL IN FRAMES WHICH WOULD HINDER OPERATION OF DOORS. HANG FREE FROM RATTLING WHEN IN LATCHED POSITION.

D. ADJUSTING:

1. ADJUST AND CHECK EACH DOOR TO ENSURE PROPER OPERATING AND FUNCTION.
2. REPLACE OR REHANG DOORS WHICH ARE HINGE BOUND AND DO NOT SWING OR OPERATE FREELY. REMOVE AND REPLACE DOORS WHICH ARE WARPED, TWISTED, OR WHICH ARE NOT IN TRUE PLANES.
3. REPLACE DOORS THAT HAVE BEEN DAMAGED DURING INSTALLATION.

END OF SECTION

SECTION 08520 - ALUMINUM WINDOWS

PART 1 - GENERAL

1.01 SUMMARY

1.02 THIS SECTION INCLUDES EGRESS CASEMENT AND FIXED WINDOWS

A. SEE DIVISION 8 SECTION "GLAZING" FOR GLAZING REQUIREMENTS FOR ALUMINUM WINDOWS, INCLUDING THOSE SPECIFIED TO BE FACTORY GLAZED.

1.03 PERFORMANCE REQUIREMENTS

A. GENERAL: PROVIDE ALUMINUM WINDOWS CAPABLE OF COMPLYING WITH PERFORMANCE REQUIREMENTS INDICATED, BASED ON TESTING MANUFACTURER'S WINDOWS THAT ARE REPRESENTATIVE OF THOSE SPECIFIED AND THAT ARE OF MINIMUM TEST SIZE REQUIRED BY AAMA/NWWDA 101/I.S.2.

B. STRUCTURAL PERFORMANCE: PROVIDE ALUMINUM WINDOWS CAPABLE OF WITHSTANDING THE FOLLOWING, INCLUDING WIND LOADS BASED ON PASSING AAMA/NWWDA 101/I.S.2, UNIFORM LOAD STRUCTURAL TEST, AT BASIC WIND SPEED INDICATED:

1. DEFLECTION: BASED ON PASSING AAMA/NWWDA 101/I.S.2, UNIFORM LOAD DEFLECTION TEST OR ON GLASS FRAMING SYSTEM DESIGNED TO LIMIT LATERAL DEFLECTIONS OF GLASS EDGES TO LESS THAN 1/175 OF GLASS-EDGE LENGTH OR 3/4 INCH (19 MM), WHICHEVER IS LESS, AT DESIGN PRESSURE BASED ON STRUCTURAL COMPUTATIONS.
2. WIND LOADS AND IMPACT RESISTANCE: DESIGN PRESSURES AS INDICATED ON STRUCTURAL DRAWINGS. PROVIDE CURRENT 2017 FLORIDA PRODUCT APPROVAL NUMBER.

C. AIR INFILTRATION: MAXIMUM RATE NOT MORE THAN .10 CFM/SF AT 6.24 PSF WHEN TESTED ACCORDING TO ASTM E 283, AIR INFILTRATION TEST.

D. WATER RESISTANCE: NO WATER LEAKAGE AS DEFINED IN AAMA/NWWDA REFERENCED TEST METHODS AT A WATER TEST PRESSURE EQUALING 12 PSF WHEN TESTED ACCORDING TO ASTM E 331/ASTM E 547, WATER RESISTANCE TEST.

E. FORCED-ENTRY RESISTANCE: COMPLY WITH PERFORMANCE LEVEL 10 REQUIREMENTS WHEN TESTED ACCORDING TO ASTM F 588.

F. CONDENSATION-RESISTANCE FACTOR: PROVIDE ALUMINUM WINDOWS TESTED FOR THERMAL PERFORMANCE ACCORDING TO AAMA 1503, SHOWING A CRF OF 48, WHERE WINDOWS ARE INDICATED TO BE "THERMALLY IMPROVED."

G. THERMAL TRANSMITTANCE: PROVIDE ALUMINUM WINDOWS WITH A WHOLE-WINDOW U-VALUE MAXIMUM 0.65 BTU/HR-SF-DEGREES AT 15-MPH (24-KM/H) EXTERIOR WIND VELOCITY AND WINTER CONDITION TEMPERATURES WHEN TESTED ACCORDING TO NFRC 103.

H. SOLAR HEAT GAIN COEFFICIENT (SHGC), NOT GREATER THAN .25 FOR THE “WHOLE WINDOW” ASSEMBLY (OR AS REQUIRED BY THE APPLICABLE ENERGY CODE)

I. THERMAL MOVEMENTS: PROVIDE ALUMINUM WINDOWS, INCLUDING ANCHORAGE, THAT ACCOMMODATE THERMAL MOVEMENTS OF UNITS RESULTING FROM THE FOLLOWING MAXIMUM CHANGE (RANGE) IN AMBIENT AND SURFACE TEMPERATURES WITHOUT BUCKLING, DISTORTION, OPENING OF JOINTS, FAILURE OF JOINT SEALANTS, DAMAGING LOADS AND STRESSES ON GLAZING AND CONNECTIONS, AND OTHER DETRIMENTAL EFFECTS. BASE ENGINEERING CALCULATION ON ACTUAL SURFACE TEMPERATURES OF MATERIALS DUE TO SOLAR HEAT GAIN AND NIGHTTIME-SKY HEAT LOSS.

1. TEMPERATURE CHANGE (RANGE): 120 DEG F (67 DEG C), AMBIENT; 180 DEG F (100 DEG C) MATERIAL SURFACES.

J. LIFE-CYCLE TESTING: TEST ACCORDING TO AAMA 910 AND COMPLY WITH AAMA/NWWDA 101/I.S.2.

K. SPECIFIC PRODUCT PERFORMANCE REQUIREMENTS: COMPLY WITH SECTION 2.2 OF AAMA/NWWDA 101/I.S.2 AS APPLICABLE TO TYPES OF ALUMINUM WINDOWS INDICATED.

1.04 SUBMITTALS

A. PRODUCT DATA: FOR EACH TYPE OF ALUMINUM WINDOW INDICATED.
B. SHOP DRAWINGS: INCLUDE PLANS, ELEVATIONS, SECTIONS, DETAILS, HARDWARE, ATTACHMENTS TO OTHER WORK, AND OPERATIONAL CLEARANCES SIGNED AND SEALED BY A REGISTERED PROFESSIONAL FLORIDA ENGINEER. ENGINEERED CALCULATIONS MAY BE SUBMITTED AFTER APPROVAL OF WINDOWS FOR DESIGN, BUT IN NO EVENT SHALL FABRICATION OF WINDOW BEGIN UNTIL CALCULATIONS HAVE BEEN SUBMITTED AND APPROVED.
   1. INCLUDE STRUCTURAL ANALYSIS DATA INDICATING STRUCTURAL TEST PRESSURES AND DESIGN PRESSURES FROM BASIC WIND SPEEDS INDICATED AND DEFLECTION LIMITATIONS OF GLASS FRAMING SYSTEMS, AS WELL AS IMPACT LOADS, SIGNED AND SEALED BY A QUALIFIED PROFESSIONAL ENGINEER REGISTERED IN THE STATE OF FLORIDA, RESPONSIBLE FOR THEIR PREPARATION.
C. SAMPLES: FOR EACH EXPOSED FINISH AND GLASS.
D. 2017 FBC FLORIDA PRODUCT APPROVAL CERTIFICATIONS
E. PRODUCT TEST REPORTS.
F. MAINTENANCE DATA.

1.05 QUALITY ASSURANCE

A. INSTALLER: A QUALIFIED INSTALLER, APPROVED BY MANUFACTURER TO INSTALL MANUFACTURER'S PRODUCTS.
B. FENESTRATION STANDARD: COMPLY WITH AAMA/NWWDA 101/I.S.2, "VOLUNTARY SPECIFICATIONS FOR ALUMINUM, VINYL (PVC) AND WOOD WINDOWS AND GLASS DOORS," FOR MINIMUM STANDARDS OF PERFORMANCE, MATERIALS, COMPONENTS, ACCESSORIES, AND FABRICATION UNLESS MORE STRINGENT REQUIREMENTS ARE INDICATED.
C. GLAZING PUBLICATIONS: COMPLY WITH PUBLISHED RECOMMENDATIONS OF GLASS MANUFACTURERS AND GANA'S "GLAZING MANUAL" UNLESS MORE STRINGENT REQUIREMENTS ARE INDICATED.
D. PRE-INSTALLATION CONFERENCE: CONDUCT CONFERENCE AT PROJECT SITE AT LEAST 1 DAY PRIOR TO BEGINNING INSTALLATION.

1.06 WARRANTY

A. SPECIAL WARRANTY: MANUFACTURER'S STANDARD FORM IN WHICH MANUFACTURER AGREES TO REPAIR OR REPLACE ALUMINUM WINDOWS THAT FAIL IN MATERIALS AND WORKMANSHIP WITHIN TWO (2) YEARS FROM DATE OF SUBSTANTIAL COMPLETION.
B. WARRANTY PERIOD FOR METAL FINISHES: 10 YEARS FROM DATE OF SUBSTANTIAL COMPLETION.
C. WARRANTY PERIOD FOR GLASS: 10 YEARS FROM DATE OF SUBSTANTIAL COMPLETION.
D. LAMINATED GLASS: FIVE (5) YEARS AGAINST DELAMINATION

PART 2 - PRODUCTS

2.01 MANUFACTURERS

A. MANUFACTURERS: FIXED WINDOWS SHALL BE WINCO WINDOWS SERIES 1150S FIXED. METAL THICKNESS FOR ALL FRAME AND SASH MEMBERS SHALL BE NOT

LESS THAN .125". PERIMETER OF WINDOW FRAME AND SASH SHALL INCORPORATE AN INTEGRALLY EXTRUDED BEVEL TO SIMULATE THE LOOK OF PUTTY GLAZING. THOSE MANUFACTURERS THAT DO NOT INCORPORATE AN INTEGRAL PERIMETER BEVEL IN THEIR STANDARD DESIGN MAY USE A GLAZED IN MUNTIN BASE TO SIMULATE THE BEVELED PERIMETER APPEARANCE. MANUFACTURERS OTHER THAN THOSE PRE-APPROVED MAY ALSO BE ACCEPTABLE, SUBJECT TO COMPLIANCE WITH REQUIREMENTS FOR PRIOR APPROVAL.

BECAUSE WE ARE MATCHING WINDOWS INSTALLED IN A PREVIOUS PHASE NO SUSBTITUTIONS ARE ALLOWED FOR THESE WINDOWS.

2.02 GLAZING

A. GLASS AND GLAZING MATERIALS: REFER TO DIVISION 8 SECTION "GLAZING" FOR GLASS UNITS AND GLAZING REQUIREMENTS APPLICABLE TO GLAZED ALUMINUM WINDOW UNITS.

B. GLASS: FACTORY GLAZED (FIELD GLAZING NOT ACCEPTABLE) OUTBOARD LITE: ¼" VITRO (FORMERLY PPG) SOLAR GRAY WITH VITRO SOLAR BAN60 LOW-E COATING ON #2 (INNER) SURFACE – 3/8" AIR CAVITY (AIR FILL) INBOARD LITE 15/32" LAMINATE CONSISTING OF 3/16" CLEAR - .090" SENTRY GLASS OR PVB INTERLAYER – 3/16" CLEAR, LAMINATED FOR IMPACT RESISTANCE MEETING LARGE MISSILE IMPACT DESIGN CRITERIA, INSULATING-GLASS UNITS COMPLYING WITH DIVISION 8 SECTION "GLAZING", AS WELL AS SPECIFIED PERFORMANCE REQUIREMENTS. EQUAL PRODUCTS BY GUARDIAN GLASS SN68 LOW-E COATING ON SOLAR GRAY #2 SURFACE

THERMAL PERFORMANCE: WINTER U-VALUE:	0.28
SUMMER U-VALUE:	0.28
SOLAR HEAT GAIN COEFFICIENT: NOT GREATER THAN .25	
SHADING COEFFICIENT:	0.31
VISIBLE LIGHT TRANSMITTANCE:	35%
TOTAL SOLAR TRANSMITTANCE:	18%

OPTICAL PERFORMANCE:VISIBLE LIGHT TRANSMITTANCE:	35%
VISIBLE LIGHT REFLECTANCE (OUTSIDE):	7%
VISIBLE LIGHT REFLECTANCE (INSIDE):	13%
TOTAL SOLAR TRANSMITTANCE:	18%
TOTAL SOLAR REFLECTANCE (OUTSIDE):	13%
ULTRAVIOLET TRANASMTTANCE:	8%

C. GLAZING SYSTEM: MANUFACTURER'S STANDARD LARGE MISSILE IMPACT RESISTANT FACTORY-GLAZING SYSTEM THAT PRODUCES WEATHERTIGHT SEAL.

2.03 FABRICATION

A. GENERAL: FABRICATE ALUMINUM WINDOWS, IN SIZES INDICATED, THAT COMPLY WITH REQUIREMENTS AND THAT MEET OR EXCEED AAMA/NWWDA 101/I.S.2 PERFORMANCE REQUIREMENTS FOR THE FOLLOWING WINDOW TYPE AND PERFORMANCE CLASS. INCLUDE A COMPLETE SYSTEM FOR ASSEMBLING COMPONENTS AND ANCHORING WINDOWS.
OUTSWING CASEMENT & FIXED WINDOWS: AW CLASS PERFORMANCE GRADE 60

B. FABRICATE ALUMINUM WINDOWS THAT ARE REGLAZABLE WITHOUT DISMANTLING SASH OR VENTILATOR FRAMING.

C. WEATHER STRIPPING: PROVIDE FULL-PERIMETER WEATHER STRIPPING FOR EACH OPERABLE SASH AND VENTILATOR.

D. WEEP HOLES: PROVIDE WEEP HOLES AND INTERNAL PASSAGES TO CONDUCT INFILTRATING WATER TO EXTERIOR.

E. PROVIDE WATER-SHED MEMBERS ABOVE SIDE-HINGED VENTILATORS AND SIMILAR LINES OF NATURAL WATER PENETRATION.

F. MULLIONS: PROVIDE MULLIONS AND COVER PLATES AS SHOWN, MATCHING WINDOW UNITS, COMPLETE WITH ANCHORS FOR SUPPORT TO STRUCTURE AND INSTALLATION OF WINDOW UNITS. COVERPLATES SHALL BE ATTACHED WITH SCREWS OR RIVETS NOT TAPED. ALLOW FOR ERECTION TOLERANCES AND PROVIDE FOR MOVEMENT OF WINDOW UNITS DUE TO THERMAL EXPANSION AND BUILDING DEFLECTIONS, AS INDICATED. PROVIDE MULLIONS AND COVER PLATES CAPABLE OF WITHSTANDING DESIGN LOADS OF WINDOW UNITS.

G. LOCKING HARDWARE: PROVIDE MULTI POINT LOCKS WITH SINGLE HANDLE RELEASE.

H. GLAZING STOPS: PROVIDE SNAP-ON EXTRUDED ALUMINUM GLAZING STOPS COORDINATED WITH DIVISION 8 SECTION "GLAZING" AND GLAZING SYSTEM INDICATED. PROVIDE GLAZING STOPS TO MATCH SASH AND VENTILATOR FRAMES.

I. HINGES: PROVIDE CONCEALED STAINLES STEEL HINGES. IF SASH SIZE OR WEIGHT EXCEEDS MANUFACTURERS RECOMMENDED LIMIT FOR CONCEALED HINGES, EXPOSED OR SEMI EXPOSED BUTT HINGES WILL BE ACCEPTABLE.

J. TRIM: PROVIDE STANDARD TRIM INCLUDING HEAD AND JAMB FILLER, HEAVY DUTY IMPACT RATED 2 PIECE INTERIOR SNAP TRIM FOR ANCHORAGE AT SILL CONDITIONS AND CONCRETE COLUMNS AT JAMBS WHERE APPLICABLE. HEAD AND JAMB ANCHORAGE SHALL BE WITH AN EXTRUDED STRAP ANCHOR EQUAL TO WINCO # AP-1 WHICH SHALL BE COVERED WITH NEW PLASTER OR DRYWALL AFTER THE WIDOWS ARE INSTALLED. PROVIDE ENGINEERED CALCULATIONS FOR QUANTITY AND SPACING OF ANCHORS AND FASTENERS AS DETAILED IN COMPLIANCE WITH REQUIRED LOADS.

K. SUBSILL FLASHING MEMBERS: WINDOW MANUFACTURER SHALL PROVIDE FACTORY FABRICATED ALUMINUM BREAK METAL OR EXTRUDED ALUMINUM SILL FLASHINGS A DETAILED

FINISHES

A. ANODIZED

A. FINISH ALL EXPOSED AREAS OF ALUMINUM WINDOWS AND COMPONENTS IN CLASS I ANODIZING FINISH IN ACCORDANCE WITH AAMA 611-92, COLOR IS TO BE SELECTED FROM STANDARD COLORS. COLORS SHALL BE MEDIUM OR DARK BRONZE. PROVIDE LIGHT AND DARK COLOR RANGE SAMPLES OF FINISH COLOR SELECTED BY THE ARCHITECT. AN ORGANIC (PAINT) FINISH IS NOT ACCEPTABLE FOR THIS PROJECT.

PART 3 - EXECUTION

3.01 INSTALLATION

A. INSTALL WINDOWS LEVEL, PLUMB, SQUARE, TRUE TO LINE, WITHOUT DISTORTION OR IMPEDING THERMAL MOVEMENT, ANCHORED SECURELY IN PLACE TO STRUCTURAL SUPPORT, AND IN PROPER RELATION TO WALL FLASHING AND OTHER ADJACENT CONSTRUCTION.

B. SET SILL MEMBERS IN BED OF SEALANT OR WITH GASKETS, AS INDICATED, FOR WEATHERTIGHT CONSTRUCTION.

C. INSTALL WINDOWS AND COMPONENTS TO DRAIN CONDENSATION, WATER PENETRATING JOINTS, AND MOISTURE MIGRATING WITHIN WINDOWS TO THE EXTERIOR.

D. METAL PROTECTION: SEPARATE ALUMINUM AND OTHER CORRODIBLE SURFACES FROM SOURCES OF CORROSION OR ELECTROLYTIC ACTION AT POINTS OF

CONTACT WITH OTHER MATERIALS BY COMPLYING WITH REQUIREMENTS SPECIFIED IN "DISSIMILAR MATERIALS" PARAGRAPH IN APPENDIX B IN AAMA/NWWDA 101/I.S.2.

E. ADJUST OPERATING SASHES AND VENTILATORS AND HARDWARE FOR A TIGHT FIT AT CONTACT POINTS AND WEATHER STRIPPING FOR SMOOTH OPERATION AND WEATHERTIGHT CLOSURE. LUBRICATE HARDWARE AND MOVING PARTS.

F. THE CONTRACTOR SHALL PROTECT WINDOW SURFACES FROM CONTACT WITH CONTAMINATING SUBSTANCES RESULTING FROM CONSTRUCTION OPERATIONS. IN ADDITION, MONITOR WINDOW SURFACES ADJACENT TO AND BELOW EXTERIOR CONCRETE AND MASONRY SURFACES DURING CONSTRUCTION FOR PRESENCE OF DIRT, SCUM, ALKALINE DEPOSITS, STAINS, OR OTHER CONTAMINANTS. IF CONTAMINATING SUBSTANCES DO CONTACT WINDOW SURFACES, REMOVE CONTAMINANTS IMMEDIATELY ACCORDING TO MANUFACTURER'S WRITTEN RECOMMENDATIONS.

G. CLEAN ALUMINUM SURFACES IMMEDIATELY AFTER INSTALLING WINDOWS. AVOID DAMAGING PROTECTIVE COATINGS AND FINISHES. REMOVE EXCESS SEALANTS, GLAZING MATERIALS, DIRT, AND OTHER SUBSTANCES.

H. CLEAN FACTORY-GLAZED GLASS IMMEDIATELY AFTER INSTALLING WINDOWS. COMPLY WITH MANUFACTURER'S WRITTEN RECOMMENDATIONS FOR FINAL CLEANING AND MAINTENANCE. REMOVE NONPERMANENT LABELS AND CLEAN SURFACES.

I. REMOVE AND REPLACE GLASS THAT HAS BEEN BROKEN, CHIPPED, CRACKED, ABRADED, OR DAMAGED DURING CONSTRUCTION PERIOD.

J. MANUFACTURER’S FIELD SERVICES: UPON OWNER’S REQUEST, PROVIDE MANUFACTURER’S FIELD SERVICE CONSISTING OF PRODUCT USE RECOMMENDATIONS AND PERIODIC SITE VISIT FOR INSPECTION OF PRODUCT INSTALLATION IN ACCORDANCE WITH MANUFACTURER’S INSTRUCTIONS.

3.3 PROTECTION AND CLEANING

A. PROTECTION: THE CONTRACTOR SHALL PROTECT INSTALLED PRODUCT’S FINISH SURFACES FROM DAMAGE DURING CONSTRUCTION. PROTECT ALUMINUM WINDOW SYSTEM FROM DAMAGE FROM GRINDING AND POLISHING COMPOUNDS, PLASTER, LIME, ACID, CEMENT OR OTHER HARMFUL CONTAMINANTS.

B. CLEANING: REPAIR OR REPLACE DAMAGED INSTALLED PRODUCTS. INSTALLED PRODUCTS ARE TO BE CLEANED IN ACCORDANCE WITH MANUFACTURER’S INSTRUCTIONS PRIOR TO OWNER’S ACCEPTANCE. REMOVE CONSTRUCTION DEBRIS FROM PROJECT SITE AND LEGALLY DISPOSE OF DEBRIS.

END OF SECTION 08520

SECTION 08710 – DOOR HARDWARE

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. DRAWINGS AND GENERAL PROVISIONS OF CONTRACT, INCLUDING GENERAL AND SUPPLEMENTARY CONDITIONS AND DIVISION 1 SPECIFICATION SECTIONS, APPLY TO THIS SECTION.

1.2 SUMMARY

A. THIS SECTION INCLUDES ITEMS KNOWN COMMERCIALLY AS FINISH OR DOOR HARDWARE THAT ARE REQUIRED FOR SWING, SLIDING, AND FOLDING DOORS, EXCEPT SPECIAL TYPES OF UNIQUE HARDWARE SPECIFIED IN THE SAME SECTIONS AS THE DOORS AND DOOR FRAMES ON WHICH THEY ARE INSTALLED.

B. THIS SECTION INCLUDES THE FOLLOWING:
1. ARCHITECTURAL HINGES
2. CONTINUOUS HINGES
3. LOCKSETS, LATCHSETS AND DEADBOLTS
4. PANIC DEVICES AND FIRE RATED EXIT DEVICES
5. CLOSERS AND DOOR CONTROL DEVICES
6. AUTOMATIC DOOR OPERATORS
7. OVERHEAD DOOR STOPS AND HOLDERS
8. FLOOR AND WALL STOPS
9. DOOR BOLTS AND COORDINATORS
10. PROTECTIVE PLATES
11. DOOR SEALS, GASKETING AND WEATHERSTRIPPING
12. THRESHOLDS
13. MISCELLANEOUS DOOR CONTROL DEVICES

C. RELATED SECTIONS: THE FOLLOWING SECTIONS CONTAIN REQUIREMENTS THAT RELATE TO THE FOLLOWING SECTIONS.
1. SECTION 00065: DIRECT PURCHASE PROCEDURES
2. SECTION 08110: STEEL DOORS AND FRAMES
3. SECTION 08210: WOOD DOORS
4. SECTION 08411: ALUMINUM STOREFRONT

D. PRODUCTS FURNISHED BUT NOT INSTALLED UNDER THIS SECTION TO INCLUDE:
1. CYLINDERS FOR LOCKS ON ENTRANCE DOORS.
2. CYLINDERS FOR DOOR LOCKS FURNISHED UNDER OTHER SECTIONS OF THE SPECIFICATIONS.
3. FINAL REPLACEMENT CORES AND KEYS TO BE INSTALLED BY OWNER.

E. KEYING: ALL LOCKS SHALL BE KEYED AT THE FACTORY, (NO EXCEPTIONS). ALL LOCKS SHALL BE FACTORY MASTER KEYED. ALL EXTERIOR CORRIDOR DOORS SHALL BE KEYED ALIKE AND TO THE CONNECTING BUILDINGS EXTERIOR CORRIDOR DOORS. ALL CLASSROOM CORRIDOR DOORS, EXTERIOR DOORS, AND STORAGE DOORS KEYED ALIKE. ALL MECHANICAL AND CUSTODIAL DOORS KEYED ALIKE AND TO THE FACILITIEIES EXISTING SYSTEM. ALL OTHERS KEYED DIFFERENT. SUPPLY THREE KEYS PER LOCK. SUPPLY EIGHT MASTER KEYS AN OR SUB MASTER KEYS AS DIRECTED. ALL KEYS TO BE

STAMPED WITH ROOM NUMBER. STAMP MASTER KEYS WITH “MASTER KEY” OR “SUB MASTER KEY”. ALL KEYS TO BE KEYED TO THE SCHOOL’S EXISTING KEYING SYSTEM. SUBMIT KEYING SCHEDULE FOR APPROVAL.

1.3 REFERENCES

A. STANDARDS OF THE FOLLOWING AS REFERENCED:
   1. AMERICAN NATIONAL STANDARDS INSTITUTE (ANSI)
   2. DOOR AND HARDWARE INSTITUTE (DHI)
   3. FACTORY MUTUAL (FM)
   4. NATIONAL FIRE PROTECTION ASSOCIATION (NFPA)
   5. UNDERWRITERS' LABORATORIES, INC. (UL)
      A. UL 10C - FIRE TESTS DOOR ASSEMBLIES
   6. WARNOCK HERSEY

B. REGULATORY STANDARDS OF THE FOLLOWING AS REFERENCED:
   1. DEPARTMENT OF JUSTICE, OFFICE OF THE ATTORNEY GENERAL, AMERICANS WITH DISABILITIES ACT, PUBLIC LAW 101-336 (ADA).
   2. CABO/ANSI A117.1: PROVIDING ACCESSIBILITY AND USABILITY FOR PHYSICALLY HANDICAPPED PEOPLE, 2010 EDITION.

1.4 SYSTEM DESCRIPTION

A. REFER TO APPLICABLE “HEADINGS” FOR SYSTEM DESCRIPTION FOR ELECTRIC AND ELECTRO-PNEUMATIC HARDWARE PRODUCTS.

1.5 SUBMITTALS

A. GENERAL: SUBMIT THE FOLLOWING IN ACCORDANCE WITH CONDITIONS OF CONTRACT AND DIVISION 1 SPECIFICATION SECTIONS.

B. PRODUCT DATA INCLUDING MANUFACTURERS' TECHNICAL PRODUCT DATA FOR EACH ITEM OF DOOR HARDWARE, INSTALLATION INSTRUCTIONS, MAINTENANCE OF OPERATING PARTS AND FINISH, AND OTHER INFORMATION NECESSARY TO SHOW COMPLIANCE WITH REQUIREMENTS. FOR ITEMS OTHER THAN THOSE SCHEDULED IN THE “HEADINGS” OF SECTION 3, PROVIDE CATALOG INFORMATION FOR THE SPECIFIED ITEMS AND FOR THOSE SUBMITTED.

C. FINAL HARDWARE SCHEDULE COORDINATED WITH DOORS, FRAMES, AND RELATED WORK TO ENSURE PROPER SIZE, THICKNESS, HAND, FUNCTION, AND FINISH OF DOOR HARDWARE.
   1. FINAL HARDWARE SCHEDULE CONTENT: BASED ON HARDWARE INDICATED, ORGANIZE SCHEDULE INTO VERTICAL FORMAT (FOLLOWING THAT OF THE CONTRACT DOCUMENTS) “HARDWARE SETS" INDICATING COMPLETE DESIGNATIONS OF EVERY ITEM REQUIRED FOR EACH DOOR OR OPENING. USE SPECIFICATION HEADING NUMBERS WITH ANY VARIATIONS SUFFIXED A, B, ETC. INCLUDE THE FOLLOWING INFORMATION:
      A. TYPE, STYLE, FUNCTION, SIZE, AND FINISH OF EACH HARDWARE ITEM.
      B. NAME AND MANUFACTURER OF EACH ITEM.
      C. FASTENINGS AND OTHER PERTINENT INFORMATION.
      D. LOCATION OF EACH HARDWARE SET CROSS-REFERENCED TO INDICATIONS ON DRAWINGS BOTH ON FLOOR PLANS AND IN DOOR AND FRAME SCHEDULE.

E. EXPLANATION OF ALL ABBREVIATIONS, SYMBOLS, AND CODES CONTAINED IN SCHEDULE.
F. MOUNTING LOCATIONS FOR HARDWARE.
G. DOOR AND FRAME SIZES AND MATERIALS.
H. KEYING INFORMATION.
I. CROSS-REFERENCE NUMBERS USED WITHIN SCHEDULE DEVIATING FROM THOSE SPECIFIED.
   1) COLUMN 1: STATE SPECIFIED ITEM AND MANUFACTURER.
   2) COLUMN 2: STATE PRIOR APPROVED SUBSTITUTED ITEM AND ITS MANUFACTURER.

2. FURNISH COMPLETE WIRING DIAGRAMS, RISER DIAGRAMS, ELEVATION DRAWINGS AND OPERATIONAL DESCRIPTIONS OF ELECTRICAL COMPONENTS AND SYSTEMS, LISTED BY OPENING IN THE HARDWARE SUBMITTALS. ELEVATION DRAWINGS SHALL IDENTIFY LOCATIONS OF THE SYSTEM COMPONENTS WITH RESPECT TO THEIR PLACEMENT IN THE DOOR OPENING. OPERATIONAL DESCRIPTIONS SHALL FULLY DETAIL HOW EACH ELECTRICAL COMPONENT WILL FUNCTION WITHIN THE OPENING, INCLUDING ALL CONDITIONS OF INGRESS AND EGRESS. PROVIDE A COPY WITH EACH HARDWARE SCHEDULE SUBMITTED FOR APPROVAL. SUPPLY A COPY WITH DELIVERY OF HARDWARE TO THE JOBSITE AND ANOTHER COPY TO THE OWNER AT THE TIME OF PROJECT COMPLETION.
3. SUBMITTAL SEQUENCE: SUBMIT FINAL SCHEDULE AT EARLIEST POSSIBLE DATE PARTICULARLY WHERE ACCEPTANCE OF HARDWARE SCHEDULE MUST PRECEDE FABRICATION OF OTHER WORK THAT IS CRITICAL IN THE PROJECT CONSTRUCTION SCHEDULE. INCLUDE WITH SCHEDULE THE PRODUCT DATA, SAMPLES, SHOP DRAWINGS OF OTHER WORK AFFECTED BY DOOR HARDWARE, AND OTHER INFORMATION ESSENTIAL TO THE COORDINATED REVIEW OF SCHEDULE.
4. KEYING SCHEDULE: SUBMIT SEPARATE DETAILED SCHEDULE INDICATING CLEARLY HOW THE OWNER'S FINAL INSTRUCTIONS ON KEYING OF LOCKS HAS BEEN FULFILLED.

D. PROVIDE SAMPLES IF REQUESTED OF EACH TYPE OF EXPOSED HARDWARE UNIT IN FINISH INDICATED AND TAGGED WITH FULL DESCRIPTION FOR COORDINATION WITH SCHEDULE. SUBMIT SAMPLES PRIOR TO SUBMISSION OF FINAL HARDWARE SCHEDULE.
   1. SAMPLES WILL BE RETURNED TO THE SUPPLIER. UNITS THAT ARE ACCEPTABLE AND REMAIN UNDAMAGED THROUGH SUBMITTAL, REVIEW, AND FIELD COMPARISON PROCESS MAY, AFTER FINAL CHECK OF OPERATION, BE INCORPORATED IN THE WORK, WITHIN LIMITATIONS OF KEYING COORDINATION REQUIREMENTS.

E. TEMPLATES FOR DOORS, FRAMES, AND OTHER WORK SPECIFIED TO BE FACTORY PREPARED FOR THE INSTALLATION OF DOOR HARDWARE. CHECK SHOP DRAWINGS OF OTHER WORK TO CONFIRM THAT ADEQUATE PROVISIONS ARE MADE FOR LOCATING AND INSTALLING DOOR HARDWARE TO COMPLY WITH INDICATED REQUIREMENTS.

F. CONTRACT CLOSEOUT SUBMITTALS:
   1. OPERATION AND MAINTENANCE DATA: COMPLETE INFORMATION FOR INSTALLED DOOR HARDWARE.
   2. WARRANTY: COMPLETED AND EXECUTED WARRANTY FORMS.

1.6 QUALITY ASSURANCE

A. SINGLE SOURCE RESPONSIBILITY: OBTAIN EACH TYPE OF HARDWARE (LATCH AND LOCKSETS, HINGES, CLOSERS, ETC.) FROM A SINGLE MANUFACTURER.
   1. SUPPLIER QUALIFICATIONS: A RECOGNIZED ARCHITECTURAL DOOR HARDWARE SUPPLIER, WITH WAREHOUSING FACILITIES IN THE PROJECT'S VICINITY, THAT HAS A RECORD OF SUCCESSFUL IN-SERVICE PERFORMANCE FOR SUPPLYING DOOR HARDWARE SIMILAR IN QUANTITY, TYPE, AND QUALITY TO THAT INDICATED FOR THIS PROJECT AND THAT EMPLOYS AN EXPERIENCED ARCHITECTURAL HARDWARE CONSULTANT (AHC) WHO IS AVAILABLE FOR CONSULTATION TO OWNER, ARCHITECT, AND CONTRACTOR, AT REASONABLE TIMES DURING THE COURSE OF THE WORK.

B. COORDINATION MEETINGS:
   1. CONTRACTOR TO SET UP AND ATTEND THE FOLLOWING:
      A. LOCK DISTRIBUTOR TO MEET WITH THE OWNER TO FINALIZE LOCK FUNCTIONS AND KEYING REQUIREMENTS AND TO OBTAIN FINAL INSTRUCTIONS IN WRITING.
      B. LOCK DISTRIBUTOR AND LOCK, CLOSER AND EXIT DEVICE MANUFACTURER TO MEET WITH THE INSTALLER PRIOR TO BEGINNING OF INSTALLATION OF DOOR HARDWARE. INSTRUCT INSTALLER ON PROPER INSTALLATION OF SPECIFIED PRODUCTS.
   2. GENERAL CONTRACTOR TO SET UP AND ATTEND THE FOLLOWING:
      A. MEET WITH THE OWNER, GENERAL CONTRACTOR, SUPPLIER, ELECTRICAL AND SECURITY CONTRACTORS TO COORDINATE ALL ELECTRICAL HARDWARE ITEMS. SUPPLIER TO PROVIDE RISER DIAGRAMS, ELEVATION DRAWINGS, WIRING DIAGRAMS AND OPERATIONAL DESCRIPTIONS AS REQUIRED BY THE GENERAL AND SUB-CONTRACTORS.

C. FIRE-RATED OPENINGS: PROVIDE DOOR HARDWARE FOR FIRE-RATED OPENINGS THAT COMPLIES WITH NFPA STANDARD NO. 80 REQUIREMENTS OF AUTHORITIES HAVING JURISDICTION.
   1. PROVIDE ONLY ITEMS OF DOOR HARDWARE THAT ARE LISTED AND TESTED BY UL OR WARNOCK HERSEY FOR GIVEN TYPE/SIZE OPENING AND DEGREE OF LABEL. PROVIDE PROPER LATCHING HARDWARE, DOOR CLOSERS, APPROVED-BEARING HINGES AND SEALS WHETHER LISTED IN THE HARDWARE SCHEDULE OR NOT. ALL HARDWARE TO COMPLY WITH STATE AND LOCAL CODES AND UL 10C.
   2. WHERE EMERGENCY EXIT DEVICES ARE REQUIRED ON FIRE-RATED DOORS, (WITH SUPPLEMENTARY MARKING ON DOORS' UL LABELS INDICATING "FIRE DOOR TO BE EQUIPPED WITH FIRE EXIT HARDWARE") PROVIDE UL LABEL ON EXIT DEVICES INDICATING "FIRE EXIT HARDWARE".

D. ALL HARDWARE IS TO COMPLY WITH FEDERAL AND STATE HANDICAP LAWS.

E. SUBSTITUTIONS: REQUEST FOR SUBSTITUTIONS OF ITEMS OF HARDWARE OTHER THAN THOSE LISTED AS "ACCEPTABLE AND APPROVED" SHALL BE MADE TO THE ARCHITECT IN WRITING NO LATER THAN FOURTEEN (14) DAYS PRIOR TO BID OPENING. NO SUBSTITUTES FOR LOCKS AND CLOSERS. APPROVAL OF SUBSTITUTIONS WILL ONLY BE GIVEN IN WRITING OR BY ADDENDA. REQUESTS FOR SUBSTITUTIONS SHALL BE ACCOMPANIED BY SAMPLES AND/OR DETAILED INFORMATION FOR EACH MANUFACTURER OF EACH PRODUCT SHOWING DESIGN, FUNCTIONS, MATERIAL THICKNESS AND ANY OTHER PERTINENT INFORMATION NEEDED TO COMPARE YOUR PRODUCT WITH THAT SPECIFIED. LACK OF THIS INFORMATION WILL RESULT IN A REFUSAL.

F. PRE-INSTALLATION COORDINATION:

1. INSTALLATION OF HARDWARE SHALL BE INSTALLED OR DIRECTLY SUPERVISED AND INSPECTED BY A SKILLED INSTALLER CERTIFIED BY THE MANUFACTURER OF LOCKSETS, DOOR CLOSERS, AND EXIT DEVICES USED ON THE PROJECT, OR WITH NOT LESS THAN 3 YEARS' EXPERIENCE IN SUCCESSFUL COMPLETION OF PROJECTS SIMILAR IN SIZE AND SCOPE.
2. SCHEDULE A HARDWARE PRE-INSTALLATION MEETING ON SITE TO REVIEW AND DISCUSS THE INSTALLATION OF CONTINUOUS HINGES, LOCKSETS, DOOR CLOSERS, EXIT DEVICES, OVERHEAD STOPS, AND ELECTROMECHANICAL DOOR HARDWARE.
3. MEETING ATTENDEES SHALL BE NOTIFIED 7 DAYS IN ADVANCE AND SHALL INCLUDE: ARCHITECT, CONTRACTOR, DOOR HARDWARE INSTALLERS (INCLUDING LOW VOLTAGE HARDWARE), MANUFACTURERS REPRESENTATIVES FOR ABOVE HARDWARE ITEMS, AND ANY OTHER EFFECTED SUBCONTRACTORS OR SUPPLIERS.
4. ALL ATTENDEES SHALL BE PREPARED TO DISTRIBUTE INSTALLATION MANUALS, HARDWARE SCHEDULES, TEMPLATES, AND PHYSICAL HARDWARE SAMPLES.

1.7 PRODUCT HANDLING

A. TAG EACH ITEM OR PACKAGE SEPARATELY WITH IDENTIFICATION RELATED TO FINAL HARDWARE SCHEDULE AND INCLUDE BASIC INSTALLATION INSTRUCTIONS WITH EACH ITEM OR PACKAGE.

B. PACKAGING OF DOOR HARDWARE IS RESPONSIBILITY OF SUPPLIER. AS MATERIAL IS RECEIVED BY HARDWARE SUPPLIER FROM VARIOUS MANUFACTURERS, SORT AND REPACKAGE IN CONTAINERS CLEARLY MARKED WITH APPROPRIATE HARDWARE SET NUMBER TO MATCH SET NUMBERS OF APPROVED HARDWARE SCHEDULE. TWO OR MORE IDENTICAL SETS MAY BE PACKED IN SAME CONTAINER.

C. INVENTORY DOOR HARDWARE JOINTLY WITH REPRESENTATIVES OF HARDWARE SUPPLIER AND HARDWARE INSTALLER UNTIL EACH IS SATISFIED THAT COUNT IS CORRECT.

D. DELIVER INDIVIDUALLY PACKAGED DOOR HARDWARE ITEMS PROMPTLY TO PLACE OF INSTALLATION (SHOP OR PROJECT SITE).

E. PROVIDE SECURE LOCK-UP FOR DOOR HARDWARE DELIVERED TO THE PROJECT, BUT NOT YET INSTALLED. CONTROL HANDLING AND INSTALLATION OF HARDWARE ITEMS THAT ARE NOT IMMEDIATELY REPLACEABLE SO THAT COMPLETION OF THE WORK WILL NOT BE DELAYED BY HARDWARE LOSSES BOTH BEFORE AND AFTER INSTALLATION.

1.8 WARRANTY

A. SPECIAL WARRANTIES:
1. LOCKS AND CYLINDERS: THREE YEAR PERIOD
2. DOOR CLOSERS: THIRTY YEAR PERIOD
3. EXIT DEVICES: THREE YEAR PERIOD
4. ELECTRIFIED EXIT DEVICES: ONE YEAR PERIOD

1.9 MAINTENANCE

A. MAINTENANCE TOOLS AND INSTRUCTIONS: FURNISH A COMPLETE SET OF SPECIALIZED TOOLS AND MAINTENANCE INSTRUCTIONS THAT ARE PACKED IN HARDWARE ITEMS FOR OWNER'S CONTINUED ADJUSTMENT, MAINTENANCE, AND REMOVAL AND REPLACEMENT

OF DOOR HARDWARE.

B. PARTS KITS: FURNISH MANUFACTURERS' STANDARD PARTS KITS FOR LOCKSETS, EXIT DEVICES, AND DOOR CLOSERS.

PART 2 - PRODUCTS

2.1 MANUFACTURED UNITS
(*DENOTES MANUFACTURER REFERENCED IN THE HARDWARE HEADINGS)

A. HINGES:
1. ACCEPTABLE MANUFACTURERS:
A. IVES*
B. BOMMER
C. MCKINNEY
2. CHARACTERISTICS:
A. TEMPLATES: PROVIDE ONLY TEMPLATE-PRODUCED UNITS.
B. SCREWS: PROVIDE PHILLIPS FLAT-HEAD SCREWS COMPLYING WITH THE FOLLOWING REQUIREMENTS:
1) FOR METAL DOORS AND FRAMES INSTALL MACHINE SCREWS INTO DRILLED AND TAPPED HOLES.
2) FOR WOOD DOORS AND FRAMES INSTALL THREADED-TO-THE-HEAD WOOD SCREWS.
3) FOR FIRE-RATED WOOD DOORS INSTALL #12 X 1-1/4 INCH, THREADED-TO-THE-HEAD STEEL WOOD SCREWS.
4) FINISH SCREW HEADS TO MATCH SURFACE OF HINGES OR PIVOTS.
C. HINGE PINS: EXCEPT AS OTHERWISE INDICATED, PROVIDE HINGE PINS AS FOLLOWS:
1) OUT-SWING EXTERIOR DOORS: NON-REMOVABLE PINS.
2) OUT-SWING CORRIDOR DOORS WITH LOCKS: NON-REMOVABLE PINS.
3) INTERIOR DOORS: NON-RISING PINS.
4) TIPS: FLAT BUTTON AND MATCHING PLUG. FINISHED TO MATCH LEAFS.
D. SIZE: SIZE HINGES IN ACCORDANCE WITH SPECIFIED MANUFACTURER'S PUBLISHED RECOMMENDATIONS.
E. QUANTITY: FURNISH ONE PAIR OF HINGES FOR ALL DOORS UP TO 5'-0" HIGH. FURNISH ONE HINGE FOR EACH ADDITIONAL 2-1/2 FEET OR FRACTION THEREOF, UNLESS OTHERWISE SPECIFIED IN HARDWARE HEADINGS.

B. GEARED CONTINUOUS HINGES:
1. ACCEPTABLE MANUFACTURERS:
A. IVES*
B. SELECT PRODUCTS
C. MARKAR
2. CHARACTERISTICS:
A. CONTINUOUS GEAR HINGES TO BE MANUFACTURED OF EXTRUDED 6063-T6 ALUMINUM ALLOY WITH ANODIZED FINISH, OR FACTORY PAINTED FINISH AS SCHEDULED.
B. ALL HINGES ARE TO BE MANUFACTURED TO TEMPLATE. UNCUT HINGES TO BE NON-HANDED AND TO BE A PINLESS ASSEMBLY OF THREE

INTERLOCKING EXTRUSIONS APPLIED TO THE FULL HEIGHT OF THE DOOR AND FRAME WITHOUT MORTISING.

C. VERTICAL DOOR LOADS TO BE CARRIED ON CHEMICALLY LUBRICATED POLYACETAL THRUST BEARINGS. THE DOOR AND FRAME LEAVES TO BE CONTINUALLY GEARED TOGETHER FOR THE ENTIRE HINGE LENGTH AND SECURED WITH A FULL COVER CHANNEL. HINGE TO OPERATE TO A FULL 180^{O}.

D. HINGES TO BE MILLED, ANODIZED AND ASSEMBLED IN MATCHING PAIRS. FASTENERS SUPPLIED TO BE STEEL SELF-DRILLING, SELF-TAPPING 12-24 X ¾" SCREWS.

E. PROVIDE UL LISTED CONTINUOUS HINGES AT FIRE DOORS. CONTINUOUS HINGES AT FIRE DOORS (SUFFIX -FR) TO MEET THE REQUIRED RATINGS WITHOUT THE USE OF AUXILIARY FUSED PINS OR STUDS.

C. CYLINDERS:

1. ACCEPTABLE MANUFACTURERS:
   A. MATCH EXISTING (SCHLAGE 29T) KEYING SYSTEM KEYING SYSTEM PER OWNER DIRECTION
2. CHARACTERISTICS:
   A. NEW KEYING SYSTEM: EXCEPT AS OTHERWISE INDICATED, PROVIDE NEW MASTER KEY SYSTEM FOR PROJECT.
   B. EQUIP EXTERIOR LOCKSETS, EXTERIOR EXIT DEVICES AND ALL INTERIOR DOORS WITH PANIC HARDWARE WITH FULL SIZE INTERCHANGEABLE CORES (FSIC) FEATURING PATENTED, RESTRICTED KEYS (SCHLAGE EVEREST 29T) AND AUXILIARY LOCKING PIN. PATENTED KEY AND CYLINDER DESIGN TO BE VALID UNTIL 2029.
   C. EXCEPT AS NOTED ABOVE, EQUIP INTERIOR LOCKSETS WITH CONVENTIONAL CYLINDERS FEATURING PATENTED, RESTRICTED KEYS (SCHLAGE EVEREST 29T) AND AUXILIARY LOCKING PIN. PATENTED KEY AND CYLINDER DESIGN TO BE VALID UNTIL 2029.
   D. METALS: CONSTRUCT LOCK CYLINDER PARTS FROM BRASS OR BRONZE, STAINLESS STEEL, OR NICKEL SILVER.
   E. COMPLY WITH OWNER'S REQUIREMENTS FOR KEYING AS FOLLOWS:
   ALL LOCKS SHALL BE KEYED AT THE FACTORY, (NO EXCEPTIONS). ALL LOCKS SHALL BE FACTORY MASTER KEYED. ALL EXTERIOR CORRIDOR DOORS SHALL BE KEYED ALIKE. ALL CLASSROOM CORRIDOR DOORS, EXTERIOR DOORS, AND STORAGE DOORS KEYED ALIKE. ALL MECHANICAL AND CUSTODIAL DOORS KEYED ALIKE. ALL OTHERS KEYED DIFFERENT. ALL KEYS TO BE STAMPED WITH ROOM NUMBER. STAMP MASTER KEYS WITH "MASTER KEY" OR "SUB MASTER KEY".
   ALL KITCHEN AREA DOORS SHALL BE KEYED TO A SUB MASTER AND FOLLOW THE FORMAT DESCRIBED ABOVE (TWO AREAS, TWO SYSTEMS) SUBMIT KEYING SCHEDULE FOR APPROVAL.
   F. KEY MATERIAL: PROVIDE KEYS OF NICKEL SILVER ONLY.
   G. KEY QUANTITY: FURNISH (3) CHANGE KEYS FOR EACH LOCK, (5) MASTER KEYS FOR EACH MASTER SYSTEM, (5) GRANDMASTER KEYS FOR EACH GRANDMASTER SYSTEM, (10) CONSTRUCTION MASTER KEYS, (2) CONSTRUCTION CONTROL KEYS.
      1) FURNISH ONE EXTRA BLANK FOR EACH LOCK.
      2) FURNISH CONSTRUCTION MASTER KEYS TO GENERAL CONTRACTOR.
      3) DELIVER KEYS TO OWNER.
   H. KEY CONTROL SOFTWARE: SCHLAGE SITEMASTER 200 FOR WINDOWS OR

EQUIVALENT, SUPPLIED WITH FACTORY BITTING, AND KEYSET SYMBOLS.

D. EXTRA HEAVY-DUTY CYLINDRICAL LOCKS AND LATCHES: AS SCHEDULED, FASTENED WITH THROUGH-BOLTS.
   1. ACCEPTABLE MANUFACTURERS:
      A. SCHLAGE ND SERIES*
   2. REQUIRED FEATURES:
      A. CHASSIS: CYLINDRICAL DESIGN, CORROSION-RESISTANT PLATED COLD-ROLLED STEEL.
      B. LOCKING SPINDLE: STAINLESS STEEL, INTERLOCKING DESIGN.
      C. LATCH RETRACTORS: FORGED STEEL. BALANCE OF INNER PARTS: CORROSION-RESISTANT PLATED STEEL, OR STAINLESS STEEL.
      D. LEVER TRIM: ACCESSIBLE DESIGN, INDEPENDENT OPERATION, SPRING-CAGE SUPPORTED, MINIMUM 2" CLEARANCE FROM LEVER MID-POINT TO DOOR FACE.
      E. ALL LOCK FUNCTIONS: 7 YEAR WARRANTY, VANDALGUARD FUNCTION OUTSIDE LEVER IS DISENGAGED WHEN IN THE LOCKED MODE.
      F. ROSETTES: MINIMUM 3-7/16" DIAMETER FOR COVERAGE OF ANSI/DHI A115.18, 1994 DOOR PREPARATION, THROUGH-BOLT LUGS ON BOTH SPRING CAGES TO FULLY ENGAGE THIS PATTERN.
      G. SPRINGS: FULL COMPRESSION TYPE.
      H. ELECTRIC OPERATION: MANUFACTURER-INSTALLED CONTINUOUS DUTY SOLENOID.
      I. STRIKES: 16 GAGE CURVED STEEL, BRONZE OR BRASS WITH 1" DEEP BOX CONSTRUCTION, LIPS OF SUFFICIENT LENGTH TO CLEAR TRIM AND PROTECT CLOTHING.
      J. LOCK SERIES AND DESIGN: SCHLAGE ND SERIES, ATHENS DESIGN.
      K. CERTIFICATIONS:
         1) ANSI A156.2, 1994, SERIES 4000, GRADE 1. TESTED TO EXCEED 3,000,000 CYCLES.
         2) UL LISTED FOR A LABEL SINGLE DOORS UP TO 4 FT X 8 FT.

E. EXIT DEVICES:
   1. ACCEPTABLE MANUFACTURERS:
      A. VON DUPRIN99 SERIES*
   2. CHARACTERISTICS:
      A. EXIT DEVICES TO BE UL LISTED FOR LIFE SAFETY. EXIT DEVICES FOR FIRE RATED OPENINGS TO HAVE “UL" LABELS FOR “FIRE EXIT HARDWARE."
      B. EXIT DEVICES MOUNTED ON LABELED WOOD DOORS TO BE MOUNTED ON THE DOOR PER THE DOOR MANUFACTURER’S REQUIREMENTS.
      C. ALL TRIM TO BE THRU BOLTED TO THE LOCK STILE CASE.
      D. LEVER TRIM TO BE SOLID CASE MATERIAL WITH A BREAK-AWAY FEATURE TO LIMIT DAMAGE TO THE UNIT FROM VANDALISM. LEVER DESIGN TO MATCH LOCKSETS.
      E. ALL EXIT DEVICES TO BE MADE OF BRASS, BRONZE, STAINLESS STEEL, OR ALUMINUM MATERIAL, POWDER COATED, ANODIZED, OR PLATED TO THE STANDARD ARCHITECTURAL FINISHES TO MATCH THE BALANCE OF THE DOOR HARDWARE.
      F. PROVIDE GLASS BEAD CONVERSION KITS TO SHIM EXIT DEVICES ON DOORS WITH RAISED GLASS BEADS.
      G. ALL EXIT DEVICES TO BE ONE MANUFACTURER. NO DEVIATION WILL BE CONSIDERED.
      H. ALL SERIES EXIT DEVICES TO INCORPORATE A FLUID DAMPER, WHICH

DECELERATES THE TOUCHPAD ON ITS RETURN STROKE AND ELIMINATES NOISE ASSOCIATED WITH EXIT DEVICE OPERATION. ALL EXIT DEVICES TO BE NON-HANDED. TOUCHPAD TO EXTEND A MINIMUM OF 1/2 OF THE DOOR WIDTH AND TO EXTEND TO THE HEIGHT OF THE CROSS-RAIL HOUSING FOR A "NO PINCH" OPERATION. PLASTIC TOUCHPADS ARE NOT ACCEPTABLE. ALL LATCHBOLTS TO BE THE DEADLOCKING TYPE. LATCHBOLTS TO HAVE A SELF-LUBRICATING COATING TO REDUCE WEAR. PLATED OR PLASTIC COATED LATCHBOLTS ARE NOT ACCEPTABLE. PLASTIC LINKAGE AND "DOGGING" COMPONENTS ARE NOT ACCEPTABLE.

I. SURFACE VERTICAL ROD DEVICES TO BE UL LABELED FOR FIRE DOOR APPLICATIONS WITHOUT THE USE OF BOTTOM ROD ASSEMBLIES. WHERE BOTTOM RODS ARE REQUIRED FOR SECURITY APPLICATIONS, THE DEVICES TO BE UL LABELED FOR FIRE DOORS APPLICATIONS WITH ROD AND LATCH GUARDS BY THE DEVICE MANUFACTURER.

J. EXIT DEVICES TO INCLUDE IMPACT RESISTANT, FLUSH MOUNTED END CAP DESIGN TO AVOID DAMAGE DUE TO CARTS AND OTHER HEAVY OBJECTS PASSING THROUGH AN OPENING. END CAP TO BE OF HEAVY-DUTY METAL ALLOY CONSTRUCTION AND PROVIDE HORIZONTAL ADJUSTMENT TO PROVIDE ALIGNMENT WITH DEVICE COVER PLATE. WHEN EXIT DEVICE END CAP IS INSTALLED, NO RAISED EDGES WILL PROTRUDE.

K. EXIT DEVICE SERIES AND DESIGN: VON DUPRIN 99 SERIES, 996L TRIM WITH 07 LEVER DESIGN.

L. EXET DEVICES SHALL BE SIZED TO ACCOMIDATE DOOR WIDTH WHETHER INDICATED OR NOT.

F. CLOSERS AND DOOR CONTROL DEVICES:

1. ACCEPTABLE MANUFACTURERS:
   A. LCN CLOSERS 4040XP/1460SERIES*
2. CHARACTERISTICS:
   A. DOOR CLOSERS TO HAVE FULLY HYDRAULIC, FULL RACK AND PINION ACTION WITH A HIGH STRENGTH CAST IRON CYLINDER.
   B. ALL CLOSERS TO UTILIZE A STABLE FLUID WITHSTANDING TEMPERATURE RANGE OF 120^{O}F TO -30^{O}F WITHOUT SEASONAL ADJUSTMENT OF CLOSER SPEED TO PROPERLY CLOSE THE DOOR. CLOSERS FOR FIRE-RATED DOORS TO BE PROVIDED WITH TEMPERATURE STABILIZING FLUID THAT COMPLIES WITH STANDARDS UBC 7-2 (1997) AND UL 10C.
   C. SPRING POWER TO BE CONTINUOUSLY ADJUSTABLE OVER THE FULL RANGE OF CLOSER SIZES AND ALLOW FOR REDUCED OPENING FORCE FOR THE PHYSICALLY HANDICAPPED. SPRING POWER ADJUSTMENT (LCN FAST ™ POWER ADJUST) ALLOWS FOR QUICK AND ACCURATE POWER ADJUSTMENT AND VISUALLY SHOWS CLOSER POWER SIZE SETTINGS BY WAY OF DIAL ADJUSTMENT GAUGE LOCATED ON CLOSER SPRING TUBE. HYDRAULIC REGULATION TO BE BY TAMPER-PROOF, NON-CRITICAL VALVES. CLOSERS TO HAVE SEPARATE ADJUSTMENT FOR LATCH SPEED, GENERAL SPEED AND BACK CHECK.
   D. ALL CLOSERS TO HAVE SOLID FORGED STEEL MAIN ARMS (AND FOREARMS FOR PARALLEL ARM CLOSERS) AND WHERE SPECIFIED TO HAVE A CAST-IN SOLID STOP ON THE CLOSER SHOE ("CUSH"). ALL PARALLEL ARM MOUNTED CLOSERS TO HAVE "EDA" TYPE ARMS OR, WHERE DOOR TRAVEL ON OUT-SWING DOORS MUST BE LIMITED, USE "CUSH" OR "SCUSH" TYPE CLOSERS. AUXILIARY STOPS ARE NOT REQUIRED WHEN "CUSH" TYPE CLOSERS ARE USED. PROVIDE DROP PLATES WHERE TOP RAIL OF DOOR IS NOT SUFFICIENT FOR CLOSER MOUNTING. PROVIDE "CUSH SHOE SUPPORTS" AND "BLADE STOP

SPACERS" WHERE DICTATED BY FRAME DETAILS.

E. OVERHEAD CONCEALED CLOSERS TO HAVE SPRING POWER ADJUSTABLE FOR 50% INCREASE IN CLOSING POWER AND FULLY MORTISED DOOR TRACKS.

F. ALL SURFACE CLOSERS TO BE CERTIFIED TO EXCEED TEN MILLION (10,000,000) FULL LOAD CYCLES BY A RECOGNIZED INDEPENDENT TESTING LABORATORY. ALL CLOSERS (OVERHEAD, SURFACE AND CONCEALED) TO BE OF ONE MANUFACTURER AND CARRY MANUFACTURER'S TEN-YEAR WARRANTY (ELECTRIC CLOSERS TO HAVE TWO YEAR WARRANTY).

G. ACCESS-FREE MANUAL CLOSERS: WHERE MANUAL CLOSERS ARE INDICATED FOR DOORS REQUIRED TO BE ACCESSIBLE TO THE PHYSICALLY HANDICAPPED PROVIDE ADJUSTABLE UNITS COMPLYING WITH ADA AND ANSI A-117.1 PROVISIONS FOR DOOR OPENING FORCE.

H. CLOSERS TO BE INSTALLED TO ALLOW DOOR SWING AS SHOWN ON PLANS. DOORS SWINGING INTO EXIT CORRIDORS TO PROVIDE FOR CORRIDOR CLEAR WIDTH AS REQUIRED BY CODE. WHERE POSSIBLE, MOUNT CLOSERS INSIDE ROOMS.

I. POWDER COATING FINISH TO BE CERTIFIED TO EXCEED 100 HOURS SALT SPRAY TESTING BY ETL, AN INDEPENDENT TESTING LABORATORY USED BY BHMA FOR ANSI CERTIFICATION.

J. COMBINATION DOOR CLOSERS AND HOLDERS: PROVIDE UNITS DESIGNED TO HOLD DOOR IN OPEN POSITION UNDER NORMAL USAGE AND TO RELEASE AND AUTOMATICALLY CLOSE DOOR UNDER FIRE CONDITIONS. INCORPORATE AN INTEGRAL ELECTROMAGNETIC HOLDER MECHANISM DESIGNED FOR USE WITH UL LISTED FIRE DETECTORS, PROVIDED WITH NORMALLY CLOSED SWITCHING CONTACTS.

K. ALL CLOSERS TO BE SET FOR 180 DEGREE OPENING

L. MAGNETIC DOOR HOLDERS TO BE HEAVY DUTY WALL OR FLOOR MOUNTED WITH METAL HOUSING AND COMPLETE MOUNTING HARDWARE. PROVIDE 24V HOLDING COILS UNLESS OTHERWISE SCHEDULED.

M. WHERE SPECIFIED, SECURITY CLOSERS (SERIES 4040XP AND 1461) TO HAVE HEAVY DUTY FORGED STEEL ARMS WITH SPECIAL JOINTS TO PREVENT DISASSEMBLY. ALL COVERS TO BE ONE-PIECE DRAWN METAL AND UTILIZE A FOUR POINT MOUNTING. ALL EXPOSED FASTENERS TO HAVE HEX-LOBULAR DRIVE WITH A SECURITY PIN.

G. OVERHEAD DOOR HOLDERS:

1. ACCEPTABLE MANUFACTURERS:
   A. GLYNN JOHNSON*
   B. RIXSON FIREMARK
2. CHARACTERISTICS:
   A. PROVIDE HEAVY DUTY SURFACE MOUNTED DOOR HOLDERS OF STAINLESS STEEL.
   B. PROVIDE MEDIUM DUTY SURFACE MOUNTED DOOR HOLDERS OF STAINLESS STEEL.
   C. SURFACE HOLDERS TO BE INSTALLED WITH THE JAMB BRACKET MOUNTED ON THE STOP.

H. FLOOR STOPS AND WALL BUMPERS:
   1. ACCEPTABLE MANUFACTURERS:
      A. IVES*
      B. TRIMCO
      C. ROCKWOOD MANUFACTURING
   2. CHARACTERISTICS: REFER TO HARDWARE HEADINGS.
   3. FLOOR STOPS TO BE MOUNTED SO AS TO NOT CAUSE A TRIPPING HAZARD. MOUNT FLOOR STOPS NEXT TO CABINETS, WALLS, OR OTHER OBSTRUCTIONS. FLOOR STOPS TO NOT BE MOUNTED CLOSER THAN HALF OF THE DOOR WIDTH PLUS 2" FROM THE HING JAMB OF THE DOOR UNLESS INDICATED OTHERWISE.

I. DOOR BOLTS/COORDINATORS:
   1. ACCEPTABLE MANUFACTURERS:
      A. IVES*
      B. TRIMCO
      C. ROCKWOOD MANUFACTURING
   2. CHARACTERISTICS:
      A. FLUSH BOLTS TO BE FORGED BRASS 6-3/4" X 1", WITH 1/2" DIAMETER BOLTS. PLUNGER TO BE SUPPLIED WITH MILLED SURFACE ONE SIDE THAT FITS INTO A MATCHING GUIDE.
      B. AUTOMATIC FLUSH BOLTS TO BE UL LISTED AS TOP AND BOTTOM BOLTS ON A PAIR OF CLASSIFIED FIRE DOORS. BOLT CONSTRUCTION TO BE OF RUGGED STEEL AND BRASS COMPONENTS.
      C. SELF-LATCHING FLUSH BOLTS TO BE UL LISTED AS TOP AND BOTTOM BOLTS ON A PAIR OF CLASSIFIED FIRE DOORS. BOLT CONSTRUCTION TO BE OF RUGGED STEEL AND BRASS COMPONENTS.
      D. AUTOMATIC FLUSH BOLTS AND SELF-LATCHING FLUSH BOLTS TO BE UL LISTED FOR FIRE DOOR APPLICATION WITHOUT BOTTOM BOLTS (LBB).
      E. FURNISH DUST PROOF BOTTOM STRIKES.
      F. COORDINATOR TO BE SOFFIT MOUNTED NON-HANDED FULLY AUTOMATIC UL LISTED COORDINATING DEVICE FOR SEQUENTIAL CLOSING OF PAIRED DOORS WITH OR WITHOUT ASTRAGALS.
      G. PROVIDE FILLER PIECE TO CLOSE THE HEADER. PROVIDE BRACKETS AS REQUIRED FOR MOUNTING OF SOFFIT APPLIED HARDWARE.

J. PUSH PLATES:
   1. ACCEPTABLE MANUFACTURERS:
      A. IVES*
      B. TRIMCO
      C. ROCKWOOD MANUFACTURING
   2. CHARACTERISTICS:
      A. EXPOSED FASTENERS: PROVIDE MANUFACTURERS STANDARD EXPOSED FASTENERS.
      B. MATERIAL TO BE FORGEDSTAINLESS STEEL, PER THE HARDWARE HEADINGS.
      C. PROVIDE PLATES SIZED AS SHOWN IN HARDWARE HEADINGS.

K. DOOR PULLS & PULL PLATES:
   1. ACCEPTABLE MANUFACTURERS:
      A. IVES*
      B. TRIMCO
      C. ROCKWOOD MANUFACTURING
   2. CHARACTERISTICS:
      A. PROVIDE CONCEALED THRU-BOLTED TRIM ON BACK TO BACK MOUNTED PULLS, BUT NOT FOR SINGLE UNITS.
      B. MATERIAL TO BE FORGEDSTAINLESS STEEL.
      C. PROVIDE UNITS SIZED AS SHOWN IN HARDWARE HEADINGS.

L. PUSH PULL SETS:
   1. ACCEPTABLE MANUFACTURERS:
      A. IVES*
      B. TRIMCO
      C. ROCKWOOD MANUFACTURING
   2. CHARACTERISTICS:
      A. PROVIDE MOUNTING SYSTEMS AS SHOWN IN HARDWARE SETS.
      B. MATERIAL TO BE TUBULARSTAINLESS STEEL.
      C. PROVIDE PUSH/PULL SETS SIZED AS SHOWN IN HARDWARE HEADINGS.

M. PROTECTIVE PLATES:
   1. ACCEPTABLE MANUFACTURERS:
      A. IVES*
      B. TRIMCO
      C. ROCKWOOD MANUFACTURING
   2. CHARACTERISTICS:
      A. PROVIDE MANUFACTURERS STANDARD EXPOSED FASTENERS FOR DOOR TRIM UNITS CONSISTING OF EITHER MACHINE SCREWS OR SELF-TAPPING SCREWS.
      B. MATERIALS:
         1) METAL PLATES: STAINLESS STEEL, .050 INCH (U.S. 18 GAGE).
      C. FABRICATE PROTECTION PLATES NOT MORE THAN 2 INCHES LESS THAN DOOR WIDTH ON PUSH SIDE AND NOT MORE THAN 1 INCH LESS THAN DOOR WIDTH ON PULL SIDE.
      D. HEIGHTS:
         1) REFER TO HARDWARE HEADINGS FOR SPECIFIC SIZES.
         2) KICK PLATES AND MOP PLATES TO BE 1” LESS THAT BOTTOM RAIL HEIGHT WHERE APPLICABLE.
         3) ARMOR PLATES TO BE 34 INCHES IN HEIGHT. ARMOR PLATES ON FIRE DOORS TO COMPLY WITH NFPA 80.

N. THRESHOLDS:
   1. ACCEPTABLE MANUFACTURERS:
      A. ZERO WEATHERSTRIPPING CO., INC.*
      B. PEMKO
      C. REESE INDUSTRIES
   2. TYPES: INDICATED IN HARDWARE HEADINGS.

O. DOOR SEALS/GASKETING:
   1. ACCEPTABLE MANUFACTURERS:

A. ZERO WEATHERSTRIPPING CO., INC.*
B. PEMKO
C. REESE INDUSTRIES

2. TYPES: INDICATED IN HARDWARE HEADINGS.

P. SILENCERS:
1. ACCEPTABLE MANUFACTURERS:
A. IVES*
B. HAGER
C. ROCKWOOD MANUFACTURING
2. THREE FOR EACH SINGLE DOOR; TWO FOR EACH PAIR OF DOORS.

Q. KEY CABINET AND SYSTEM:
1. ACCEPTABLE MANUFACTURERS:
A. TELKEE, INC.
2. PROVIDE A KEY CONTROL SYSTEM INCLUDING ENVELOPES, LABELS, TAGS WITH SELF-LOCKING KEY CLIPS, RECEIPT FORMS, 3-WAY VISIBLE CARD INDEX, TEMPORARY MARKERS, PERMANENT MARKERS, AND STANDARD METAL CABINET, ALL AS RECOMMENDED BY SYSTEM MANUFACTURER, WITH CAPACITY FOR 150 PERCENT OF THE NUMBER OF LOCKS REQUIRED FOR THE PROJECT.
A. PROVIDE COMPLETE CROSS INDEX SYSTEM SET UP BY KEY CONTROL DISTRIBUTOR, AND PLACE KEYS ON MARKERS AND HOOKS IN THE CABINET AS DETERMINED BY THE FINAL KEY SCHEDULE.
B. PROVIDE HINGED-PANEL TYPE CABINET FOR WALL MOUNTING.
C. PROVIDE MULTIPLE-DRAWER TYPE CABINET.

2.2 MATERIALS AND FABRICATION

A. MANUFACTURER'S NAME PLATE: DO NOT USE MANUFACTURERS' PRODUCTS THAT HAVE MANUFACTURER'S NAME OR TRADE NAME DISPLAYED IN A VISIBLE LOCATION (OMIT REMOVABLE NAMEPLATES) EXCEPT IN CONJUNCTION WITH REQUIRED FIRE-RATED LABELS AND AS OTHERWISE ACCEPTABLE TO ARCHITECT.
1. MANUFACTURER'S IDENTIFICATION WILL BE PERMITTED ON RIM OF LOCK CYLINDERS ONLY.

B. BASE METALS: PRODUCE HARDWARE UNITS OF BASIC METAL AND FORMING METHOD INDICATED, USING MANUFACTURER'S STANDARD METAL ALLOY, COMPOSITION, TEMPER, AND HARDNESS, BUT IN NO CASE OF LESSER (COMMERCIALLY RECOGNIZED) QUALITY THAN SPECIFIED FOR APPLICABLE HARDWARE UNITS BY APPLICABLE ANSI/BHMA A156 SERIES STANDARDS FOR EACH TYPE OF HARDWARE ITEM AND WITH ANSI/BHMA A156.18 FOR FINISH DESIGNATIONS INDICATED. DO NOT FURNISH "OPTIONAL" MATERIALS OR FORMING METHODS FOR THOSE INDICATED, EXCEPT AS OTHERWISE SPECIFIED.

C. FASTENERS: PROVIDE HARDWARE MANUFACTURED TO CONFORM TO PUBLISHED TEMPLATES, GENERALLY PREPARED FOR MACHINE SCREW INSTALLATION.
1. DO NOT PROVIDE HARDWARE THAT HAS BEEN PREPARED FOR SELF-TAPPING SHEET METAL SCREWS, EXCEPT AS SPECIFICALLY INDICATED.

2. FURNISH SCREWS FOR INSTALLATION WITH EACH HARDWARE ITEM. PROVIDE PHILLIPS FLAT-HEAD SCREWS EXCEPT AS OTHERWISE INDICATED. FINISH EXPOSED (EXPOSED UNDER ANY CONDITION) SCREWS TO MATCH HARDWARE FINISH OR, IF EXPOSED IN SURFACES OF OTHER WORK, TO MATCH FINISH OF THIS OTHER WORK AS CLOSELY AS POSSIBLE INCLUDING “PREPARED FOR PAINT" SURFACES TO RECEIVE PAINTED FINISH.
3. PROVIDE CONCEALED FASTENERS FOR HARDWARE UNITS THAT ARE EXPOSED WHEN DOOR IS CLOSED EXCEPT TO THE EXTENT NO STANDARD UNITS OF TYPE SPECIFIED ARE AVAILABLE WITH CONCEALED FASTENERS.
4. USE THRU-BOLTS FOR INSTALLATION OF ALL EXIT DEVICES, CLOSERS, AND SURFACE-MOUNTED OVERHEAD STOPS. COORDINATE WITH WOOD DOORS AND METAL DOORS AND FRAMES. WHERE THRU-BOLTS ARE USED, PROVIDE SLEEVES FOR EACH THRU-BOLT AS A MEANS OF REINFORCING THE WORK, OR PROVIDE SEX NUTS AND BOLTS.

2.3 HARDWARE FINISHES

A. MATCH ITEMS TO THE MANUFACTURER’S STANDARD COLOR AND TEXTURE FINISH FOR THE LATCH AND LOCK SETS (OR PUSH-PULL UNITS IF NO LATCH OR LOCK SETS).

B. PROVIDE FINISHES THAT MATCH THOSE ESTABLISHED BY ANSI OR, IF NONE ESTABLISHED, MATCH THE ARCHITECT’S SAMPLE.

C. PROVIDE QUALITY OF FINISH, INCLUDING THICKNESS OF PLATING OR COATING (IF ANY), COMPOSITION, HARDNESS, AND OTHER QUALITIES COMPLYING WITH MANUFACTURER’S STANDARDS, BUT IN NO CASE LESS THAN SPECIFIED BY REFERENCED STANDARDS FOR THE APPLICABLE UNITS OF HARDWARE.

D. PROVIDE PROTECTIVE LACQUER COATING ON ALL EXPOSED HARDWARE FINISHES OF BRASS, BRONZE, AND ALUMINUM, EXCEPT AS OTHERWISE INDICATED. THE SUFFIX "-NL" IS USED WITH STANDARD FINISH DESIGNATIONS TO INDICATE "NO LACQUER."

E. THE DESIGNATIONS USED TO INDICATE HARDWARE FINISHES ARE THOSE LISTED IN ANSI/BHMA A156.18, "MATERIALS AND FINISHES," INCLUDING COORDINATION WITH THE TRADITIONAL U.S. FINISHES SHOWN BY CERTAIN MANUFACTURERS FOR THEIR PRODUCTS.

1. CONTINUOUS HINGES: 628 (US28) CLEAR ANODIZED ALUMINUM
2. FLUSH BOLTS: 626 (US26D) SATIN CHROME PLATED BRASS/BRONZE
3. LOCKS: 626 (US26D) SATIN CHROME PLATED
4. CYLINDRICAL LOCKS: 626 (US26D) SATIN CHROME PLATED
5. EXIT DEVICES: 628 (US28) - ANODIZED ALUMINUM – POWDER COATED COVER – 630 SATIN STAINLESS-STEEL TOUCH PAD – 628 ANODIZED ALUMINUM MECHANISM CASE
6. DOOR CLOSERS: 689 POWDER COAT ALUMINUM
7. DOOR CLOSERS: 689 POWDER COAT ALUMINUM
8. PUSH PLATES: 630 (US32D) SATIN STAINLESS STEEL
9. PULL PLATES: 630 (US32D) SATIN STAINLESS STEEL
10. PROTECTIVE PLATES: 630 (US32D) SATIN STAINLESS STEEL
11. DOORSTOPS: 626 (US26D) SATIN CHROME PLATED BRASS/BRONZE
12. OVERHEAD HOLDERS: 630 SATIN STAINLESS STEEL

PART 3 - EXECUTION

3.1 INSTALLATION

A. MOUNT HARDWARE UNITS AT HEIGHTS INDICATED IN FOLLOWING APPLICABLE PUBLICATIONS, EXCEPT AS SPECIFICALLY INDICATED OR REQUIRED TO COMPLY WITH GOVERNING REGULATIONS AND EXCEPT AS OTHERWISE DIRECTED BY ARCHITECT.
   1. "RECOMMENDED LOCATIONS FOR BUILDERS HARDWARE FOR STANDARD STEEL DOORS AND FRAMES" BY THE DOOR AND HARDWARE INSTITUTE.
   2. "RECOMMENDED LOCATIONS FOR BUILDERS HARDWARE FOR CUSTOM STEEL DOORS AND FRAMES" BY THE DOOR AND HARDWARE INSTITUTE.
   3. NWWDA INDUSTRY STANDARD I.S.1.7, "HARDWARE LOCATIONS FOR WOOD FLUSH DOORS."

B. INSTALL EACH HARDWARE ITEM IN COMPLIANCE WITH THE MANUFACTURER'S INSTRUCTIONS AND RECOMMENDATIONS. WHERE CUTTING AND FITTING IS REQUIRED TO INSTALL HARDWARE ONTO OR INTO SURFACES THAT ARE LATER TO BE PAINTED OR FINISHED IN ANOTHER WAY, COORDINATE REMOVAL, STORAGE, AND REINSTALLATION OR APPLICATION OF SURFACE PROTECTION WITH FINISHING WORK SPECIFIED IN THE DIVISION 9 SECTIONS. DO NOT INSTALL SURFACE-MOUNTED ITEMS UNTIL FINISHES HAVE BEEN COMPLETED ON THE SUBSTRATES INVOLVED.

C. SET UNITS LEVEL, PLUMB, AND TRUE TO LINE AND LOCATION. ADJUST AND REINFORCE THE ATTACHMENT SUBSTRATE AS NECESSARY FOR PROPER INSTALLATION AND OPERATION.

D. DRILL AND COUNTERSINK UNITS THAT ARE NOT FACTORY PREPARED FOR ANCHORAGE FASTENERS. SPACE FASTENERS AND ANCHORS IN ACCORDANCE WITH INDUSTRY STANDARDS.

E. SET THRESHOLDS FOR EXTERIOR DOORS IN FULL BED OF BUTYL-RUBBER OR POLYISOBUTYLENE MASTIC SEALANT COMPLYING WITH REQUIREMENTS SPECIFIED IN DIVISION 7 SECTION “JOINT SEALERS”.

F. WEATHERSTRIPPING AND SEALS: COMPLY WITH MANUFACTURER'S INSTRUCTIONS AND RECOMMENDATIONS TO THE EXTENT INSTALLATION REQUIREMENTS ARE NOT OTHERWISE INDICATED.

3.2 ADJUSTING, CLEANING, AND DEMONSTRATING

A. ADJUST AND CHECK EACH OPERATING ITEM OF HARDWARE AND EACH DOOR TO ENSURE PROPER OPERATION OR FUNCTION OF EVERY UNIT. REPLACE UNITS THAT CANNOT BE ADJUSTED TO OPERATE FREELY AND SMOOTHLY OR AS INTENDED FOR THE APPLICATION MADE.
   1. WHERE DOOR HARDWARE IS INSTALLED MORE THAN ONE MONTH PRIOR TO ACCEPTANCE OR OCCUPANCY OF A SPACE OR AREA, RETURN TO THE INSTALLATION DURING THE WEEK PRIOR TO ACCEPTANCE OR OCCUPANCY AND MAKE FINAL CHECK AND ADJUSTMENT OF ALL HARDWARE ITEMS IN SUCH SPACE OR AREA. CLEAN OPERATING ITEMS AS NECESSARY TO RESTORE PROPER FUNCTION AND FINISH OF HARDWARE AND DOORS. ADJUST DOOR CONTROL DEVICES TO FUNCTION PROPERLY WITH FINAL OPERATION OF HEATING AND VENTILATING EQUIPMENT.

B. CLEAN ADJACENT SURFACES SOILED BY HARDWARE INSTALLATION.

C. DOOR HARDWARE SUPPLIER'S FIELD SERVICE:

1. INSPECT DOOR HARDWARE ITEMS FOR CORRECT INSTALLATION AND ADJUSTMENT AFTER COMPLETE INSTALLATION OF DOOR HARDWARE.
2. INSTRUCT OWNER'S PERSONNEL IN THE PROPER ADJUSTMENT AND MAINTENANCE OF DOOR HARDWARE AND HARDWARE FINISHES.
3. FILE WRITTEN REPORT OF THIS INSPECTION TO ARCHITECT.

3.3.1 HARDWARE SCHEDULE

SECTION 08800 - GLASS AND GLAZING

1. GENERAL:

   A. THIS SECTION COVERS FURNISHING OF ALL LABOR, MATERIALS, TOOLS, EQUIPMENT AND PERFORMING ALL WORK AND SERVICES FOR ALL GLASS AND GLAZING AND STOREFRONT AS SHOWN ON THE DRAWINGS AND AS SPECIFIED, IN ACCORDANCE WITH PROVISIONS OF THE CONTRACT DOCUMENTS, AND COMPLETELY COORDINATED WITH WORK OF ALL OTHER TRADES.

   B. ALTHOUGH SUCH WORK IS NOT SPECIFICALLY INDICATED, FURNISH AND INSTALL ALL SUPPLEMENTARY OR MISCELLANEOUS ITEMS, APPURTENANCES AND DEVICES INCIDENTAL TO OR NECESSARY FOR A SOUND, SECURE AND COMPLETE INSTALLATION.

2. JOB CONDITIONS:

   A. EXAMINE FRAMING OR GLAZING CHANNEL SURFACES, BACKING, STOP DESIGN, AND CONDITIONS UNDER WHICH GLAZING IS TO BE PERFORMED. DO NOT PROCEED UNTIL CONDITIONS ARE CORRECT.

   B. DO NOT PROCEED WITH INSTALLATION OF SEALANTS OR GLAZING UNDER ADVERSE WEATHER CONDITIONS, OR WHEN TEMPERATURES ARE BELOW OR ABOVE MANUFACTURER'S RECOMMENDED LIMITATIONS FOR INSTALLATION.

3. MATERIALS:

   A. LABELS: GLASS SHALL BE DELIVERED WITH ORIGINAL MANUFACTURER'S TRADE AND GRADE MARKS. LABELS SHALL REMAIN ON GLASS AND SHALL BE VISIBLE AT FINAL INSPECTION.

   B. ALL PLATE GLASS ON INTERIOR OF BUILDING SHALL BE 1/4" CLEAR FLOAT GLASS UNLESS MARKED OTHERWISE. WHERE SAFETY GLASS IS SHOWN OR REQUIRED BY CODE, USE 1/4" CLEAR SAFETY TEMPERED GLASS unless noted otherwise. ALL SAFETY GLASS SHALL BE IDENTIFIED AS SUCH BY A PLAINLY VISIBLE ETCHED OR OTHER PERMANENTLY AFFIXED LABEL. ALL GLAZING WITHIN 4’-0” OF DOOR OPENINGS TO BE TEMPERED SAFETY GLASS.

   C. LARGE MISSILE IMPACT GLAZING FOR EXTERIOR WINDOWS : SEE SECTION 08520

   E. PROVIDE HURRICANE IMPACT RESISTANT GLASS AT EXTERIOR DOORS, HOLLOW METAL SIDELIGHTS AND TRANSOMS. GLASS SHALL BE OLDCASTLE 17/32” LAMINATEED IMPACT CONSISTING OF 3/16” CLEAR - .090” SENTRY GLASS – 1/4” OLDCASTLE GUARDIAN MIDNIGHT GRAY (MNGY) HIGH PERFORMAMCE TINT FOR IMPACT RESISTANCE MEETING LARGE MISSILE IMPACT DESIGN CRITERIA. GLASS SHALL BE PERMANENTLY MARKED WITH MANUFACTURER’S LOGO.

   F. PROVIDE IMPACT RESISTANT GLASS AT ALL INTERIOR CORRIDOR GLAZING WHETHER INDICATED OR NOT. GLASS SHALL BE GUARDIAN GLASS 7/16” +/- LAMINATED IMPACT CONSISTING OF 3/16” CLEAR - .090” SAFLEX R SERIES CLEAR PVB – 3/16” CLEAR. GLASS SHALL BE PERMANENTLY MARKED WITH MANUFACTURER’S LOGO.

5. INSTALLATION:

A. GLASS SHALL BE INSTALLED BY MECHANICS SKILLED IN THIS TRADE.

B. DO NOT INSTALL GLASS WITH EDGE DAMAGE.

C. COMPLY WITH COMBINED RECOMMENDATION OF MATERIAL MANUFACTURERS, EXCEPT WHERE MORE STRINGENT REQUIREMENTS ARE INDICATED.

D. AS A MINIMUM, COMPLY WITH FGJA GLAZING MANUAL.

E. DO NOT ATTEMPT TO CUT TEMPERED, HEAT-STRENGTHENED, OR COATED GLASS.

F. CLEAN CHANNEL OR FRAMING MEMBERS TO RECEIVE GLASS. REMOVE COATINGS WHICH ARE NOT FIRMLY BONDED TO SUBSTRATE.

G. MAINTAIN GLASS REASONABLY CLEAN DURING CONSTRUCTION, SO THAT IT WILL NOT BE DAMAGED BY CORROSIVE ACTION AND WILL NOT CONTRIBUTE TO DETERIORATION OF OTHER MATERIALS.

H. WASH AND POLISH GLASS ON BOTH FACES NOT MORE THAN FOUR (4) DAYS PRIOR TO OWNER'S ACCEPTANCE OF THE WORK IN EACH AREA. COMPLY WITH GLASS MANUFACTURER'S RECOMMENDATIONS.

END OF SECTION

SECTION 09110 - NON-STRUCTURAL METAL FRAMING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. DRAWINGS AND GENERAL PROVISIONS OF THE CONTRACT, INCLUDING GENERAL AND SUPPLEMENTARY CONDITIONS AND DIVISION 01 SPECIFICATION SECTIONS, APPLY TO THIS SECTION.

1.2 SUMMARY

A. THIS SECTION INCLUDES NON-LOAD-BEARING STEEL FRAMING MEMBERS FOR THE FOLLOWING APPLICATIONS:

1. INTERIOR FRAMING SYSTEMS (E.G., SUPPORTS FOR PARTITION WALLS, FRAMED SOFFITS, FURRING, ETC.).

B. RELATED SECTIONS:

1. SECTION 01813 – SUSTAINABLE DESIGN REQUIREMENTS.

PART 2 - PRODUCTS

2.1 NON-LOAD-BEARING STEEL FRAMING, GENERAL

A. FRAMING MEMBERS, GENERAL: COMPLY WITH ASTM C 754 FOR CONDITIONS INDICATED.

1. STEEL SHEET COMPONENTS: COMPLY WITH ASTM C 645 REQUIREMENTS FOR METAL, UNLESS OTHERWISE INDICATED.
2. PROTECTIVE COATING: HOT-DIP GALVANIZED, UNLESS OTHERWISE INDICATED.

2.2 STEEL FRAMING FOR FRAMED ASSEMBLIES

A. STEEL STUDS AND RUNNERS: ASTM C 645.

1. MINIMUM BASE-METAL THICKNESS: 25 – 20 GA.
2. DEPTH: AS INDICATED ON DRAWINGS.

B. FLAT STRAP AND BACKING PLATE: STEEL SHEET FOR BLOCKING AND BRACING IN LENGTHS AND WIDTHS AS REQUIRED .

1. MINIMUM BASE-METAL THICKNESS: 20 GA.

C. CH STUDS FOR SHAFT WALL: 18 GA.

2.3 AUXILIARY MATERIALS

A. GENERAL: PROVIDE AUXILIARY MATERIALS THAT COMPLY WITH REFERENCED INSTALLATION STANDARDS.

1. FASTENERS FOR METAL FRAMING: OF TYPE, MATERIAL, SIZE, CORROSION RESISTANCE, HOLDING POWER, AND OTHER PROPERTIES REQUIRED TO FASTEN STEEL MEMBERS TO SUBSTRATES.

PART 3 - EXECUTION

3.1 EXAMINATION

A. EXAMINE AREAS AND SUBSTRATES, WITH INSTALLER PRESENT, AND INCLUDING WELDED HOLLOW-METAL FRAMES, CAST-IN ANCHORS, AND STRUCTURAL FRAMING, FOR COMPLIANCE WITH REQUIREMENTS AND OTHER CONDITIONS AFFECTING PERFORMANCE.

1. PROCEED WITH INSTALLATION ONLY AFTER UNSATISFACTORY CONDITIONS HAVE BEEN CORRECTED.

3.2 INSTALLATION, GENERAL

A. INSTALLATION STANDARD: ASTM C 754, EXCEPT COMPLY WITH FRAMING SIZES AND SPACING INDICATED.

1. GYPSUM BOARD ASSEMBLIES: ALSO COMPLY WITH REQUIREMENTS IN ASTM C 840 THAT APPLY TO FRAMING INSTALLATION.

B. INSTALL SUPPLEMENTARY FRAMING, AND BLOCKING TO SUPPORT FIXTURES, EQUIPMENT SERVICES, HEAVY TRIM, GRAB BARS, TOILET ACCESSORIES, FURNISHINGS, OR SIMILAR CONSTRUCTION.

C. INSTALL BRACING AT TERMINATIONS IN ASSEMBLIES.

3.3 INSTALLING FRAMED ASSEMBLIES

A. INSTALL STUDS SO FLANGES WITHIN FRAMING SYSTEM POINT IN SAME DIRECTION.

1. SPACE STUDS AS FOLLOWS:

A. SINGLE-LAYER APPLICATION: 16 INCHES (406 MM)
B. TILE BACKING PANELS: 16 INCHES (406 MM) O.C., UNLESS OTHERWISE INDICATED.

B. INSTALL TRACKS (RUNNERS) AT FLOORS AND OVERHEAD SUPPORTS. EXTEND FRAMING FULL HEIGHT TO STRUCTURAL SUPPORTS OR SUBSTRATES ABOVE SUSPENDED CEILINGS, EXCEPT WHERE PARTITIONS ARE INDICATED TO TERMINATE AT SUSPENDED CEILINGS. CONTINUE FRAMING AROUND DUCTS PENETRATING PARTITIONS ABOVE CEILING.

1. DOOR OPENINGS: SCREW VERTICAL STUDS AT JAMBS TO JAMB ANCHOR CLIPS ON DOOR FRAMES; INSTALL RUNNER TRACK SECTION (FOR CRIPPLE STUDS) AT HEAD AND SECURE TO JAMB STUDS.

   A. INSTALL TWO STUDS AT EACH JAMB, UNLESS OTHERWISE INDICATED.

2. WINDOW AND DOOR OPENINGS: INSTALL TWO STUDS AT EACH JAMB AND BOX HEADER AT EACH HEAD.

C. INSTALLATION TOLERANCE: INSTALL EACH FRAMING MEMBER SO FASTENING SURFACES VARY NOT MORE THAN 1/8 INCH (3 MM) FROM THE PLANE FORMED BY FACES OF ADJACENT FRAMING.

D. LIMITING HEIGHTS:

1. 3 5/8 “ (25 GA. TO 14’-4”) (20 GA. TO 16’-5”)(18 GA STUDS TO 21’-0”)
2. 6” (25 GA. TO 19’-9”) (20 GA TO 21’-0”)

END OF SECTION

SECTION: 09215 - VENEER PLASTER

PART 1 GENERAL

1.01 RELATED DOCUMENTS:

Drawings and General Provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification sections, apply to work of this section.

1.02 SCOPE:

A. The work thin coat plaster (tcp) on 5/8 backer board on interior masonry furring and metal studs.

B. The Contractor shall furnish all labor, materials, tools, equipment and perform all work and services for all lath and plaster work as shown on drawings and as specified, in accordance with provisions of the contract documents and completely coordinated with work of all other trades.

C. Although such work is not specifically indicated, finish and install all supplementary or miscellaneous items, appurtenances, and devices incidental to or necessary for a sound, secure and complete installation.

D. Wherever a fire-resistance classification is indicated or scheduled, provide materials, accessories and application procedures which have been listed by UL or tested according to ASTM E119 for type of construction.

1.03 ACCEPTABLE MANUFACTURERS AND STANDARDS

A. Plastering system by US Gypsum Co. shall be used as standard of quality. Other companies desiring approval shall submit literature and information to Architect for approval 10 days prior to taking of bids.

1.04 SUBMITTALS

A. List of materials and accessories with identified manufacturers data.

B. Samples: Samples of all finishes shall be applied at job site for approval by Architect before proceeding with finish coats of plaster.

1.05 PRODUCT DELIVERY, STORAGE AND HANDLING

Deliver all components, except bulk aggregates, in sealed containers with identifying labels. Store cementitious items under cover, protected from weather. Store and handle to prevent damage.

1.06 JOB CONDITIONS

Verify suitability of substrate to accept installation. Perform no plaster work when ambient temperatures are below 55□F. Protect finished work with temporary covers to preclude damage. Provide adequate ventilation and temporary heating on interior of building before proceeding with interior work.

Heat shall be well distributed in all areas with deflective screens used to prevent irregular heat on plaster surfaces.

PART 2 MATERIALS

2.01

1. Casing Beads: Zinc #66 and Imperial casing bead #701-B.

2. Corner Beads: Exterior #1A zinc, interior #900 galvanized USG.

3. Control Joints: For veneer plaster #093 zinc; for stucco plaster Unimast Double V zinc and #75 and #100 zinc, imperial type for veneer plaster base.

4. Z Channel: 3" USG.

5. Reinforcing Tape for Imperial, Type P or S.

6. Screws: Size 1", 1 5/8" and 2" (drywall type S) self drilling type S-12, laminating type G. Heads: Bugle and pan corrosive resistant.

7. Framing and Furring: Galvanized cold rolled channels 3/4", 1 1/2" and 2" and hat channels 7/8" deep USG.

2.02 VENEER PLASTER BASE

(5/8") thick, 48" wide, square edge, (Regular) (Firecode) (Firecode C).

2.03 INSULATION

Thermafiber Blankets 3" x 16", 24" USG.

2.05 PLASTERING MATERIAL

A. Veneer Plaster Basecoat: Imperial Basecoat, Custom Veneer Basecoat.

B. Veneer Plaster-Prepared Finish: Imperial Finish Plaster, Diamond Interior Finish, Red Top Finish.

C. Mortar Type S

D. Aggregate: Sand, graded to pass a 30-mesh screen.

2.06 MIXES

A. Veneer Plaster Basecoat: Shall be mixed in accordance with water proportions identified on bag. Mix for 2 to 5 minutes with a cage-type paddle mixer using a 900-1000 rpm ½" drill.

B. Veneer Plaster-Prepared Finish: Add all but 1 to 2 quarts of the required water to a non-plastic mixing container. Mix for 1 to 2 minutes, add up to 1 to 2 quarts of retained water and then mix for 1 to 2 minutes more. Mix with a cage-type paddle mixer using a 900-1000 rpm ½" drill.

PART 3 EXECUTION

3.1 STEEL FRAMING AND FURRING INSTALLATION

3.1.1 Ceiling Grillage Erection: Space 8-ga. hanger wires 48" o.c., along carrying channels and within 6" of ends of carrying channel runs or by approved inserts in concrete. For steel construction, wrap hanger around or through trusses, beams, or joists.

Install 1½" carrying channels 48" o.c., and within 6" of walls. Position channels for proper ceiling height, level, and secure with hanger wire saddle-tied along channel. Provide 1" clearance between runners and abutting walls and partitions. At channel splices, interlock flange, overlap ends 12" and secure each end with double-strand 18-ga. tie wire.

Erect metal furring channels at right angles to 1½" or 2" carrying channels or main support members. Space furring 16" o.c. and within 6" of walls. Provide 1" clearance between furring ends and abutting walls and partitions. Secure furring to carrying channels with clips or saddle-tie to supports with double-strand 18-ga. tie wire. At splices, nest furring channels at least 8" and wire-tie each end with double-strand 18-ga. tire wire.

At light troffers or any openings that interrupt the carrying or furring channels, install additional cross reinforcing to restore lateral stability of grillage.

3.1.2 Wall Furring Channel Attachment - Direct: Attachment metal furring channels vertically, spaced 24" o.c., to interior of masonry or concrete surfaces with hammer-set or power-driven fasteners or concrete stub nails 24" o.c. Where furring channel is installed directly to exterior wall install asphalt felt protection strip between furring channel and wall.

3.2 FIBERGLASS BLANKET INSTALLATION

3.2.1 Insert the 25" wide blanket in the stud cavity by bowing the blanket slightly. Butt ends of blankets closely together and fill all voids.

3.3 VENEER PLASTER BASE INSTALLATION

3.3.1 Ceiling Installation: Apply gypsum base maximum practical lengths wherever possible on ceilings first with long dimension perpendicular to furring channels with blue face paper down. Position end joints over framing and stagger in adjacent rows.

Fit ends and edges closely, but not forced together. Fasten base to channels with 1" Type S screws spaced 12" o.c. in field of base and along abutting ends and edges.

3.3.2 Single Layer Gypsum Base Erection: Apply gypsum base parallel to studs or perpendicular to studs. Position all edges over stud flanges for parallel application, all ends over stud flanges for perpendicular application. To maintain a true surface plane, arrange direction of application so leading edge of base is attached first to open edge of stud flange. Use maximum practical lengths to minimize end joints. Fit ends and edges closely, but not forced together. Stagger joints on opposite sides of partition placed on different studs.

Fasten base to stud framing with screws spaced 12" o.c. in field of base and along abutting end joints. Screw spacing shown is for non-rated construction. For fire-rated construction, obtain screw spacing from test report.

Float gypsum base at vertical interior angles by attaching the overlapping sheet of base only, at the angle; at horizontal interior angles by attaching both sheets of base no closer than 8" from the angle.

3.3.3 Double Layer Gypsum Base Erection: For screw attachment, space screws 24" o.c. for base layer and 12" o.c. for face layer. Apply both layers of gypsum base parallel to framing with joints in face layer offset from base layer joints. For 5/8" base, use 1" screws for base layer and 1 5/8" screws for face layer.

In double-layer laminated construction, attach base layer with 1" Type S screws spaced 12" o.c. in field of base and along abutting ends and edges. Apply face layer parallel to studs with specified Sheetrock Setting-Type Joint Compound or Sheetrock Ready-Mixed Joint Compound spread on back side, joints staggered approx. 12" and fastened to base layer with 1 1/2 Type G screws. Drive screws approximately 2' from ends and 4' o.c. infield of panel, 1' from ends and 3' o.c. along a line 3" from vertical edges. Screw spacing shown is for non-rated construction. For fire-rated construction, obtain screw spacing from test report. Tape and float all joints of both layers.

3.4 ACCESSORY APPLICATION

3.4.1 Corner Bead: Attach to all vertical and horizontal exterior corners with nails, screws or 9/16" galvanized staples spaced 12" o,c, along both flanges along entire length of board.

3.4.2 Control Joints: Install where indicated on plans. Break base behind joint and back by double studs. Apply acoustical sealant to fill gap and attach joint to gypsum base with nails, screws or 9/16" galvanized stapes spaced 6" o.c. on both flanges along joint length.

3.4.3 Casing Beads and Metal Trim: Apply to Imperial Gypsum with fasteners or 9/16" galvanized staples 12" o.c. or wire-tie and fasten to metal lath. Cut and miter ends accurately and install where partition or ceilings terminate against masonry, dissimilar material and where indicated.

3.4.4 Laminating Adhesive: For laminating double layers of Imperial Gypsum Base, spread to provide full 1/2" adhesive bead 4 1/2" o.c. for full sheet lamination. For strip lamination apply adhesive in vertical strips of four 1/2" beads to 2" o.c. Space strips 24" o.c.

3.4.5 Joint System: Use Sheetrock Setting-Type Joint Compound and Sheetrock Joint Tape system when Imperial Gypsum Base is applied to steel framing and when rapid drying, low humidity or high temperatures exist. Use on all joints, internal corners, trim and corner beads and allow to set and dry before plaster application.

3.5 CONTROL JOINT INSTALLATION

Where indicated on drawings, attach Sheetrock Zinc Control Joints with drywall screws or Bostich 9/16" "G" staples spaced not over 6" apart in each flange. (Control joint Nos. 50, 75, 100 - splice ends together with 16-ga. tie wire inserted into openings in the key-lock sections.) (Control joint No. 093-square-cut end joints, butt together and align for neat fit.) Remove protective tape after plastering.

3.5.1 Interior Walls and partitions: Space control joints maximum of 30' apart; control joints occur over door frames as indicated in drawings.

3.6 VENEER BASECOAT PLASTER

3.6.1 Imperial Basecoat: When applied directly to Imperial Gypsum Base, embed tape, and fill beads, and allow plaster to set; then scratch and immediately double back to a thickness of 1/16" to 3/32" in accordance with manufacturer's directions.

3.6.2 Where plaster is flush with metal base, metal door frames, etc., trowel-cut at the junction to reduce the possibility of chipping. Cut basecoat plaster free from these

metal sections before plaster sets.

3.6.3 Where plastering directly to masonry walls, use cement rather than plaster base coat.

3.7 VENEER PLASTER FINISH APPLICATIONS

3.7.1 Imperial Finish Coat:

A. Travertine Texture: Over basecoat apply Imperial Finish with spray machine with proper orifice setting and when sufficiently set, strike down to a travertine finish, in approved texture.

3.8 FINISH COAT PLASTER APPLICATIONS

A. Textured Finish Coat: Apply over base coat with a spray machine with proper orifice setting and when sufficiently set, strike down to a travertine finish, in approved texture. Fog spray surface with water for several days after setting to avoid shrinkage cracks.

B. Sand float finish on exterior.

3.9 PATCHING

Point up around trim and other work. Cut out and patch defective and damaged plaster. Patch plaster to match existing work in texture and finish flush and smooth.

3.10 COMPLETION

At the completion of the finish plaster work, clean all plaster from beads, screeds, metal base and metal trim, leaving work ready for decoration by others. Remove all plaster rubbish, excess material, scaffolding, tools, and equipment from the building, leaving floors broom clean.

END OF SECTION

SECTION 09250 – GYPSUM DRYWALL

PART 1 - GENERAL

1.01 SUMMARY

A. Provide paperless gypsum board and support framing systems for walls.

1.02 SUBMITTALS

A. Submit for approval product data.

1.03 QUALITY ASSURANCE

A. Comply with governing codes and regulations. Provide products of acceptable manufacturers which have been in satisfactory use in similar service for three years. Use experienced installers. Deliver, handle, and store materials in accordance with manufacturer's instructions.

PART 2 - PRODUCTS

2.01 MATERIALS

A. Paperless gypsum board: ASTM C 36/C 36M and ASTM C 1177/C 1177M, 5/8" thick, moisture and mold resistant with coated glass-mat facings; DensArmor Plus Paperless Interior Panel by Georgia-Pacific Building Products or approved equal.

B. Steel studs: ASTM C 645, 20 gage screw-type steel studs, at 16 inches o.c. maximum, ASTM A 653 G40, hot-dip galvanized.

C. Deep-leg deflection track: ASTM C 645, 20 gage galvanized steel top runner with 2-inch deep flanges.

D. Joint reinforcement: ASTM C 475/C 475M, 2” wide 10-by-10 fiberglass mesh tape and ready-mixed joint compound; ToughRock Tape and ToughRock Ready Mix All-Purpose Joint Compound by Georgia-Pacific Building Products or approved equal.

E. Accessories: ASTM C 1047, galvanized steel, Sheetrock Dur-A-Bead corner beads, No. 200 series metal trim, No. 093 zinc control joints, U.S. Gypsum or approved equal.

F. Acoustical sealant: U.S. Gypsum Acoustical Sealant or approved equal.

PART 3 - EXECUTION

3.01 INSTALLATION

A. Comply with ASTM C754, ASTM C844, ASTM C843 and manufacturer's instructions and recommendations. Maintain environmental conditions within the limits prescribed by manufacturer.

1. Do not allow gypsum base to fade from exposure to light.
2. Erection Tolerance: No more than 1/16-inch offsets between planes of gypsum base faces, and 1/8 inch in 8 feet for level, plumb, warp, and bow.

B. Space framing at 16" O.C., unless indicated otherwise. Extend walls above ceilings to underside of roof deck.

C. Install gypsum board over interior face of ICF wall system and attach to ICF wall system webs at minimum 16" o.c.

D. Install supplementary framing, blocking, and bracing to support fixtures, equipment services, heavy trim, furnishings, or similar construction.

E. Isolate partition framing and wall furring where they abut structure, except at floor. Install slip-type joints at head of assemblies that avoid axial loading of assemblies and laterally support assemblies. Use deep-leg deflection track where indicated. Seal joints between edges and abutting structural surfaces with acoustical sealant.

F. Provide sound attenuation blankets within assemblies where indicated.

G. On partitions/walls, apply gypsum board panels vertically (parallel to framing) unless otherwise indicated or required by fire-resistance-rated assembly, and minimize end joints.

END OF SECTION 09250

SECTION 09510 – ACOUSTICAL CEILINGS

1. GENERAL:

   A. THE CONTRACTOR SHALL FURNISH ALL LABOR, MATERIALS, TOOLS, EQUIPMENT, AND PERFORM ALL WORK AND SERVICES FOR ALL ACOUSTICAL CEILINGS, AS SHOWN ON DRAWINGS AND AS SPECIFIED IN ACCORDANCE WITH PROVISIONS OF THE CONTRACT DOCUMENTS AND COMPLETELY COORDINATED WITH WORK OF ALL OTHER TRADES.

   B. ALTHOUGH SUCH WORK IS NOT SPECIFICALLY INDICATED, FURNISH, AND INSTALL ALL SUPPLEMENTARY OR MISCELLANEOUS ITEMS, APPURTENANCES AND DEVICES INCIDENTAL TO OR NECESSARY FOR A SOUND, SECURE AND COMPLETE INSTALLATION.

   C. CAREFULLY COORDINATE CEILING LAYOUT WITH OTHER WORK WHICH PENETRATES ACOUSTICAL CEILING SYSTEMS.

2. QUALITY ASSURANCE:

   A. FOLLOWING GRID MANUFACTURER'S ARE APPROVED:
   CHICAGO METALLIC SNAPPED GRID 200
   ARMSTRONG, PRELUDE XL 15/16"
   USG, DXL

3. SUBMITTALS:

   A. SAMPLES OF ALL MATERIALS AND COMPONENTS PROPOSED FOR USE.

   B. SHOP DRAWINGS AND LITERATURE.

   C. COPIES OF MANUFACTURER'S INSTALLATION INSTRUCTIONS.

   D. CERTIFICATION OF ACOUSTIC RATING. IF ACOUSTIC RATING OF INSTALLED TILE DOES NOT MEET SPECIFIED RATING PROVIDE SUCH ADDITIONAL TESTING OF SUBSTANTIATE RATING AS ARCHITECT MAY DIRECT.

   E. GREEN GLOBE SUBMITTALS:
   (REFERENCE SECTION 01813 – SUSTAINABLE DESIGN REQUIREMENTS)

      1. EPD (ENVIRONMENTAL PRODUCT DECLARATION): PROVIDE FOR EACH PRODUCT AND COMPONENT CONTAINED HEREIN, WHERE APPLICABLE, AN EPD OR OTHER THIRD PARTY VERIFIED PRODUCT LIFE CYCLE ASSESSMENT IDENTIFIED BY ONE OF THE FOLLOWING:

         A. PROVIDE INDUSTRY WIDE EPD OR BRAND SPECIFIC EPD

         B. NSF SUSTAINABILITY ASSESSMENT STANDARDS

         C. UL ENVIRONMENTAL SUSTAINABILITY STANDARDS

         D. SUSTAINABLE MINDS TRANSPARENCY REPORT FRAMEWORK

         E. ASSESSMENT BASED ON ISO 14040:2006 AND ISO 14044:2006

      2. PRODUCT MATERIAL COST: PROVIDE TOTAL MATERIAL COST FOR EACH SEPARATE PRODUCT CALLED FOR HEREIN AS DESCRIBED IN SECTION

01813 - SUSTAINABLE DESIGN REQUIREMENTS. COST IS TO BE FOR MATERIALS ONLY IS TO EXCLUDE COST OF INSTALLATION.

3. VOC CONTENT: PROVIDE ONE OF THE FOLLOWING METHODS INDICATING VOC CONTENT COMPLIANCE WITH VOC LIMITS AS IDENTIFIED IN SECTION 01813 – SUSTAINABLE DESIGN REQUIREMENTS:

   A. PROVIDE MANUFACTURER'S PRODUCT DATA AND MATERIAL SAFETY DATA SHEETS (MSDS) FOR ADHESIVES AND SEALANTS USED ON THE INTERIOR OF THE BUILDING INCLUDING PRINTED STATEMENT OF VOC CONTENT IN G/L.

   B. OR THIRD-PARTY PRODUCT CERTIFICATION INDICATING COMPLIANCE TO PREDETERMINED INDOOR AIR QUALITY STANDARDS BY ONE OF THE FOLLOWING RECOGNIZED PROGRAMS ASSOCIATED WITH THE PRODUCT TYPE:

      1) ECOLOGO (PAINTS & ADHESIVES)
      2) GREEN SEAL (PAINTS & ADHESIVES)
      3) FLOORSCORE (RESILIENT FLOORING)
      4) GREENGUARD CHILDREN & SCHOOLS
      5) GREENGUARD GOLD
      6) INDOOR ADVANTAGE GOLD
      7) CALIFORNIA DEPARTMENT OF HEALTH SERVICES STANDARD PRACTICE FOR THE TESTING OF VOC EMISSIONS SOURCES
      8) SCS-EC10.2-2007

4. PRODUCT DELIVERY, STORAGE AND HANDLING:

   A. DELIVER IN MANUFACTURER'S ORIGINAL SEALED PACKAGES WITH NAME AND CONTENTS LEGIBLY MARKED THEREON.

   B. STORE IN DRY AREAS, PROTECTED FROM WEATHER AND DAMAGE.

5. MATERIALS - ACOUSTICAL TILE:

   A. ACT-1:

      1. USG OLYMPIA # 4750, OR
      2. ARMSTRONG MESA #680

   B. ACT-2:

      1. USG SHEETROCK LAY-IN CEILING PANEL CLIMATE PLUS VINYL #3260, OR
      2. USG CLEAN ROOM CLIMATE PLUS #56099 (FIELD CUT EDGES AND HOLES TO BE SEALED WITH MATCHING WHITE LATEX PAINT, TWO (2) COATS), OR
      3. ARMSTRONG CLEAN ROOM VL UN PERFORATED-CLASS 5 (CLASS 100) #868

6. MATERIALS - SUSPENSION SYSTEM
(EXPOSED GRID) ACT-1 SHALL BE EQUAL TO CHICAGO METALLIC, HOT DIPPED GALVANIZED STEEL AND SHALL BE FINISHED ON EXPOSED SURFACES IN WHITE COLOR.

   A. PROVIDE MATCHING WALL MOULDING

   B. SYSTEM SHALL COMPLY WITH ASTM C-635 METAL SUSPENSION SYSTEMS FOR ACOUSTICAL TILE AND LAY-IN PANEL CEILINGS. SUSPENSION SYSTEM SHALL BE CLASSIFIED INTERMEDIATE DUTY.

   C. ANY SYSTEM THAT IS NOT HOT DIPPED GALVANIZED WILL NOT BE APPROVED.

   D. PROVIDE ALUMINUM CAPPING SYSTEM FOR GRID SUPPORTING ALL ACT-2 CEILING PANELS.

7. INSTALLATION:

   THE SYSTEM SHALL BE INSTALLED BY EXPERIENCED MECHANICS AS FOLLOWS:

   A. INSTALL SYSTEM ACCORDING TO ASTM C-636 INSTALLATION OF METAL CEILING SUSPENSION SYSTEMS FOR ACOUSTIC LAY-IN PANELS.

   B. SUPPORT SUSPENSION SYSTEM BY 12 GAUGE HANGER WIRES.

   C. PLACE EXTRA HANGERS TO SUPPORT LIGHT FIXTURES OR OTHER EQUIPMENT AS REQUIRED AND IN ACCORDANCE WITH CODE.

   D. ALL MATERIAL SHALL BE INSTALLED ACCORDING TO MANUFACTURER'S RECOMMENDATIONS.

   E. MAIN T-BARS SHALL BE MAXIMUM OF 48" O.C.

8. ADDITIONAL MATERIAL:

   A. PROVIDE AND DELIVER TO THE SCHOOL DISTRICT OF SANTA ROSA COUNTY MAINTENANCE DEPARTMENT WITH ONE (1) PERCENT OF EACH TYPE AND PATTERN OF MATERIAL FOR MAINTENANCE PURPOSES. PROVIDE IN SEALED LABELED BOXES TO FACILITATE IDENTIFICATION. (6544 FIREHOUSE DRIVE, MILTON, FLORIDA)

   B. PROVIDE TO THE ARCHITECT A WRITTEN, SIGNED DELIVERY RECEIPT ALONG WITH PROJECT CLOSE-OUT DOCUMENTS.

END OF SECTION

SECTION 09900 - INTERIOR, EXTERIOR AND INDUSTRIAL PAINTS AND COATINGS

PART 1 GENERAL

1.1 SECTION INCLUDES

A. PAINTING AND SURFACE PREPARATION FOR ALL UNFINISHED INTERIOR AND EXTERIOR SURFACES, INCLUDING ELECTRICAL AND MECHANICAL EQUIPMENT.

B. INTERIOR HIGH-PERFORMANCE PAINT AND COATINGS SYSTEMS INCLUDING SURFACE PREPARATION.

A. EXTERIOR PAINT AND COATINGS SYSTEMS INCLUDING SURFACE PREPARATION.

1.2 RELATED SECTIONS

A. SECTION 03300 - CAST-IN-PLACE CONCRETE.

B. SECTION 04200 - UNIT MASONRY: CONCRETE MASONRY UNITS (CMU)

C. SECTION 06400 - ARCHITECTURAL WOODWORK.

D. SECTION 08110 - HOLLOW METAL DOORS AND FRAMES.

E. SECTION 09250 - GYPSUM BOARD.

F. SECTION 07210 – SPRAY FOAM INSULATION FOR THERMAL AND IGINTION BARRIER COATING- PROVIDE COMPATIBLE PRIMERS. PROVIDE COMPATIBLE TOPCOAT AT EXPOSED LOCATIONS

G. SECTION 07810 – SPRAY-APPLIED AND INTUMESCENT FIRE RESISTIVE MATERIALS (FOR INTUMESCENT COATING)

1.3 REFERENCES

A. STEEL STRUCTURES PAINTING COUNCIL (SSPC):
1. SSPC-SP 1 - SOLVENT CLEANING.
2. SSPC-SP 2 - HAND TOOL CLEANING.
3. SSPC-SP 3 - POWER TOOL CLEANING.
4. SSPC-SP5/NACE NO. 1, WHITE METAL BLAST CLEANING.
5. SSPC-SP6/NACE NO. 3, COMMERCIAL BLAST CLEANING.
6. SSPC-SP7/NACE NO. 4, BRUSH-OFF BLAST CLEANING.
7. SSPC-SP10/NACE NO. 2, NEAR-WHITE BLAST CLEANING.
8. SSPC-SP11, POWER TOOL CLEANING TO BARE METAL.
9. SSPC-SP12/NACE NO. 5, SURFACE PREPARATION AND CLEANING OF METALS BY WATERJETTING PRIOR TO RECOATING.
10. SSPC-SP 13 / NACE NO. 6 SURFACE PREPARATION FOR CONCRETE.

B. MATERIAL SAFETY DATA SHEETS / ENVIRONMENTAL DATA SHEETS: PER MANUFACTURER'S MSDS/EDS FOR SPECIFIC VOCS (CALCULATED PER 40 CFR 59.406). VOCS MAY VARY BY BASE AND SHEEN.

C. SOUTH COAST AIR QUALITY MANAGEMENT DISTRICT (SCAQMD): RULE 1113 - ARCHITECTURAL COATINGS.

1.4 SUBMITTALS

A. SUBMIT UNDER PROVISIONS OF SECTION 01 30 00 - ADMINISTRATIVE REQUIREMENTS.

B. PRODUCT DATA: FOR EACH PAINT SYSTEM INDICATED, INCLUDING.
   1. PRODUCT CHARACTERISTICS.
   2. SURFACE PREPARATION INSTRUCTIONS AND RECOMMENDATIONS.
   3. PRIMER REQUIREMENTS AND FINISH SPECIFICATION.
   4. STORAGE AND HANDLING REQUIREMENTS AND RECOMMENDATIONS.
   5. APPLICATION METHODS.
   6. CAUTIONS FOR STORAGE, HANDLING, AND INSTALLATION.

C. SELECTION SAMPLES: SUBMIT A COMPLETE SET OF COLOR CHIPS THAT REPRESENT THE FULL RANGE OF MANUFACTURER'S PRODUCTS, COLORS AND SHEENS AVAILABLE.

D. VERIFICATION SAMPLES: FOR EACH FINISH PRODUCT SPECIFIED, SUBMIT SAMPLES THAT REPRESENT ACTUAL PRODUCT, COLOR, AND SHEEN.

E. ONLY SUBMIT COMPLYING PRODUCTS BASED ON PROJECT REQUIREMENTS. ONE MUST ALSO COMPLY WITH THE REGULATIONS REGARDING VOCS (CARB, OTC, SCAQMD, LADCO). TO ENSURE COMPLIANCE WITH DISTRICT REGULATIONS AND OTHER RULES, BUSINESSES THAT PERFORM COATING ACTIVITIES SHOULD CONTACT THE LOCAL DISTRICT IN EACH AREA WHERE THE COATING WILL BE USED.

1.5 QUALITY ASSURANCE

A. INSTALLER QUALIFICATIONS: A FIRM OR INDIVIDUAL EXPERIENCED IN APPLYING PAINTS AND COATINGS SIMILAR IN MATERIAL, DESIGN, AND EXTENT TO THOSE INDICATED FOR THIS PROJECT, WHOSE WORK HAS RESULTED IN APPLICATIONS WITH A RECORD OF SUCCESSFUL IN-SERVICE PERFORMANCE.

B. PAINT EXPOSED SURFACES. IF A COLOR OF FINISH, OR A SURFACE IS NOT SPECIFICALLY MENTIONED, ARCHITECT WILL SELECT FROM STANDARD PRODUCTS, COLORS AND SHEENS AVAILABLE.

C. DO NOT PAINT PREFINISHED ITEMS, CONCEALED SURFACES, FINISHED METAL SURFACES, OPERATING PARTS, AND LABELS UNLESS INDICATED.

D. MOCK-UP: PROVIDE A MOCK-UP FOR EVALUATION OF SURFACE PREPARATION TECHNIQUES, PROPER ADHESION TO WATER-REPELLANT TREATED CMU, AND APPLICATION WORKMANSHIP.
   1. FINISH SURFACES FOR VERIFICATION OF PRODUCTS, COLORS AND SHEENS.
   2. FINISH AREA DESIGNATED BY ARCHITECT.
   3. PROVIDE SAMPLES THAT DESIGNATE PRIMER AND FINISH COATS.
   4. DO NOT PROCEED WITH REMAINING WORK UNTIL THE ARCHITECT APPROVES THE MOCK-UP.

1.6 DELIVERY, STORAGE, AND HANDLING

A. DELIVERY: DELIVER MANUFACTURER'S UNOPENED CONTAINERS TO THE WORK SITE. PACKAGING SHALL BEAR THE MANUFACTURER'S NAME, LABEL, AND THE FOLLOWING LIST OF INFORMATION.
   1. PRODUCT NAME, AND TYPE (DESCRIPTION).
   2. APPLICATION AND USE INSTRUCTIONS.
   3. SURFACE PREPARATION.
   4. VOC CONTENT.
   5. ENVIRONMENTAL HANDLING.
   6. BATCH DATE.
   7. COLOR NUMBER.

B. STORAGE: STORE AND DISPOSE OF SOLVENT-BASED MATERIALS, AND MATERIALS USED WITH SOLVENT-BASED MATERIALS, IN ACCORDANCE WITH REQUIREMENTS OF LOCAL AUTHORITIES HAVING JURISDICTION.

C. STORE MATERIALS IN AN AREA THAT IS WITHIN THE ACCEPTABLE TEMPERATURE RANGE, PER MANUFACTURER'S INSTRUCTIONS. PROTECT FROM FREEZING.

D. HANDLING: MAINTAIN A CLEAN, DRY STORAGE AREA, TO PREVENT CONTAMINATION OR DAMAGE TO THE COATINGS.

1.7 PROJECT CONDITIONS

A. MAINTAIN ENVIRONMENTAL CONDITIONS (TEMPERATURE, HUMIDITY, AND VENTILATION) WITHIN LIMITS RECOMMENDED BY MANUFACTURER FOR OPTIMUM RESULTS. DO NOT INSTALL PRODUCTS UNDER ENVIRONMENTAL CONDITIONS OUTSIDE MANUFACTURER'S RECOMMENDED LIMITS.

1.8 EXTRA MATERIALS

A. FURNISH EXTRA PAINT MATERIALS FROM THE SAME PRODUCTION RUN AS THE MATERIALS APPLIED AND, IN THE QUANTITIES, DESCRIBED BELOW. PACKAGE WITH PROTECTIVE COVERING FOR STORAGE AND IDENTIFY WITH LABELS DESCRIBING CONTENTS. DELIVER EXTRA MATERIALS TO OWNER.

B. FURNISH OWNER WITH AN ADDITIONAL ONE PERCENT OF EACH MATERIAL AND COLOR, BUT NOT LESS THAN 1 GAL (3.8 L) OR 1 CASE, AS APPROPRIATE.

PART 2 PRODUCTS

2.1 MANUFACTURERS

A. ACCEPTABLE MANUFACTURER: SHERWIN-WILLIAMS, WHICH IS LOCATED AT: 101 PROSPECT AVE.; CLEVELAND, OH 44115; TOLL FREE TEL: 800-524-5979; TEL: 216-566-2000; FAX: 440-826-1989; EMAIL: REQUEST INFO SPECIFICATIONS@SHERWIN.COM; WEB:WWW.SWSPECS.COM. EXTERIOR COATING FOR STUCCO IS DOWSIL ALLGUARD SILICONE ELASTOMERIC COATING BY DOW CORNING. SIMILAR AND EQUAL PRODUCTS BY TREMCO WILL BE CONSIDERED EQUAL. EXTERIOR COATING FOR EXISTING BRICK MASONRY IS MASTER PROTECT H177 HIGH PERFORMANCE BREATHABLE WATER BASED SILANE/SILOXANE WATER REPELLANT-SEALER BY BASF IS THE BASIS OF DESIGN. SIMILAR AND EQUAL PRODUCTS BY PROSOCO WILL BE CONSIDERED EQUAL.

B. REQUESTS FOR SUBSTITUTIONS WILL BE CONSIDERED IN ACCORDANCE WITH PROVISIONS OF SECTION 01300.

2.2 APPLICATIONS/SCOPE

A. INTERIOR PAINTS AND COATINGS:
1. CONCRETE: POURED, PRECAST, TILT-UP, CAST-IN-PLACE, CEMENT BOARD, PLASTER.
2. METAL: ALUMINUM, STEEL, GALVANIZED STEEL.
3. GYPSUM BOARD AND THINCOAT PLASTER

B. INTERIOR HIGH-PERFORMANCE PAINTS AND COATINGS:
1. CONCRETE: POURED, PRECAST, TILT-UP, CAST-IN-PLACE, CEMENT BOARD.
2. MASONRY: CMU - CONCRETE, SMOOTH, STUCCO.
3. MASONRY: BRICK

4. NON-FERROUS METAL: GALVANIZED STEEL AND ALUMINUM.
5. METAL FERROUS: CEILINGS, STRUCTURAL STEEL, JOISTS, TRUSSES, BEAMS, AND SIMILAR ITEMS INCLUDING DRYFALL COATINGS.
6. WOOD: WALLS, CEILINGS, DOORS, TRIM, CABINET WORK, AND SIMILAR ITEMS.
7. PLASTER WALLS

C. EXTERIOR PAINTS AND COATINGS:
1. CONCRETE: CEMENTITIOUS SIDING, FLEXBOARD, TRANSITE, AND SHINGLES (NON-ROOF).
2. MASONRY: CONCRETE MASONRY UNITS, CINDER OR CONCRETE BLOCK.
3. CONCRETE: CONCRETE FLOORS, PATIOS, PORCHES, STEPS AND PLATFORMS, (NON-VEHICULAR).
4. METAL: ALUMINUM, GALVANIZED STEEL.
5. METAL: MISCELLANEOUS IRON, ORNAMENTAL IRON, FERROUS METAL.
6. ARCHITECTURAL PVC, PLASTIC, FIBERGLASS.
7. VINYL: SIDING, EIFS, SYNTHETIC STUCCO.

2.3 PAINT MATERIALS - GENERAL

A. PAINTS AND COATINGS:
1. UNLESS OTHERWISE INDICATED, PROVIDE FACTORY-MIXED COATINGS. WHEN REQUIRED, MIX COATINGS TO CORRECT CONSISTENCY IN ACCORDANCE WITH MANUFACTURER'S INSTRUCTIONS BEFORE APPLICATION. DO NOT REDUCE, THIN, OR DILUTE COATINGS OR ADD MATERIALS TO COATINGS UNLESS SUCH PROCEDURE IS SPECIFICALLY DESCRIBED IN MANUFACTURER'S PRODUCT INSTRUCTIONS.
2. FOR OPAQUE FINISHES, TINT EACH COAT INCLUDING PRIMER COAT AND INTERMEDIATE COATS, ONE-HALF SHADE LIGHTER THAN SUCCEEDING COAT, WITH FINAL FINISH COAT AS BASE COLOR. OR FOLLOW MANUFACTURES PRODUCT INSTRUCTIONS FOR OPTIMAL COLOR CONFORMANCE.

B. PRIMERS: WHERE THE MANUFACTURER OFFERS OPTIONS ON PRIMERS FOR A PARTICULAR SUBSTRATE, USE PRIMER CATEGORIZED AS "BEST" BY THE MANUFACTURER.

C. COATING APPLICATION ACCESSORIES: PROVIDE ALL PRIMERS, SEALERS, CLEANING AGENTS, CLEANING CLOTHS, SANDING MATERIALS, AND CLEAN-UP MATERIALS REQUIRED, PER MANUFACTURER'S SPECIFICATIONS.

D. COLOR: REFER TO FINISH SCHEDULE FOR PAINT COLORS, AND AS SELECTED.

2.4 INTERIOR PAINT SYSTEMS

A. METAL: ALUMINUM, GALVANIZED.
1. ACRYLIC LATEX SYSTEMS:
SEMI-GLOSS FINISH HIGH PERFORMANCE:
1) 1ST COAT: S-W PRO INDUSTRIAL PRO-CRYL UNIVERSAL PRIMER, B66-1310 SERIES (5.0 MILS WET, 2.0 MILS DRY).
2) 2ND COAT: S-W PRO INDUSTRIAL DTM ACRYLIC SEMI-GLOSS, B66 SERIES.
3) 3RD COAT: S-W PRO INDUSTRIAL DTM ACRYLIC SEMI-GLOSS, B66 SERIES (6-10 MILS WET, 2.5-4.0 MILS DRY PER COAT).

B. METAL - (STRUCTURAL STEEL COLUMNS, JOISTS, TRUSSES, BEAMS, MISCELLANEOUS AND ORNAMENTAL IRON, STRUCTURAL IRON, FERROUS METAL,

1. ALKYD SYSTEMS (WATER BASED):
   SEMI-GLOSS FINISH:
   1) 1ST COAT: S-W PRO INDUSTRIAL PRO-CRYL UNIVERSAL PRIMER, B66-1310 SERIES (5.0 MILS WET, 2.0 MILS DRY).
   2) 2ND COAT: S-W INDUSTRIAL WATER BASED ALKYD URETHANE ENAMEL SEMI-GLOSS, B53-1150 SERIES.
   3) 3RD COAT: S-W INDUSTRIAL WATER BASED ALKYD URETHANE ENAMEL SEMI-GLOSS, B53-1150 SERIES ((4.0-5.0 MILS WET, 1.4 - 1.7 MILS DRY PER COAT).

C. DRYWALL - (WALLS, CEILINGS, GYPSUM BOARD AND SIMILAR ITEMS)
1. HIGH PERFORMANCE LATEX SYSTEMS:
   EGG SHELL / SATIN FINISH:
   1) 1ST COAT: S-W PROMAR 200 ZERO VOC INTERIOR LATEX PRIMER, B28W2600 (4 MILS WET, 1.5 MILS DRY).
   2) 2ND COAT: S-W PROMAR 200 HP ZERO VOC LATEX EG-SHEL, B20-1950 SERIES.
   3) 3RD COAT: S-W PROMAR 200 HP ZERO VOC LATEX EG-SHEL, B20-1950 SERIES (4 MILS WET, 1.7 MILS DRY PER COAT).

D. EXPOSED CEILINGS – (DECKING, CONDUIT, STRUCTURAL STEEL)
1. ACRYLIC DRYFALL SYSTEMS:
   A. FLAT FINISH:
   1) 1ST COAT: S-W PROCRYL UNIVERSAL PRIMER, B66 SERIES. (5 MILS WET, 1.8 MILS DRY).
   2) 2ND COAT: S-W PRO INDUSTRIAL WATERBORNE ACRYLIC DRYFALL, B42-80 SERIES.
   3) 3RD COAT: S-W PRO INDUSTRIAL WATERBORNE ACRYLIC DRYFALL, B42-80 SERIES (6 MILS WET, 2.0 MILS DRY PER COAT).

E. MASONRY – (CMU – CONCRETE, SMOOTH, HIGH DENSITY, LOW DENSITY, FLUTED, STUCCO).
1. ACRYLIC LATEX SYSTEM:
   A. SEMI-GLOSS FINISH:
   1) 1ST COAT: S-W LOXON BLOCK SURFACER, LX1W200 (16.0 MILS WET, 8.8 MILS DRY).
   2) 2ND COAT: S-W PROMAR 200 HP ZERO VOC LATEX EG-SHEL, B20-1950 SERIES.
   3) 3RD COAT: S-W PROMAR 200 HP ZERO VOC LATEX EG-SHEL, B20-1950 SERIES (4 MILS WET, 1.7 MILS DRY PER COAT).

2.5 HIGH PERFORMANCE INTERIOR PAINT SYSTEMS

A. MASONRY - (CMU - CONCRETE, SMOOTH, HIGH DENSITY, LOW DENSITY, FLUTED, STUCCO).
1. EPOXY SYSTEM (WATER BASED):
   SEMI-GLOSS/HIGH LUSTER FINISH:
   1) 1ST COAT: S-W LOXON BLOCK SURFACER, LX1W200 (16.0 MILS WET, 8.8 MILS DRY).
   2) 2ND COAT: S-W PRO INDUSTRIAL PRE-CATALYZED WATERBASED EPOXY SEMI-GLOSS, K46- SERIES.
   3) 3RD COAT: S-W PRO INDUSTRIAL PRE-CATALYZED WATERBASED EPOXY SEMI-GLOSS, K46- SERIES (4 MILS WET, 1.5 MILS DRY PER COAT).

B. MASONRY – (CEMENT BOARD SIDING): MECHANICAL ROOMS
1. PRE-CATALYZED EPOXY SYSTEM (WATER BASED):
1ST COAT: S-W LOXON MASONRY PRIMER, LX2 SERIES (5.3 MILS WET, 2.1 MILS DRY)
2ND COAT; S-W PRO INDUSTRIAL PRE-CATALYZED WATERBASED EPOXY SEMI-GLOSS, K46 SERIES.
3RD COAT: S-W PRO INDUSTRIAL PRE-CATALYZED WATERBASED EPOXY SEMI-GLOSS, K46 SERIES (4MILS WET, 1.5 MILS DRY PER COAT).

C. CONCRETE FLOORS – MECHANICAL ROOMS
1. EPOXY SYSTEM (WATER BASED):
SATIN FINISH:
1) 1ST COAT: S-W ARMORSEAL 8100 WATERBASED EPOXY FLOOR COATING, B70-8160 SERIES (REDUCED 1 PINT PER GALLON WITH WATER).
2) 2ND COAT: S-W ARMORSEAL 8100 WATERBASED EPOXY FLOOR COATING, B70-8160 SERIES (5.0 MILS WET, 2.0 MILS DRY).

D. DRYWALL & THINCOAT PLASTER
1. PRE-CATALYZED EPOXY SYSTEM (WATER BASED)
SEMI-GLOSS FINISH
1) 1ST COAT: S-W PRO MAR 200 ZERO VOC DRYWALL PRIMER, B28W2600 (4.0 MILS WET, 1.5 MILS DRY)
2) 2ND COAT: S-W PRO INDUSTRIAL PRE-CATALYZED WATERBASED EPOXY SEMI-GLOSS, K46 SERIES.
3) 3RD COAT: S-W PRO INDUSTRIAL PRE-CATALYZED WATERBASED EPOXY SEMI-GLOSS, K46 SERIES (4.0 MILS WET, 1.5 MILS DRY PER COAT).

2.6 EXTERIOR PAINT SYSTEMS

A. CONCRETE (CEMENTITIOUS SIDING, FLEXBOARD, TRANSITE BOARD, SHINGLES (NON-ROOF), COMMON BRICK, STUCCO, TILT-UP, PRECAST, AND POURED-IN-PLACE CEMENT).
1. LATEX SYSTEMS:
FLAT FINISH:
1) 1ST COAT: S-W LOXON CONCRETE & MASONRY PRIMER SEALER, A24W8300 (5.3-8.0 MILS WET, 2.1-3.2 MILS DRY).
2) 2ND COAT: S-W LOXON SELF CLEANING ACRYLIC, LX13 SERIES
3) 3RD COAT: S=W LOXON SELF CLEANING ACRYLIC, LX13 SERIES, (7.0 MILS WET, 2.9 MILS DRY PER COAT)

B. MASONRY: CONCRETE MASONRY UNITS (CMU)- CINDER OR CONCRETE BLOCK.
1. SELF CLEANING ELASTOMERIC WATERPROOFING SYSTEM:
FLAT FINISH:
1) 1ST COAT: S-W LOXON XP WATERPROOFING SYSTEM, LX11 SERIES (14.0-18.0 MILS WET; 6.4-8.3 MILS DRY).
2) 2ND COAT: S-W LOXON SELF CLEANING ACRYLIC, LX13 SERIES
3) 3RD COAT: S=W LOXON SELF CLEANING ACRYLIC, LX13 SERIES, (7.0 MILS WET, 2.9 MILS DRYPER COAT)

C. METAL: ALUMINUM, GALVANIZED.
1. ACRYLIC LATEX SYSTEMS:
SEMI-GLOSS FINISH:
1) 1ST COAT: S-W PRO INDUSTRIAL PRO-CRYL UNIVERSAL PRIMER, B66-1310 SERIES (5.0 MILS WET, 2.0 MILS DRY).

2) 2ND COAT: S-W PRO INDUSTRIAL DTM ACRYLIC SEMI-GLOSS, B66 SERIES.
3) 3RD COAT: S-W PRO INDUSTRIAL DTM ACRYLIC SEMI-GLOSS, B66 SERIES (6-10 MILS WET, 2.5-4.0 MILS DRY PER COAT).

D. METAL: MISC. IRON, ORNAMENTAL IRON, STRUCTURAL IRON AND STEEL, FERROUS METAL.
1. LATEX SYSTEMS:
SEMI-GLOSS FINISH:
1) 1ST COAT: S-W PRO INDUSTRIAL PRO-CRYL UNIVERSAL PRIMER, B66-1310 SERIES (5.0 MILS WET, 2.0 MILS DRY).
2) 2ND COAT: S-W INDUSTRIAL WATER BASED ALKYD URETHANE ENAMEL SEMI-GLOSS, B53-1150 SERIES.
3) 3RD COAT: S-W INDUSTRIAL WATER BASED ALKYD URETHANE ENAMEL SEMI-GLOSS, B53-1150 SERIES ((4.0-5.0 MILS WET, 1.4 - 1.7 MILS DRY PER COAT).

E. EXTERIOR STUCCO
1. SILICONE ELASTOMERIC COATING

PART 3 EXECUTION

3.1 EXAMINATION

A. DO NOT BEGIN INSTALLATION UNTIL SUBSTRATES HAVE BEEN PROPERLY PREPARED; NOTIFY ARCHITECT OF UNSATISFACTORY CONDITIONS BEFORE PROCEEDING. IF SUBSTRATE PREPARATION IS THE RESPONSIBILITY OF ANOTHER INSTALLER, NOTIFY ARCHITECT OF UNSATISFACTORY PREPARATION BEFORE PROCEEDING.

B. PROCEED WITH WORK ONLY AFTER CONDITIONS HAVE BEEN CORRECTED AND APPROVED BY ALL PARTIES, OTHERWISE APPLICATION OF COATINGS WILL BE CONSIDERED AS AN ACCEPTANCE OF SURFACE CONDITIONS.

C. PREVIOUSLY PAINTED SURFACES: VERIFY THAT EXISTING PAINTED SURFACES DO NOT CONTAIN LEAD BASED PAINTS, NOTIFY ARCHITECT IMMEDIATELY IF LEAD BASED PAINTS ARE ENCOUNTERED.

D. PAINT BOTTOMS OF ALL EXTERIOR DOORS WITH ONE COAT OF ROVAL R COLD GALVANIZING SPRAY PAINT PRIOR TO HANGING DOORS.

E. CAULK TOPS OF ALL EXTERIOR DOORS AND UNWELDED EXTERIOR JOINTS OF EXTERIOR FRAMES WITH DOW 795 SILICONE CAULK PRIOR TO FINISH PAINTING

3.2 SURFACE PREPARATION

A. GENERAL: SURFACES SHALL BE DRY AND IN SOUND CONDITION. REMOVE OIL, DUST, DIRT, LOOSE RUST, PEELING PAINT OR OTHER CONTAMINATION TO ENSURE GOOD ADHESION.
1. PRIOR TO ATTEMPTING TO REMOVE MILDEW, IT IS RECOMMENDED TO TEST ANY CLEANER ON A SMALL, INCONSPICUOUS AREA PRIOR TO USE. BLEACH AND BLEACHING TYPE CLEANERS MAY DAMAGE OR DISCOLOR EXISTING PAINT FILMS. BLEACH ALTERNATIVE CLEANING SOLUTIONS ARE ADVISED.
2. REMOVE MILDEW BEFORE PAINTING BY WASHING WITH A SOLUTION OF 1 PART LIQUID HOUSEHOLD BLEACH AND 3 PARTS OF WARM WATER. APPLY THE

SOLUTION AND SCRUB THE MILDEWED AREA. ALLOW THE SOLUTION TO REMAIN ON THE SURFACE FOR 10 MINUTES. RINSE THOROUGHLY WITH CLEAN WATER AND ALLOW THE SURFACE TO DRY BEFORE PAINTING. WEAR PROTECTIVE GLASSES OR GOGGLES, WATERPROOF GLOVES, AND PROTECTIVE CLOTHING. QUICKLY WASH OFF ANY OF THE MIXTURE THAT COMES IN CONTACT WITH YOUR SKIN. DO NOT ADD DETERGENTS OR AMMONIA TO THE BLEACH/WATER SOLUTION.

3. REMOVE ITEMS INCLUDING BUT NOT LIMITED TO THERMOSTATS, ELECTRICAL OUTLETS, SWITCH COVERS AND SIMILAR ITEMS PRIOR TO PAINTING. AFTER COMPLETING PAINTING OPERATIONS IN EACH SPACE OR AREA, REINSTALL ITEMS REMOVED USING WORKERS SKILLED IN THE TRADES INVOLVED.
4. NO EXTERIOR PAINTING SHOULD BE DONE IMMEDIATELY AFTER A RAIN, DURING FOGGY WEATHER, WHEN RAIN IS PREDICTED, OR WHEN THE TEMPERATURE IS BELOW 50 DEGREES F (10 DEGREES C), UNLESS PRODUCTS ARE DESIGNED SPECIFICALLY FOR THESE CONDITIONS. ON LARGE EXPANSES OF METAL SIDING, THE AIR, SURFACE, AND MATERIAL TEMPERATURES MUST BE 50 DEGREES F (10 DEGREES F) OR HIGHER TO USE LOW TEMPERATURE PRODUCTS.

B. ALUMINUM: REMOVE ALL OIL, GREASE, DIRT, OXIDE AND OTHER FOREIGN MATERIAL BY CLEANING PER SSPC-SP1, SOLVENT CLEANING.

C. BLOCK (CINDER AND CONCRETE): REMOVE ALL LOOSE MORTAR AND FOREIGN MATERIAL. SURFACE MUST BE FREE OF LAITANCE, CONCRETE DUST, DIRT, FORM RELEASE AGENTS, MOISTURE CURING MEMBRANES, LOOSE CEMENT, AND HARDENERS. CONCRETE AND MORTAR MUST BE CURED AT LEAST 30 DAYS AT 75 DEGREES F (24 DEGREES C). THE PH OF THE SURFACE SHOULD BE BETWEEN 6 AND 9, UNLESS THE PRODUCTS ARE DESIGNED TO BE USED IN HIGH PH ENVIRONMENTS. ON TILT-UP AND POURED-IN-PLACE CONCRETE, COMMERCIAL DETERGENTS AND ABRASIVE BLASTING MAY BE NECESSARY TO PREPARE THE SURFACE. FILL BUG HOLES, AIR POCKETS, AND OTHER VOIDS WITH A CEMENT PATCHING COMPOUND.

D. CONCRETE, SSPC-SP13 OR NACE 6: THIS STANDARD GIVES REQUIREMENTS FOR SURFACE PREPARATION OF CONCRETE BY MECHANICAL, CHEMICAL, OR THERMAL METHODS PRIOR TO THE APPLICATION OF BONDED PROTECTIVE COATING OR LINING SYSTEMS. THE REQUIREMENTS OF THIS STANDARD ARE APPLICABLE TO ALL TYPES OF CEMENTITIOUS SURFACES INCLUDING CAST-IN-PLACE CONCRETE FLOORS AND WALLS, PRECAST SLABS, MASONRY WALLS, AND SHOTCRETE SURFACES. AN ACCEPTABLE PREPARED CONCRETE SURFACE SHOULD BE FREE OF CONTAMINANTS, LAITANCE, LOOSELY ADHERING CONCRETE, AND DUST, AND SHOULD PROVIDE A SOUND, UNIFORM SUBSTRATE SUITABLE FOR THE APPLICATION OF PROTECTIVE COATING OR LINING SYSTEMS.

E. CEMENT COMPOSITION SIDING/PANELS: REMOVE ALL SURFACE CONTAMINATION BY WASHING WITH AN APPROPRIATE CLEANER, RINSE THOROUGHLY AND ALLOW TO DRY. EXISTING PEELED OR CHECKED PAINT SHOULD BE SCRAPED AND SANDED TO A SOUND SURFACE. PRESSURE CLEAN, IF NEEDED, WITH A MINIMUM OF 2100 PSI PRESSURE TO REMOVE ALL DIRT, DUST, GREASE, OIL, LOOSE PARTICLES, LAITANCE, FOREIGN MATERIAL, AND PEELING OR DEFECTIVE COATINGS. ALLOW THE SURFACE TO DRY THOROUGHLY. THE PH OF THE SURFACE SHOULD BE BETWEEN 6 AND 9, UNLESS THE PRODUCTS ARE DESIGNED TO BE USED IN HIGH PH ENVIRONMENTS.

F. COPPER AND STAINLESS STEEL: REMOVE ALL OIL, GREASE, DIRT, OXIDE AND OTHER FOREIGN MATERIAL BY CLEANING PER SSPC-SP 2, HAND TOOL CLEANING.

G. EXTERIOR COMPOSITION BOARD (HARDBOARD): SOME COMPOSITION BOARDS MAY

EXUDE A WAXY MATERIAL THAT MUST BE REMOVED WITH A SOLVENT PRIOR TO COATING. WHETHER FACTORY PRIMED OR UNPRIMED, EXTERIOR COMPOSITION BOARD SIDING (HARDBOARD) MUST BE CLEANED THOROUGHLY AND PRIMED WITH AN ALKYD PRIMER.

H. DRYWALL - EXTERIOR: MUST BE CLEAN AND DRY. ALL NAIL HEADS MUST BE SET AND SPACKLED. JOINTS MUST BE TAPED AND COVERED WITH A JOINT COMPOUND. SPACKLED NAIL HEADS AND TAPE JOINTS MUST BE SANDED SMOOTH AND ALL DUST REMOVED PRIOR TO PAINTING. EXTERIOR SURFACES MUST BE SPACKLED WITH EXTERIOR GRADE COMPOUNDS.

I. DRYWALL - INTERIOR: MUST BE CLEAN AND DRY. ALL NAIL HEADS MUST BE SET AND SPACKLED. JOINTS MUST BE TAPED AND COVERED WITH A JOINT COMPOUND. SPACKLED NAIL HEADS AND TAPE JOINTS MUST BE SANDED SMOOTH AND ALL DUST REMOVED PRIOR TO PAINTING.

J. GALVANIZED METAL: CLEAN PER SSPC-SP1 USING DETERGENT AND WATER OR A DEGREASING CLEANER TO REMOVE GREASES AND OILS. APPLY A TEST AREA, PRIMING AS REQUIRED. ALLOW THE COATING TO DRY AT LEAST ONE WEEK BEFORE TESTING. IF ADHESION IS POOR, BRUSH BLAST PER SSPC-SP16 IS NECESSARY TO REMOVE THESE TREATMENTS.

K. PLASTER: MUST BE ALLOWED TO DRY THOROUGHLY FOR AT LEAST 30 DAYS BEFORE PAINTING, UNLESS THE PRODUCTS ARE DESIGNED TO BE USED IN HIGH PH ENVIRONMENTS. ROOM MUST BE VENTILATED WHILE DRYING; IN COLD, DAMP WEATHER, ROOMS MUST BE HEATED. DAMAGED AREAS MUST BE REPAIRED WITH AN APPROPRIATE PATCHING MATERIAL. BARE PLASTER MUST BE CURED AND HARD. TEXTURED, SOFT, POROUS, OR POWDERY PLASTER SHOULD BE TREATED WITH A SOLUTION OF 1 PINT HOUSEHOLD VINEGAR TO 1 GALLON OF WATER. REPEAT UNTIL THE SURFACE IS HARD, RINSE WITH CLEAR WATER AND ALLOW TO DRY.

L. STEEL: STRUCTURAL, PLATE, AND SIMILAR ITEMS: SHOULD BE CLEANED BY ONE OR MORE OF THE SURFACE PREPARATIONS DESCRIBED BELOW. THESE METHODS ARE USED THROUGHOUT THE WORLD FOR DESCRIBING METHODS FOR CLEANING STRUCTURAL STEEL. VISUAL STANDARDS ARE AVAILABLE THROUGH THE SOCIETY OF PROTECTIVE COATINGS. A BRIEF DESCRIPTION OF THESE STANDARDS TOGETHER WITH NUMBERS BY WHICH THEY CAN BE SPECIFIED FOLLOW.
   1. SOLVENT CLEANING, SSPC-SP1: SOLVENT CLEANING IS A METHOD FOR REMOVING ALL VISIBLE OIL, GREASE, SOIL, DRAWING AND CUTTING COMPOUNDS, AND OTHER SOLUBLE CONTAMINANTS. SOLVENT CLEANING DOES NOT REMOVE RUST OR MILL SCALE. CHANGE RAGS AND CLEANING SOLUTION FREQUENTLY SO THAT DEPOSITS OF OIL AND GREASE ARE NOT SPREAD OVER ADDITIONAL AREAS IN THE CLEANING PROCESS. BE SURE TO ALLOW ADEQUATE VENTILATION.
   2. HAND TOOL CLEANING, SSPC-SP2: HAND TOOL CLEANING REMOVES ALL LOOSE MILL SCALE, LOOSE RUST, AND OTHER DETRIMENTAL FOREIGN MATTER. IT IS NOT INTENDED THAT ADHERENT MILL SCALE, RUST, AND PAINT BE REMOVED BY THIS PROCESS. BEFORE HAND TOOL CLEANING, REMOVE VISIBLE OIL, GREASE, SOLUBLE WELDING RESIDUES, AND SALTS BY THE METHODS OUTLINED IN SSPC-SP1.
   3. POWER TOOL CLEANING, SSPC-SP3: POWER TOOL CLEANING REMOVES ALL LOOSE MILL SCALE, LOOSE RUST, AND OTHER DETRIMENTAL FOREIGN MATTER. IT IS NOT INTENDED THAT ADHERENT MILL SCALE, RUST, AND PAINT BE REMOVED BY THIS PROCESS. BEFORE POWER TOOL CLEANING, REMOVE VISIBLE OIL, GREASE, SOLUBLE WELDING RESIDUES, AND SALTS BY THE METHODS OUTLINED IN SSPC-SP1.

4. WHITE METAL BLAST CLEANING, SSPC-SP5 OR NACE 1: A WHITE METAL BLAST CLEANED SURFACE, WHEN VIEWED WITHOUT MAGNIFICATION, SHALL BE FREE OF ALL VISIBLE OIL, GREASE, DIRT, DUST, MILL SCALE, RUST, PAINT, OXIDES, CORROSION PRODUCTS, AND OTHER FOREIGN MATTER. BEFORE BLAST CLEANING, VISIBLE DEPOSITS OF OIL OR GREASE SHALL BE REMOVED BY ANY OF THE METHODS SPECIFIED IN SSPC-SP1 OR OTHER AGREED UPON METHODS.
5. COMMERCIAL BLAST CLEANING, SSPC-SP6 OR NACE 3: A COMMERCIAL BLAST CLEANED SURFACE, WHEN VIEWED WITHOUT MAGNIFICATION, SHALL BE FREE OF ALL VISIBLE OIL, GREASE, DIRT, DUST, MILL SCALE, RUST, PAINT, OXIDES, CORROSION PRODUCTS, AND OTHER FOREIGN MATTER, EXCEPT FOR STAINING. STAINING SHALL BE LIMITED TO NO MORE THAN 33 PERCENT OF EACH SQUARE INCH OF SURFACE AREA AND MAY CONSIST OF LIGHT SHADOWS, SLIGHT STREAKS, OR MINOR DISCOLORATION CAUSED BY STAINS OF RUST, STAINS OF MILL SCALE, OR STAINS OF PREVIOUSLY APPLIED PAINT. BEFORE BLAST CLEANING, VISIBLE DEPOSITS OF OIL OR GREASE SHALL BE REMOVED BY ANY OF THE METHODS SPECIFIED IN SSPC-SP1 OR OTHER AGREED UPON METHODS.
6. BRUSH-OFF BLAST CLEANING, SSPC-SP7 OR NACE 4: A BRUSH-OFF BLAST CLEANED SURFACE, WHEN VIEWED WITHOUT MAGNIFICATION, SHALL BE FREE OF ALL VISIBLE OIL, GREASE, DIRT, DUST, LOOSE MILL SCALE, LOOSE RUST, AND LOOSE PAINT. TIGHTLY ADHERENT MILL SCALE, RUST, AND PAINT MAY REMAIN ON THE SURFACE. BEFORE BLAST CLEANING, VISIBLE DEPOSITS OF OIL OR GREASE SHALL BE REMOVED BY ANY OF THE METHODS SPECIFIED IN SSPC-SP 1 OR OTHER AGREED UPON METHODS.
7. POWER TOOL CLEANING TO BARE METAL, SSPC-SP11: METALLIC SURFACES THAT ARE PREPARED ACCORDING TO THIS SPECIFICATION, WHEN VIEWED WITHOUT MAGNIFICATION, SHALL BE FREE OF ALL VISIBLE OIL, GREASE, DIRT, DUST, MILL SCALE, RUST, PAINT, OXIDE CORROSION PRODUCTS, AND OTHER FOREIGN MATTER. SLIGHT RESIDUES OF RUST AND PAINT MAY BE LEFT IN THE LOWER PORTIONS OF PITS IF THE ORIGINAL SURFACE IS PITTED. PRIOR TO POWER TOOL SURFACE PREPARATION, REMOVE VISIBLE DEPOSITS OF OIL OR GREASE BY ANY OF THE METHODS SPECIFIED IN SSPC-SP1, SOLVENT CLEANING, OR OTHER AGREED UPON METHODS.
8. NEAR-WHITE BLAST CLEANING, SSPC-SP10 OR NACE 2: A NEAR WHITE BLAST CLEANED SURFACE, WHEN VIEWED WITHOUT MAGNIFICATION, SHALL BE FREE OF ALL VISIBLE OIL, GREASE, DIRT, DUST, MILL SCALE, RUST, PAINT, OXIDES, CORROSION PRODUCTS, AND OTHER FOREIGN MATTER, EXCEPT FOR STAINING. STAINING SHALL BE LIMITED TO NO MORE THAN 5 PERCENT OF EACH SQUARE INCH OF SURFACE AREA AND MAY CONSIST OF LIGHT SHADOWS, SLIGHT STREAKS, OR MINOR DISCOLORATION CAUSED BY STAINS OF RUST, STAINS OF MILL SCALE, OR STAINS OF PREVIOUSLY APPLIED PAINT. BEFORE BLAST CLEANING, VISIBLE DEPOSITS OF OIL OR GREASE SHALL BE REMOVED BY ANY OF THE METHODS SPECIFIED IN SSPC-SP1 OR OTHER AGREED UPON METHODS.
9. HIGH- AND ULTRA-HIGH-PRESSURE WATER JETTING FOR STEEL AND OTHER HARD MATERIALS: SSPC-SP12 OR NACE 5: THIS STANDARD PROVIDES REQUIREMENTS FOR THE USE OF HIGH- AND ULTRA-HIGH-PRESSURE WATER JETTING TO ACHIEVE VARIOUS DEGREES OF SURFACE CLEANLINESS. THIS STANDARD IS LIMITED IN SCOPE TO THE USE OF WATER ONLY WITHOUT THE ADDITION OF SOLID PARTICLES IN THE STREAM.
10. WATER BLASTING, SSPC-SP12/NACE NO. 5: REMOVAL OF OIL GREASE DIRT, LOOSE RUST, LOOSE MILL SCALE, AND LOOSE PAINT BY WATER AT PRESSURES OF 2,000 TO 2,500 PSI AT A FLOW OF 4 TO 14 GALLONS PER MINUTE.

M. WOOD: MUST BE CLEAN AND DRY. PRIME AND PAINT AS SOON AS POSSIBLE. KNOTS AND PITCH STREAKS MUST BE SCRAPED, SANDED, AND SPOT PRIMED BEFORE A FULL PRIMING COAT IS APPLIED. PATCH ALL NAIL HOLES AND IMPERFECTIONS WITH A WOOD FILLER OR PUTTY AND SAND SMOOTH.

N. EXTERIOR STUCCO: ALL SURFACES MUST BE CLEAN AND FREE OF DIRT, FROST, DUST, OIL, GREASE, MOLD, FUNGUS, EFFLORESCENCE, LAITANCE, PEELING COATING, CHALKING COATING, AND ANY OTHER FOREIGN MATERIAL. GREEN CONCRETE MUST BE ALLOWED TO CURE 28 DAYS BEFORE APPLICATION OF DOWSIL™ ALLGUARD SILICONE ELASTOMERIC COATING (SEE “LIMITATIONS”). PRESSURE CLEAN, WIRE BRUSH, OR GRIND THE WALL SURFACE TO REMOVE ALL OF THE ABOVE MATERIALS. REPAIR ANY DAMAGED STUCCO. REPAIR CRACKS LARGER THAN 1/16" (1.6 MM) WITH A MATERIAL THAT IS COMPATIBLE WITH THE SUBSTRATE AND DOWSIL™ ALLGUARD SILICONE ELASTOMERIC COATING. DOWSIL™ 790 SILICONE BUILDING SEALANT OR DOWSIL™ 795 SILICONE BUILDING SEALANT OR DOWSIL™ 791 SILICONE WEATHERPOOFING SEALANT CAN BE USED FOR CRACK REPAIRS.

O. BRICK MASONRY WATERPROOFING: SURFACES SHALL BE CLEAN, DRY, STRUCTURALLY SOUND, AND FREE OF ALKALI AND EFFLORESCENCE. REMOVE DUST, DIRT, OIL, GREASE, CHEMICAL FILMS, AND OTHER CONTAMINANTS.

3.3 INSTALLATION

A. APPLY ALL COATINGS AND MATERIALS WITH THE MANUFACTURER'S SPECIFICATIONS IN MIND. MIX AND THIN COATINGS ACCORDING TO MANUFACTURER'S RECOMMENDATIONS.

B. DO NOT APPLY TO WET OR DAMP SURFACES. WAIT AT LEAST 30 DAYS BEFORE APPLYING TO NEW CONCRETE OR MASONRY. OR FOLLOW MANUFACTURER'S PROCEDURES TO APPLY APPROPRIATE COATINGS PRIOR TO 30 DAYS. TEST NEW CONCRETE FOR MOISTURE CONTENT. WAIT UNTIL WOOD IS FULLY DRY AFTER RAIN OR MORNING FOG OR DEW.

C. APPLY COATINGS USING METHODS RECOMMENDED BY MANUFACTURER.

D. UNIFORMLY APPLY COATINGS WITHOUT RUNS, DRIPS, OR SAGS, WITHOUT BRUSH MARKS, AND WITH CONSISTENT SHEEN.

E. APPLY COATINGS AT SPREADING RATE REQUIRED TO ACHIEVE THE MANUFACTURERS RECOMMENDED DRY FILM THICKNESS.

F. REGARDLESS OF NUMBER OF COATS SPECIFIED, APPLY AS MANY COATS AS NECESSARY FOR COMPLETE HIDE, AND UNIFORM APPEARANCE.

G. INSPECTION: THE COATED SURFACE MUST BE INSPECTED AND APPROVED BY THE MANUFACTURERS REPRESENTATIVE JUST PRIOR TO THE APPLICATION OF EACH COAT.

H. EXTERIOR STUCCO: ONE COAT OF PRIMER IS REQUIRED. 1. APPLY AT A RATE OF 300 FT2 /GALLON (7.4 M2 /L) USING A 1 /2 TO 3 /4" (13- TO 19-MM) SYNTHETIC NAP ROLLER, NYLON BRISTLE BRUSH, OR AIRLESS SPRAYER. 2. APPLY PRIMER TO THE POINT OF RUNDOWN. 3. DRY 30 MINUTES TO 2 HOURS. ACTUAL DRYING TIME WILL DEPEND ON TEMPERATURE, HUMIDITY, AND WIND CONDITIONS. ALLOW AN ADDITIONAL 30 MINUTES TO DRY AFTER DRY TO THE TOUCH. 4. APPLY COATING OVER PRIMER AT LEAST 30 MINUTES AFTER PRIMER IS DRY TO THE TOUCH, BUT WITHIN 24 HOURS.

A MINIMUM OF TWO THICK (10- TO 12-MIL) COATS OF DOW CORNING ALLGUARD

SILICONE ELASTOMERIC COATING ARE NECESSARY TO ACHIEVE THE REQUIRED 10-MIL (0.25-MM) MINIMUM DRY FILM THICKNESS TO ATTAIN PROTECTION AGAINST THROUGH-WATER PENETRATION AND TO QUALIFY FOR A PROJECT-SPECIFIC WARRANTY. APPLY THE COATING IN A MINIMUM 10- TO 12-MIL (0.25- MM) WET THICKNESS (SEE TABLE II FOR ESTIMATED APPLICATION RATES; A JOB-SPECIFIC MOCKUP IS RECOMMENDED TO DETERMINE ACTUAL USAGE). TYPICALLY, TWO 10- TO 12-MIL (0.25-MM) WET COATS WILL RESULT IN THE REQUIRED 10-MIL (0.25-MM) DRY COATING THICKNESS; HOWEVER, AN ADDITIONAL COAT MAY BE REQUIRED DUE TO SURFACE TEXTURE OR POROSITY. APPLY USING A 3 /4 TO 11 /2" (19- TO 38-MM) NAP, POLYESTER, OR 50/50 POLYESTER/WOOL BLEND ROLLER COVER, NYLON BRISTLE BRUSH, OR AIRLESS SPRAYER. WHEN APPLYING THE COATING WITH A ROLLER, APPLY IT IN A FAN PATTERN TO achieve UNIFORM THICKNESS. ALWAYS FINISH ROLLER APPLICATIONS IN THE SAME DIRECTION TO REDUCE VISUAL SURFACE TEXTURE DIFFERENCES. ALLOW THE COATING TO DRY (TYPICALLY 2 TO 4 HOURS) BEFORE APPLYING THE NEXT COAT. NOTE: DO NOT THIN OR CUT BACK DOW CORNING ALLGUARD SILICONE ELASTOMERIC COATING.

I. BRICK MASONRY SEALER: APPLY SEALER IN ACCORDANCE WITH MANUFACTURER'S INSTRUCTIONS. MIX MATERIAL THOROUGHLY BEFORE AND DURING APPLICATION. DO NOT DILUTE. APPLY A MIST COAT OF SEALER IMMEDIATELY BEFORE APPLICATION TO HELP BREAK SURFACE TENSION, ENSURING MAXIMUM PENETRATION OF SEALER. FLOOD SURFACES TO SATURATION BY APPLYING FROM THE BOTTOM UP WITH CONTROLLED 8 TO 10-INCH (20-CM) MATERIAL RUNDOWN TO ENSURE MAXIMUM PENETRATION INTO SUBSTRATE.

3.4 PROTECTION

A. PROTECT FINISHED COATINGS FROM DAMAGE UNTIL COMPLETION OF PROJECT.

B. TOUCH-UP DAMAGED COATINGS AFTER SUBSTANTIAL COMPLETION, FOLLOWING MANUFACTURER'S RECOMMENDATION FOR TOUCH UP OR REPAIR OF DAMAGED COATINGS. REPAIR ANY DEFECTS THAT WILL HINDER THE PERFORMANCE OF THE COATINGS.

END OF SECTION

SECTION 11120 – ELECTRIC KILN AND KILN HOOD

1. GENERAL:

   A. THE CONTRACTOR SHALL FURNISH ALL LABOR, MATERIALS, TOOLS, EQUIPMENT, AND PERFORM ALL WORK AND SERVICES NECESSARY FOR INSTALLATION COMPLETE, OF THE ELECTRIC KILN, AS SHOWN ON DRAWINGS AND OR SPECIFIED, IN ACCORDANCE WITH PROVISIONS OF THE CONTRACT DOCUMENTS, AND COMPLETELY COORDINATED WITH WORK OF ALL OTHER TRADES.

   B. ALTHOUGH SUCH WORK IS NOT SPECIFICALLY INDICATED, FURNISH, AND INSTALLALL SUPPLEMENTARY OR MISCELLANEOUS ITEMS, APPURTENANCES AND DEVICES INCIDENTAL TO OR NECESSARY FOR A SOUND, SECURE AND COMPLETE INSTALLATION.

2. SCOPE OF WORK:

   A. THE FOLLOWING EQUIPMENT WILL BE FURNISHED AND INSTALLED BY THE CONTRACTOR. (1 OF EACH)

      (1) KILN

      (2) ENVIROVENT

      (3) KILN FURNITURE KIT

      (4) KILN HOOD SYSTEM

      (5) SWINGING WALL BRACKET KIT.

   B. THE HVAC AND ELECTRICAL CONTRACTOR WILL ROUGH-IN ALL SERVICES REQUIRED, SET THE EQUIPMENT IN PLACE AND MAKE ALL CONNECTIONS TO SAME, INCLUDING SHEET METAL VENTING SYSTEM AND ELECTRICAL HOOKUP. ALL CONNECTIONS SHALL BE IN ACCORDANCE WITH MANUFACTURERS RECOMMENDATIONS.

      EQUIPMENT SHALL BE LEFT FULLY CONNECTED AND READY FOR USE BY THE OWNER.

   C. MANUFACTURERS:

      1. SKUTT CHRAMIC PRODUCTS, INC.
         6441 S.E. JOHNSON CREEK BLVD.,PORTLANT, OR 97205
         (503) 774-6000

      2. VENT-A-KILN
         621 HARTEL AVE., BUFFALO, NY 14207
         (716) 876-2023

D. MATERIALS:

1. KILN - SKUTT MODEL KM-1027-3. SKUTT PART # 1461, 3 PHASE, 208 VOLT

2. KILN FURNITURE KIT - SKUTT PART # 1600. KIT SHALL CONSIST OF 8 - 5/8" HALF SHELVES AND A TRI-POST ASSORTMENT OF 6 EACH 1" THRU 6" LONG POSTS.

3. KILN HOOD SYSTEM - VENT-A-KILN MODEL #1437/500, 37", 1 PHASE, 110 VOLT, 500 CFM, 6” DIAMETER VENT HOSE

4. SWINGING WALL BRACKET KIT – VENT-A-KILN MODEL # 11-47.

END OF SECTION

SECTION 12491 – HORIZONTAL LOUVER BLINDS

PART 1 - GENERAL

1.01 SUMMARY

A. PROVIDE WINDOW COVERINGS AT ALL INTERIOR AND EXTERIOR GLAZING WITH THE EXCEPTION OF DOOR LIGHTS.

B. ALL WINDOW OPENINGS GREATER THAN 6”-0” WIDE SHALL BE PROVIDED WITH TWO (2) BLINDS OF EQUAL WIDTH UNLESS SPECIFICALLY NOTED OTHERWISE.

C. BLINDS FOR HOLLOW METAL VIEW WINDOWS SHALL BE BETWEEN JAMB MOUNTED AND FILL EACH INDIVIDUAL GLAZED OPENING.

1.02 SUBMITTALS

A. SUBMIT FOR APPROVAL SAMPLES, SHOP DRAWINGS, COLOR SELECTIONS AND PRODUCT DATA.

1.03 QUALITY ASSURANCE

A. COMPLY WITH GOVERNING CODES AND REGULATIONS. PROVIDE PRODUCTS OF ACCEPTABLE MANUFACTURERS WHICH HAVE BEEN IN SATISFACTORY USE IN SIMILAR SERVICE FOR THREE YEARS. USE EXPERIENCED INSTALLERS. DELIVER, HANDLE, AND STORE MATERIALS IN ACCORDANCE WITH MANUFACTURER'S INSTRUCTIONS.

PART 2 - PRODUCTS

2.01 MATERIALS

A. HORIZONTAL BLINDS, RAISING AND TILTING, WAND AND CORD OPERATION; RIVIERA LIGHTMASTER DUSTGUARD AS MANUFACTURED BY LEVELOR LORENTZEN, BALI MEETING THESE SPECIFICATIONS OR APPROVED EQUAL:
1. SLAT WIDTH: 1".
2. SLAT THICKNESS: .0085” NOMINAL.
3. SLAT MATERIAL: NON-PERFORATED ALUMINUM.
4. COLOR: AS SELECTED BY ARCHITECT.
5. THE BOTTOM OF OPERATING DEVICES SHAL BE NO HIGHER THAN 5’-0” AFF.

PART 3 - EXECUTION

3.01 INSTALLATION

A. TAKE FIELD MEASUREMENTS PRIOR TO FABRICATION TO ENSURE FIT. HORIZONTAL BLINDS SHALL FILL WINDOW OPENINGS COMPLETELY BETWEEN JAMBS AND BETWEEN HEAD AND SILL.

B. INSTALL MATERIALS AND SYSTEMS IN ACCORDANCE WITH MANUFACTURER'S INSTRUCTIONS AND APPROVED SUBMITTALS. INSTALL MATERIALS AND SYSTEMS IN PROPER RELATION WITH ADJACENT CONSTRUCTION AND WITH

UNIFORM APPEARANCE. COORDINATE WITH WORK OF OTHER SECTIONS.

C. RESTORE DAMAGED FINISHES AND TEST FOR PROPER OPERATION. CLEAN AND PROTECT WORK FROM DAMAGE.

END OF SECTION

SECTION 23 00 00 – MECHANICAL GENERAL

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.

B. This is a Basic Mechanical Requirements Section. Provisions of this section apply to work of all Division 21, 22, and 23 sections (HVAC, Plumbing and Fire Protection).

C. Review all other contract documents to be aware of conditions affecting work herein.

D. All work under Division 23 shall be constructed in accordance with the codes listed herein. The design has been based on the requirements of these codes; and while it is not the responsibility of the Contractor to verify that all work called for complies with these codes, he shall be responsible for calling to the Architect/Engineer's attention any details or specifications that are not in conformance with these or other codes.

E. Where code conflict exists, generally the most restrictive requirement applies. Comply with current code edition, unless noted.

1. 2020 Florida Building Code.
2. National Electric Code (NFPA 70).
3. Life Safety Code (NFPA 101).
4. Air Conditioning and Ventilating Systems (NFPA 90A).
5. Standard for the Installation of Sprinkler Systems (NFPA 13).
6. Handicapped Accessibility, ANSI A117.1 and Florida Statute Chapter 553, Part V.

F. All mechanical materials, installation and systems shall meet the requirements of the following standards, including the latest addenda and amendments, to the extent referenced:

1. Underwriters' Laboratories (UL)
2. American National Standards Institution (ANSI)
3. American Society of Testing Materials (ASTM)
4. Air Conditioning and Refrigeration Institute (ARI)
5. National Fire Protection Association (NFPA)
6. National Electrical Manufacturers Association (NEMA)
7. Sheet Metal and Air Conditioning Contractors' National Association SMACNA)
8. American Society of Heating, Refrigeration, and Air Conditioning Engineers (ASHRAE)
9. Air Movement and Control Association (AMCA)

G. Codes or standards applying to a specific part of the work may be included in that section.

H. Comply with regulations and codes of suppliers of utilities.

I. Where no specific method or form of construction is called for in the contract documents, the Contractor shall comply with code requirements when carrying out such work.

1.2 CONTRACTORS QUALIFICATIONS

A. General: Wherever the word “mechanical contractor”, "sub-contractor" or "firm" is used in these sub-paragraphs, it shall mean the contractor/sub-contractor of record for the installations used for proficiency qualification.

B. Location: The firm which performs the installation of the work under this section shall be one who maintains an established, experienced organization with a permanent, manned office within 50 miles from the project site location.

C. HVAC Experience: The firm's proficiency in the installation, start-up, adjustment, and maintenance of air conditioning systems shall have been demonstrated by the successful performance of work as specified herein on at least three systems each with ducted air distribution, and hydronic and refrigerant piping of 200 tons capacity or greater. The firm shall have been in business performing services as specified herein, for at least 5 years.

D. Plumbing Experience: The firm's proficiency in the installation and adjustment of plumbing systems shall have been demonstrated by the successful performance of work as specified herein on at least three commercial or institutional buildings, each containing a minimum of 10 plumbing fixtures. The firm shall have been in business performing services as specified herein, for at least 5 years.

E. Test and Balance: The firm's proficiency in the test and balance of the air conditioning systems shall have been demonstrated by the successful performance of work as specified herein on at least three systems each with ducted air distribution, and refrigerant piping of 230 tons capacity or greater, incremental units excluded. The firm shall have trained personnel, instruments, tools, and equipment to perform the testing and balancing service specified. The firm shall have been in business performing services as specified herein, for at least 3 years and be independent of the mechanical contractor and shall be an active member of AABC or NEBB. TAB Contractor shall be hired directly by the School District

1.3 SUMMARY

A. This Section includes the following:

1. Piping materials and installation instructions common to most piping systems.
2. Joining Materials.
3. Transition fittings.
4. Dielectric fittings.
5. Flexible Connectors.
6. Excavation and backfill.
7. Mechanical demolition.
8. Equipment installation requirements common to equipment sections.
9. Painting and finishing.
10. Concrete bases.
11. Supports and anchorages.

1.4 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.

F. The following are industry abbreviations for plastic materials:

1. CPVC: Chlorinated polyvinyl chloride plastic.
2. PE: Polyethylene plastic.
3. PVC: Polyvinyl chloride plastic.

G. The following are industry abbreviations for rubber materials:

1. EPDM: Ethylene-propylene-diene terpolymer rubber.
2. NBR: Acrylonitrile-butadiene rubber.

H. Provide: Furnish and install, complete and ready for intended use.

I. Furnish: Supply and deliver to project site, ready for subsequent requirements.

J. Install: Operations at project site, including unloading, unpacking, assembly, erection, placing, anchoring, applying, working to dimension, finishing, curing, protecting, cleaning, and similar requirements.

K. Permits and Fees: Contractor shall purchase all necessary permits, meters, and pay for any inspections required for his work and pay all fees and charges incidental thereto.

L. Verification of Owner's Data: Prior to commencing any work the Contractor shall satisfy himself as to the accuracy of all data as indicated in these plans and specifications and/or as provided by the Owner. Should the Contractor discover any inaccuracies, errors, or omissions in the data, he shall immediately notify the Architect/Engineer in order that proper adjustments can be anticipated and ordered. Commencement by the Contractor of any work shall be held as an acceptance of the data by him after which time the Contractor has no claim against the Owner resulting from alleged errors, omissions or inaccuracies of the said data.

M. Delivery and Storage of Materials: Materials delivered to site shall be inspected for damage, unloaded, and stored with a minimum of handling. All material shall be stored to provide protection from the weather and accidental damage.

N. Extent of work is indicated by the drawings, schedules, and the requirements of the specifications. Singular references shall not be constructed as requiring only one device if multiple devices are shown on the drawings or are required for proper system operation.

1.5 FIELD MEASUREMENTS AND COORDINATION:

A. The intent of the drawings and specifications is to obtain a complete and satisfactory installation. Separate divisional drawings and specifications shall not relieve the Contractor or subcontractors from full compliance of work of his trade indicated on any of the drawings or in any section of the specifications.

B. Verify all field dimensions and locations of equipment to insure close, neat fit with other trades' work. Make use of all contract documents and approved shop drawings to verify exact dimension and locations.

C. Coordinate work in this division with all other trades in proper sequence to insure that the total work is completed within contract time schedule and with a minimum cutting and patching.

D. Locate all apparatus symmetrical with architectural elements. Install to exact height and locations when shown on architectural drawings. When locations are shown only on mechanical drawings, be guided by architectural details and conditions existing at job and correlate this work with that of others.

E. Install work as required to fit structure, avoid obstructions, and retain clearance, headroom, openings and passageways. Cut no structural members without written approval.

F. Carefully examine any existing conditions, piping, and premises. Compare drawings with existing conditions. Report any observed discrepancies. It shall be the Contractor's responsibility to properly coordinate the work and to identify problems in a timely manner. Written instructions will be issued to resolve discrepancies.

G. Because of the small scale of the drawings, it is not possible to indicate all offsets and fittings or to locate every accessory. Drawings are essentially diagrammatic. Study carefully the sizes and locations of structural members, wall and partition locations, trusses, and room dimensions and take actual measurements on the job. Locate piping, ductwork, equipment and accessories with sufficient space for installing and servicing. Contractor is responsible for accuracy of his measurements and for coordination with all trades. Contractor shall not order materials or perform work without such verification. No extra compensation will be allowed because field measurements vary from the dimensions on the drawings. If field measurements show that equipment or piping cannot be fitted, the Architect/Engineer shall be consulted. Remove and relocate, without additional compensation, any item that is installed and is later found to encroach on space assigned to another use.

H. Coordinate with the General Contractor for all cutting and patching. Contractors performing Division 23 work shall inform the General Contractor of all cutting and patching required prior to bidding and shall coordinate installation.

1.6 SUBMITTALS

A. Coordination Drawings: Detail major elements, components, and systems of mechanical equipment and materials in relationship with other systems, installations, and building components. Drawings shall be prepared by the contractor using AutoCAD 2007 or higher. The Engineer will supply base floor plans only. All other work shall be by the contractor. Show space requirements for installation and access. Indicate if sequence and coordination of installations are important to efficient flow of the Work. Include the following:

1. Planned piping layout, including valve and specialty locations and valve-stem movement.
2. Planned ductwork layout, including dampers, elbows, etc.
3. Clearances for installing and maintaining insulation.
4. Clearances for servicing and maintaining equipment, accessories, and specialties, including space for disassembly required for periodic maintenance.
5. Equipment and accessory service connections and support details.
6. Exterior wall and foundation penetrations.
7. Fire-rated wall and floor penetrations.
8. Access panel and door locations.
9. Sizes and location of required concrete pads and bases.
10. Scheduling, sequencing, movement, and positioning of large equipment into building during construction.
11. Floor plans, elevations, and details to indicate penetrations in floors, walls, and ceilings and their relationship to other penetrations and installations.
12. Reflected ceiling plans to coordinate and integrate installation of air outlets and inlets, light fixtures, communication system components, sprinklers, and other ceiling-mounted items.

B. Samples: Of color, lettering style and other graphic representation required for each identification material and device.

C. When approved, the submittal control log and submittals shall be an addition to the specifications herewith, and shall be of equal force in that no deviation will be permitted except with the approval of the Architect/Engineer.

D. Shop drawings, product literature, and other approval submittals will only be reviewed if they are submitted in full accordance with the General and Supplementary Conditions and Division 1 Specification sections and the following:

1. Submittals shall be properly organized in accordance with the approved submittal control log.
2. Submittals shall not include items from more than one specification section in the same submittal package unless approved in the submittal control log.
3. Submittals shall be properly identified by a cover sheet showing the project name, Architect and Engineer names, submittal control number, specification section, a list of products or item names with model numbers in the order they appear in the package, and spaces for approval stamps. A sample cover sheet is included at the end of this section.
4. Submittals shall have been reviewed and approved by the General Contractor (or Prime Contractor). Evidence of this review and approval shall be an "Approved" stamp with a signature and date on the cover sheet.
5. Submittals that include a series of fixtures or devices (such as plumbing fixtures or valves) shall be organized by the fixture number or valve type and be marked

accordingly. Each fixture must include all items associated with that fixture regardless of whether or not those items are used on other fixtures.

6. The design shown on the drawings supports the mechanical equipment basis of design specifications at the time of design. If mechanical equipment is submitted with different electrical, physical, capacity, etc. requirements, it shall be the responsibility of the mechanical contractor to resolve all required design changes (wire and conduit size, type of disconnect or overload protection, point(s) of connection, ductwork modifications, etc.) and clearly show the new design on the mechanical submittal with a written statement that this change will be provided at no additional cost. Mechanical submittals made with no written reference to the electrical design will be presumed to work with the electrical design. Any corrections required will be at no additional cost.

E. If the shop drawings show variation from the requirements of contract because of standard shop practice or other reasons, the Contractor shall make specific mention of such variation in writing in his letter of transmittal and on the submittal cover sheet in order that, if acceptable, Contractor will not be relieved of the responsibility for executing the work in accordance with the contract.

F. Review of shop drawings, product literature, catalog data, or schedules shall not relieve the Contractor from responsibility for deviations from contract drawings or specifications, unless he has in writing called to the attention of the Architect/Engineer each such deviation in writing at the time of submission, nor shall it relieve him from responsibility for errors of any sort in shop drawings, product literature, catalog data, or schedules. Any feature or function specified but not mentioned in the submittal shall be assumed to be included per the specification.

G. Submit shop drawings as called for in other sections after award of the contract and before any material is ordered or fabricated. Shop drawings shall consist of plans, sections, elevations and details to scale (not smaller than 1/4" per foot), with dimensions clearly showing the installation. Direct copies of small scale project drawings issued to the Contractor are not acceptable. Drawings shall take into account equipment furnished under other sections and shall show space allotted for it. Include construction details and materials. NOTE: Failure of the Contractor to provide this information during the shop drawings phase shall make the Contractor responsible for all changes to achieve compliance with the Contract Documents without additional compensation.

H. Test Reports and Verification Submittals: Submit test reports, certifications and verification letters as called for in other sections. Contractor shall coordinate the required testing and documentation of system performance such that sufficient time exists to prepare the reports, submit the reports, review the reports and take corrective action within the scheduled contract time.

I. O&M Data Submittals: Submit Operation and Maintenance data as called for in other sections. When a copy of approval submittals is included in the O&M Manual, only the final Approved or Approved as Noted copy shall be used. Contractor shall organize these data in the O&M Manuals tabbed by specification number. Prepare O&M Manuals as required by Division 1 and as described herein. Submit manuals at the Substantial Completion inspection.

1.6 QUALITY ASSURANCE

A. Steel Support Welding: Qualify processes and operators according to AWS D1.1, "Structural Welding Code-Steel."

B. Comply with ASME A13.1 for lettering size, length of color field, colors, and viewing angles of identification devices.

C. Steel Pipe Welding: Qualify processes and operators according to ASME Boiler and Pressure Vessel Code: Section IX, "Welding and Brazing Qualifications."

D. Comply with provisions in ASME B31 Series, "Code for Pressure Piping."

E. Certify that each welder has passed AWS qualification tests for welding processes involved and that certification is current.

F. The design and layout shown on the drawings are based on the Manufacturers listed in the Division 23 specifications. If equipment other than that of the Manufacturers indicated is submitted to the Engineer for consideration as an equal, it shall be the responsibility of the Manufacturer requesting approval to submit with the request a revised drawing(s) of the mechanical equipment layouts acceptable to the Engineer. These revised drawings shall show the proposed location(s) of the alternate unit(s) and the area required for withdrawal space of replacement or serviceable components. These drawings shall also show clearances of adjacent equipment and the service area required by that equipment.

G. Equipment Selection: Equipment of differing electrical characteristics, physical dimensions and/or weights, capacities, and ratings may be furnished provided such proposed equipment is approved in writing and connecting mechanical, electrical, structural, and architectural services (such as circuit breakers, conduit, motors, bases, equipment pads, and equipment spaces) are adjusted by the contractor accordingly. The additional costs resulting from these modifications shall be the responsibility of the Contractor and no costs resulting from these modifications shall be passed to the Owner. If minimum energy ratings or efficiencies of equipment are specified, equipment must meet design and commissioning requirements.

1.7 COORDINATION

A. Coordinate mechanical equipment installation with other building components.

B. Arrange for pipe spaces, chases, slots, and openings in building structure during progress of construction, to allow for mechanical installations.

C. Coordinate installation of required supporting devices and set sleeves in poured-in-place concrete and other structural components as they are constructed.

D. Sequence, coordinate, and integrate installations of mechanical materials and equipment for efficient flow of the Work. Coordinate installation of large equipment requiring positioning before closing in building.

E. Coordinate connection of mechanical systems with exterior underground and overhead utilities and services. Comply with requirements of governing regulations, franchised service companies, and controlling agencies.

F. Coordinate requirements for access panels and doors for mechanical items requiring access that are concealed behind finished surfaces.

G. Coordinate installation of identifying devices after completing covering and painting, if devices are applied to surfaces. Install identifying devices before installing acoustical ceilings and similar concealment.

H. Refer to other Division 23 sections and/or drawings for specific requirements of the particular piping system being installed. Where another Division 23 section or the drawings conflict with requirements of this section, the other Division 23 section or the drawings shall take precedence over the general requirements herein.

I. OSHA: Contractor employee worker protection for all trenching and excavation operations shall comply with 29 CFR 1926.650 Subpart P and all current OSHA requirements.

1.8 MULTI-DISCIPLINE COORDINATION

A. DIVISION 2 SITE WORK

1. Refer to Division Sitework for:

a. All water, sewer, and storm water piping greater than five feet from the building
b. Manholes and catch-basins.
c. Underground tanks and enclosures.
d. Site fire protection work.

2. The following work is part of Division 23:

a. All site heating hot water and chilled water piping.
b. Grease trap.
c. All site gas piping.
d. All site acid waste piping and neutralization tank.

B. DIVISION 3 CONCRETE

1. Refer to Division 3, Concrete for:

a. Rough grouting in and around mechanical work.
b. Patching concrete cut to accommodate mechanical work.

2. The following is part of Division 23 work, complying with the requirements of Division 3

a. Curbs, foundations and pads for mechanical equipment.
b. Basins, sumps, and vaults of mechanical work.
c. Underground structural concrete to accommodate mechanical work.
d. Inertia bases.

C. DIVISION 4 MASONRY

1. Refer to Division 4, Masonry for:

    a. Installation of access doors in walls.

D. DIVISION 5 METALS

1. Refer to Division 5, Metals for:

    a. Framing openings for mechanical equipment.

2. The following is part of Division 23 work.

    a. Supports for mechanical work.

E. DIVISION 6 WOOD AND PLASTIC

1. Refer to Division 6, Wood for:

    a. Framing openings for mechanical equipment

F. DIVISION 7 THERMAL AND MOISTURE PROTECTION

1. Refer to Division 7, Thermal and Moisture Protection for:

    a. Installation of all roof curbs and roof supports for mechanical work.
    b. Caulking and waterproofing of all wall and roof mounted mechanical work.
    c. Providing all roof curbs and all vent flashing for metal roofs.

2. The following is part of Division 23 work, complying with the requirements of Division 7.

    a. Fire barrier penetration seals.

G. DIVISION 8 DOORS AND WINDOWS

1. Refer to Division 8, Doors & Windows for:

    a. Installation of all door grilles.
    b. Providing all undercuts

H. DIVISION 9 FINISHES

1. Refer to Division 9, Finishes for:

    a. Painting exposed ductwork, piping, and equipment.

b. Painting structural metal and concrete for mechanical work.
c. Painting door grilles and access panels.
d. Painting color-coded mechanical work indicated for continuous painting. See color schedule in Division 23 section, "Mechanical Identification".
e. Installation of access doors in gypsum drywall.
f. Colors shall be selected by the Architect for all painting of exposed mechanical work in occupied spaces, unless specified herein. Do not paint insulated or jacketed surfaces.

2. Perform the following as part of Division 23 work:

a. Touch up painting of factory finishes.
b. Painting of all hangers.

I. DIVISION 10 SPECIALTIES

1. Refer to Division 10, Specialties for:

a. Fire extinguishers and fire extinguisher cabinets and accessories.

J. DIVISION 11 EQUIPMENT

1. Refer to Division 11, Equipment for:

a. Equipment for all food service equipment to be provided. This includes the cooking hoods with fire suppression, dishwasher hoods, dishwasher booster heaters, and food preparation/cleanup equipment.
b. Equipment for all laboratory equipment including cabinets, casework, student stations, demonstration desks, safety stations, eyewashes, and all related fixtures, fittings, and trim.

2. Provide the following as part of Division 23 work:

a. All ducts, connections, and related devices to make kitchen hoods operational.
b. All trim including faucets, waste connections, drain traps, vents, valves, piping, flashing, fittings, strainers, and other materials necessary to make equipment operational. Provide rough-in for all equipment. Provide final connections for all equipment.
c. All fixtures specified in Contract Documents.
d. All automatic gas valves for shutoff of gas to cooking appliances when fire suppression system activates. Coordinate type of valve with fire suppression system supplier.
e. All trim not furnished by Division 11 including drains, wastes, continuous wastes, tailpieces, traps and similar devices necessary to make fixtures operational. Provide rough-in for all fixtures. Provide final connections for all fixtures. Provide all fixtures specified in Contract Documents.

K. DIVISION 26 ELECTRICAL

1. Mechanical contractor shall coordinate the exact electrical requirements of all mechanical equipment being provided with the electrical contractor. Where approval submittals are required, this coordination shall be accomplished prior to making the submittals. The electrical design shown on the drawings supports the mechanical equipment basis of design. If mechanical equipment is submitted with different electrical requirements, it is the responsibility of the mechanical contractor to resolve all required electrical design changes (wire and conduit size, type of disconnect or overload protection, point(s) of connection, etc.) and clearly show the new electrical design on the mechanical submittal with a written statement that this design will be provided at no additional cost. Mechanical submittals made with no written reference to the electrical design will be presumed to work with the electrical design. Any corrections required will be at no additional cost.

2. Mechanical contractor shall provide all HVAC control wiring including the Energy Management Control system sensors, alarms, and input/output signals and all relays, interlocks, warning lights, and control devices, complying with the requirements of Division 26. The intent is for the mechanical contractor to be responsible for the entire HVAC control system, including point-to-point wiring and connections.

3. Electrical contractor shall provide disconnect switches, starters, and contactors for mechanical equipment unless specifically noted as being furnished as part of mechanical equipment.

4. Electrical contractor shall provide all power wiring, raceway and devices, and make final electrical connections to all mechanical equipment, switches, starters, contactors, controllers, and similar equipment.

5. All duct-mounted smoke detectors shall be furnished and wired by the electrical contractor and installed by the mechanical contractor.

PART 2 - PRODUCTS

2.1 EQUIPMENT AND MATERIALS

A. All materials shall be new or Owner-supplied reused as shown on the drawings, the best of their respective kinds, suitable for the conditions and duties imposed on them at the building and shall be of reputable manufacturers. The description, characteristics, and requirements of materials to be used shall be in accordance with qualifying conditions established in the following sections.

B. All equipment and materials shall be new and the most suitable grade for the purpose intended. Equipment furnished under this division shall be the product of a manufacturer regularly engaged in the manufacture of such items for a period of three years. Where practical, all of the components shall be products of a single manufacturer in order to provide proper coordination and responsibility. Where required, Contractor shall furnish proof of installation of similar units or equipment.

C. Each item of equipment shall bear a name plate showing the manufacturer's name, trade name, model number, serial number, ratings and other information necessary to fully identify it. This plate shall be permanently mounted in a prominent location and shall not be concealed, insulated or painted.

D. The label of the approving agency, such as UL, IBR, ASME, ARI, AMCA, by which a standard has been established for the particular item shall be in full view.

E. The equipment shall be essentially the standard product of a manufacturer regularly engaged in the production of such equipment and shall be a product of the manufacturer's latest design.

F. A service organization with personnel and spare parts shall be available within two hours for each type of equipment furnished.

G. Install in accordance with manufacturer's recommendations. Place in service by a factory trained representative where required.

H. Materials and equipment are specified herein by a single or by multiple manufacturers to indicate quality, material and type of construction desired. Manufacturer's products shown on the drawings have been used as basis for design; it shall be the Contractor's responsibility to ascertain that alternate manufacturer's products, or the particular products of named manufacturers, meet the detailed specifications and that size and arrangement of equipment are suitable for installation.

I. Model Numbers: Catalog numbers and model numbers indicated in the drawings and specifications are used as a guide in the selection of the equipment and are only listed for the contractor's convenience. The contractor shall determine the actual model numbers for ordering materials in accordance with the written description of each item and with the intent of the drawings and specifications.

2.2 REQUESTS FOR SUBSTITUTION

A. Where a particular system, product or material is specified by name, consider it as standard basis for bidding, and base proposal on the particular system, product or material specified.

B. Requests by Contractor for substitution will be considered only when reasonable, timely, fully documented, and qualifying under one or more of the following circumstances.

1. Required product cannot be supplied in time for compliance with Contract time requirements.
2. Required product is not acceptable to governing authority, or determined to be non-compatible, or cannot be properly coordinated, warranted or insured, or has other recognized disability as certified by Contractor.
3. Substantial cost advantage is offered Owner after deducting offsetting disadvantages including delays, additional compensation for redesign, investigation, evaluation and other necessary services and similar considerations.

C. All requests for substitution shall contain a "Comparison Schedule" and clearly and specifically indicate any and all differences or omissions between the product specified as the basis of

design and the product proposed for substitution. Differences shall include but shall not be limited to data as follows for both the specified and substituted products:

1. Principal of operation.
2. Materials of construction or finishes.
3. Thickness of gauge of materials.
4. Weight of item.
5. Deleted features or items.
6. Added features or items.
7. Changes in other work caused by the substitution.
8. Performance curves.

If the approved substitution contains differences or omissions not specifically called to the attention of the Architect/Engineer, the Owner reserves the right to require equal or similar features to be added to the substituted products (or to have the substituted products replaced) at the Contractor's expense.

2.3 EXCAVATION AND BACKFILL MATERIALS

A. Sand: Clean, hard, uncoated grains free from organic matter or other deleterious substances. Sand for backfill shall be of a grade equal to mortar sand.
B. Gravel: Clean, well graded hard stone or gravel, free from organic material. Size range to be from No. 4 screen retentions to 1".
C. Earth: Fill free of clay, muck, stones, wood, roots or rubbish.
D. Identification Tape: Polyethylene 6 inches wide, 0.004 inches thick, continuously printed with "CAUTION" in large letters and type of pipe below.
E. Copper Identification Wire: 12-gauge.

PART 3 - EXECUTION

3.1 WORKMANSHIP

A. All materials and equipment shall be installed and completed in a first-class workmanlike manner and in accordance with the best modern methods and practice. Any materials installed which do not present an orderly and reasonably neat and/or workmanlike appearance, or do not allow adequate space for maintenance, shall be removed and replaced when so directed by the Architect/Engineer.

3.2 COORDINATION

A. The Contractor shall be responsible for full coordination of the mechanical systems with shop drawings of the building construction so the proper openings and sleeves or supports are provided for piping, ductwork, or other equipment passing through slabs or walls.

B. Any additional steel supports required for the installation of any mechanical equipment, piping, or ductwork shall be furnished and installed under the section of the specifications requiring the additional supports.

C. It shall be the Contractor's responsibility to see that all equipment such as valves, dampers, filters and such other apparatus or equipment that may require maintenance and operation are made easily accessible, regardless of the diagrammatic location shown on the drawings.

D. All connections to fixtures and equipment shown on the drawings shall be considered diagrammatic unless otherwise indicated by detail. The actual connections shall be made to fully suit the requirements of each case and adequately provide for expansion and servicing.

E. The contractor shall protect equipment, material, and fixtures at all times. He shall replace all equipment, material, and fixtures which are damaged as a result of inadequate protection.

F. Prior to starting and during progress of work, examine work and materials installed by others as they apply to work in this division. Report conditions which will prevent satisfactory installation.

G. Start of work will be construed as acceptance of suitability of work of others.

H. Before any equipment is shut down for disconnecting or tie-ins, arrangements shall be made with the Architect/Engineer and this work shall be done at the time best suited to the Owner. This will typically be on weekends and/or holidays and/or after normal working hours. Services shall be restored the same day unless prior arrangements are made. All overtime or premium costs associated with this work shall be included in the base bid.

I. Provide all required temporary valves, piping, ductwork, equipment and devices as required. Maintain temporary services to areas as required. Remove all temporary material and equipment on completion of work unless Engineer concurs that such material and equipment would be beneficial to the Owner on a permanent basis.

J. Notify General Contractor to do all cutting and patching of all holes, chases, sleeves, and other openings required for installation of equipment furnished and installed under this section. Utilize experienced trades for cutting and patching. Obtain permission from Architect/Engineer before cutting any structural items.

K. Bolt equipment directly to concrete pads or vibration isolators as required, using hot-dipped galvanized anchor bolts, nuts and washers. Level equipment.

L. Touch-up factory finishes on equipment located inside and outside shall be done under Division 23. Obtain matched color coatings from the manufacturer and apply as directed. If corrosion is found during inspection on the surface of any equipment, clean, prime, and paint, as required.

M. Thoroughly clean all exposed parts of apparatus and equipment of cement, plaster, and other materials and remove all oil and grease spots. Repaint or touch up as required to look like new. During progress of work, contractor is to carefully clean up and leave premises and all portions of building free from debris and in a clean and safe condition.

N. Start each item of equipment in strict accordance with the manufacturer's instructions; or where noted under equipment specification, start-up shall be done by a qualified representative of the manufacturer. Alignment, lubrication, safety, and operating control shall be included in start-up check.

O. Operate heating and cooling systems as required after initial startup to maintain temperature and humidity conditions to avoid freeze damage and warping or sagging of ceilings and carpet.

3.3 RECORD DRAWINGS

1. During the progress of the work the Contractor shall record on their field set of drawings the exact location, as installed, of all piping, ductwork, equipment, and other systems which are not installed exactly as shown on the contract drawings.

2. Upon completion of the work, record drawings shall be prepared as described in the General Conditions, Supplementary Conditions, and Division 1 sections.

3.4 ACCEPTANCE

1. Punch List: Submit written confirmation that all punch lists have been checked and the required work completed.

2. Instructions: At completion of the work, provide a competent and experienced person who is thoroughly familiar with project, for one day to instruct permanent operating personnel in operation of equipment and control systems. This is in addition to any specific equipment operation and maintenance training.

3. Operation and Maintenance Manuals: Furnish three complete manuals bound in ring binders with Table of Contents, organized, and tabbed by specification section. Manuals shall contain:

    a. Detailed operating instructions and instructions for making minor adjustments.
    b. Complete wiring and control diagrams.
    c. Routine maintenance operations.
    d. Manufacturer's catalog data, service instructions, and parts lists for each piece of operating equipment.
    e. Copies of approved submittals.
    f. Copies of all manufacturer's warranties.
    g. Copies of test reports and verification submittals.

4. Record Drawings: Submit record drawings.

5. Control Diagrams: Frame under plastic and mount on equipment room wall.

3.5 MECHANICAL DEMOLITION

A. Refer to Division 1 Sections and Contract Drawings for general demolition requirements and procedures.

B. Disconnect, demolish, and remove mechanical systems, equipment, and components indicated to be removed.

C. Piping to Be Removed: Remove portion of piping indicated to be removed and cap or plug remaining piping with same or compatible piping material.

D. Piping to Be Abandoned in Place: Drain piping and cap or plug piping with same or compatible piping material.

E. Ducts to Be Removed: Remove portion of ducts indicated to be removed and plug remaining ducts with same or compatible ductwork material.

F. Ducts to Be Abandoned in Place: Cap or plug ducts with same or compatible ductwork material.

G. Equipment to Be Removed: Disconnect and cap services and remove equipment.

H. Equipment to Be Removed and Reinstalled: Disconnect and cap services and remove, clean, and store equipment; when appropriate, reinstall, reconnect, and make equipment operational.

I. Equipment to Be Removed and Salvaged: Disconnect and cap services and remove equipment and deliver to Owner.

3.6 PIPING SYSTEMS - COMMON REQUIREMENTS

A. Install piping according to the following requirements and Division 23 Sections specifying piping systems. Individual Division 23 piping Sections specify unique piping installation requirements

B. Drawing plans, schematics, and diagrams indicate general location and arrangement of piping systems. Indicated locations and arrangements were used to size pipe and calculate friction loss, expansion, pump sizing, and other design considerations. Install piping as indicated unless deviations to layout are approved on Coordination Drawings.

C. Install piping in concealed locations, unless otherwise indicated and except in equipment rooms and service areas.

D. Install piping indicated to be exposed and piping in equipment rooms and service areas at right angles or parallel to building walls. Diagonal runs are prohibited unless specifically indicated otherwise.

E. Install piping such that no piping passes over electrical panels.

F. Refer to fire protection, plumbing and HVAC specifications for sleeve, sleeve seal system and escutcheon requirements.

G. Install piping above accessible ceilings to allow sufficient space for ceiling panel removal.

H. Install piping to permit valve servicing.

I. Install piping at indicated slopes.

J. Install piping free of sags and bends.

K. Install fittings for changes in direction and branch connections.

L. Install piping to allow application of insulation.

M. Select system components with pressure rating equal to or greater than system operating pressure.

N. Verify final equipment locations for roughing-in.

O. Refer to equipment specifications in other Sections of these Specifications for roughing-in requirements.

3.7 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.

3.8 PAINTING

A. Apply paint to exposed uninsulated piping according to the following:

1. Interior, Ferrous Piping: Use semigloss, acrylic-enamel finish. Include finish coat over enamel undercoat and primer.
2. Interior, Galvanized-Steel Piping: Use semigloss, acrylic-enamel finish. Include two finish coats over galvanized metal primer.
3. Interior, Ferrous Supports: Use semigloss, acrylic-enamel finish. Include finish coat over enamel undercoat and primer.
4. Exterior, Ferrous Piping: Use semigloss, acrylic-enamel finish. Include two finish coats over rust-inhibitive metal primer.
5. Exterior, Galvanized-Steel Piping: Use semigloss, acrylic-enamel finish. Include two finish coats over galvanized metal primer.
6. Exterior, Ferrous Supports: Use semigloss, acrylic-enamel finish. Include two finish coats over rust-inhibitive metal primer.

B. Do not paint piping specialties with factory-applied finish.

C. Damage and Touchup: Repair marred and damaged factory-painted finishes with materials and procedures to match original factory finish.

3.9 CONCRETE BASES

A. Construct concrete bases of dimensions indicated, but not less than 4 inches larger in both directions than supported unit. Follow supported equipment manufacturer's setting templates for anchor bolt and tie locations. Use 3,000-psig, 28-day compressive-strength concrete and reinforcement.

3.10 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

B. Field Welding: Comply with AWS D1.1.

3.11 CUTTING AND PATCHING

A. Cut, channel, chase, and drill floors, walls, partitions, ceilings, and other surfaces necessary for mechanical installations. Perform cutting by skilled mechanics of trades involved.

B. Repair cut surfaces to match adjacent surfaces.

3.12 GROUTING

A. Mix and install grout for mechanical equipment base bearing surfaces, pump and other equipment base plates, and anchors.

B. Clean surfaces that will come into contact with grout.

C. Provide forms as required for placement of grout.

D. Avoid air entrapment during placement of grout.

E. Place grout, completely filling equipment bases.

F. Place grout on concrete bases and provide smooth bearing surface for equipment.

G. Place grout around anchors.

H. Cure placed grout.

3.13 EXCAVATION AND BACKFILL

A. Ditching and Excavation: Shall be performed by hand wherever there is a possibility of encountering obstacles or any existing utility lines of any nature whatsoever. Where clear and unobstructed areas are to be excavated, appropriate machine excavation methods may be employed. Avoid use of machine excavators within the limits of the building lines.

B. Bedding: Excavate to bottom grade of pipe to be installed, and shape bed of undisturbed earth to contour of pipe for a width of at least 50% of pipe diameter. If earth conditions necessitate excavation below grade of the pipe, such as due to the presence of clay, muck, or roots, subcut and bring bed up to proper elevation with clean, new sand (as described in paragraph 2.3), deposited in 6" layers and tamped. Notify Architect/Engineer if subcut exceeds 12", or if bed is of an unstable nature. In this case a 6" minimum layer of gravel will be required before sand bedding begins. Submit cost proposal if the earth conditions require subcut in excess of 12" or if gravel is required to achieve proper bedding.

C. Placing: Pipe shall be carefully handled into place. Avoid knocking loose soil from the banks of the trench into the pipe bed. Rig heavier sections with nylon slings in lieu of wire rope to avoid crushing or chipping. Pipe which is handled with insulation in place, coated pipe, and jacketed pipe shall have special handling slings as required to prevent damage to the material.

D. Backfilling: Deposit clean new sand (as described in paragraph 2.3) to 6" above the pipe and tamp. Then deposit sand or earth carefully in 6" layers, maintaining adequate side support, especially on nonferrous piping materials. Compact fill in 6" layers, using mechanical means, up to the top elevation of the pipe, and in 12" layers to rough or finish grade as required. Fine grade and restore surface to original condition.

E. Special: Excavations shall be installed and maintained in satisfactory condition during the progress of the work. Subsurface structures are to be constructed in adequately sized excavations. De-watering equipment shall be installed and properly maintained where required. Shoring shall be employed in the event of unstable soil condition, and in all cases where required by OSHA regulations and necessary to protect materials and personnel from injury.

F. Identification: Install identification tape directly above all underground piping, one tape for each pipe where multiple pipes are installed. Depth of tape shall be at least 6 inches below finished grade and 24" above buried pipe. Install copper wire above non-metallic pipes.

G. Depth of Cover: Minimum cover for underground piping is two feet unless indicated otherwise.

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SECTION 23 05 13 - COMMON MOTOR REQUIREMENTS FOR HVAC EQUIPMENT

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. Section includes general requirements for single-phase and polyphase, general-purpose, horizontal, small and medium, squirrel-cage induction motors for use on ac power systems up to 600 V and installed at equipment manufacturer's factory or shipped separately by equipment manufacturer for field installation.

1.3 COORDINATION

A. Coordinate features of motors, installed units, and accessory devices to be compatible with the following:

1. Motor controllers.
2. Torque, speed, and horsepower requirements of the load.
3. Ratings and characteristics of supply circuit and required control sequence.
4. Ambient and environmental conditions of installation location.

PART 2 - PRODUCTS

2.1 GENERAL MOTOR REQUIREMENTS

A. Comply with NEMA MG 1 unless otherwise indicated.

2.2 MOTOR CHARACTERISTICS

A. Duty: Continuous duty at ambient temperature of 104 deg F (40 deg C) and at altitude of 3,300 feet above sea level.

B. Capacity and Torque Characteristics: Sufficient to start, accelerate, and operate connected loads at designated speeds, at installed altitude and environment, with indicated operating sequence, and without exceeding nameplate ratings or considering service factor.

2.3 POLYPHASE MOTORS

A. Description: NEMA MG 1, Design B, medium induction motor.

B. Efficiency: Energy efficient, as defined in NEMA MG 1.

C. Service Factor: 1.15.

D. Multispeed Motors: Variable torque.

1. For motors with 2:1 speed ratio, consequent pole, single winding.
2. For motors with other than 2:1 speed ratio, separate winding for each speed.

E. Rotor: Random-wound, squirrel cage.

F. Bearings: Regreasable, shielded, antifriction ball bearings suitable for radial and thrust loading.

G. Temperature Rise: Match insulation rating.

H. Insulation: Class F.

I. Code Letter Designation:

1. Motors 15 HP and Larger: NEMA starting Code F or Code G.
2. Motors Smaller than 15 HP: Manufacturer's standard starting characteristic.

J. Enclosure Material: Cast iron for motor frame sizes 324T and larger; rolled steel for motor frame sizes smaller than 324T.

2.4 POLYPHASE MOTORS WITH ADDITIONAL REQUIREMENTS

A. Motors Used with Reduced-Voltage and Multispeed Controllers: Match wiring connection requirements for controller with required motor leads. Provide terminals in motor terminal box, suited to control method.

B. Motors Used with Variable Frequency Controllers: Ratings, characteristics, and features coordinated with and approved by controller manufacturer.

1. Windings: Copper magnet wire with moisture-resistant insulation varnish, designed and tested to resist transient spikes, high frequencies, and short time rise pulses produced by pulse-width modulated inverters.
2. Energy- and Premium-Efficient Motors: Class B temperature rise; Class F insulation.
3. Inverter-Duty Motors: Class F temperature rise; Class H insulation.
4. Thermal Protection: Comply with NEMA MG 1 requirements for thermally protected motors.

2.5 SINGLE-PHASE MOTORS

A. Motors larger than 1/20 hp shall be one of the following, to suit starting torque and requirements of specific motor application:

1. Permanent-split capacitor.
2. Split phase.
3. Capacitor start, inductor run.
4. Capacitor start, capacitor run.

B. Multispeed Motors: Variable-torque, permanent-split-capacitor type.

C. Bearings: Prelubricated, antifriction ball bearings or sleeve bearings suitable for radial and thrust loading.

D. Motors 1/20 HP and Smaller: Shaded-pole type.

E. Thermal Protection: Internal protection to automatically open power supply circuit to motor when winding temperature exceeds a safe value calibrated to temperature rating of motor insulation. Thermal-protection device shall automatically reset when motor temperature returns to normal range.

PART 3 - EXECUTION (Not Applicable)

END OF SECTION 23 05 13

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SECTION 23 05 19 - METERS AND GAUGES FOR HVAC PIPING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. Section Includes:
1. Liquid-in-glass thermometers.
2. Thermowells.
3. Dial-type pressure gages.
4. Gauge attachments.
5. Test plugs.
6. Test-plug kits.
7. Venturi flowmeters.
8. Electromagnetic flowmeters.

1.3 ACTION SUBMITTALS

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

B. Wiring Diagrams: For power, signal, and control wiring.

1.4 INFORMATIONAL SUBMITTALS

A. Product certificates: For each type of meter and gauge, from manufacturer.

1.5 CLOSEOUT SUBMITTALS

A. Operation and maintenance data: For meters and gauges to include in operation and maintenance manuals.

PART 2 - PRODUCTS

2.1 LIQUID-IN-GLASS THERMOMETERS

A. Metal-Case, Industrial-Style, Liquid-in-Glass Thermometers:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

    a. Flo Fab Inc.
    b. Miljoco Corporation.
    c. Palmer Wahl Instrumentation Group.
    d. Tel-Tru Manufacturing Company.
    e. Trerice, H. O. Co.
    f. Weiss Instruments, Inc.

2. Standard: ASME B40.200.
3. Case: Cast aluminum 7-inch nominal size unless otherwise indicated.
4. Case Form: Adjustable angle unless otherwise indicated.
5. Tube: Glass with magnifying lens and red organic liquid.
6. Tube Background: Nonreflective aluminum with permanently etched scale markings graduated in deg F.
7. Window: Glass.
8. Stem: Aluminum and of length to suit installation.

    a. Design for Air-Duct Installation: With ventilated shroud.
    b. Design for Thermowell Installation: Bare stem.

9. Connector: 1-1/4 inches, with ASME B1.1 screw threads.
10. Accuracy: Plus or minus 1 percent of scale range or one scale division, to a maximum of 1.5 percent of scale range.

2.2 DUCT-THERMOMETER MOUNTING BRACKETS

A. Description: Flanged bracket with screw holes, for attachment to air duct and made to hold thermometer stem.

2.3 THERMOWELLS

A. Thermowells:

1. Standard: ASME B40.200.
2. Description: Pressure-tight, socket-type fitting made for insertion into piping tee fitting.
3. Material for Use with Copper Tubing: CNR or CUNI.
4. Material for Use with Steel Piping: CRES or CSA.
5. Type: Stepped shank unless straight or tapered shank is indicated.
6. External Threads: NPS 1/2, NPS 3/4, or NPS 1, ASME B1.20.1 pipe threads.
7. Internal Threads: 1/2, 3/4, and 1 inch, with ASME B1.1 screw threads.
8. Bore: Diameter required to match thermometer bulb or stem.
9. Insertion Length: Length required to match thermometer bulb or stem.
10. Lagging Extension: Include on thermowells for insulated piping and tubing.
11. Bushings: For converting size of thermowell's internal screw thread to size of thermometer connection.

B. Heat-Transfer Medium: Mixture of graphite and glycerin.

2.4 PRESSURE GAUGES

A. Direct-Mounted, Metal-Case, Dial-Type Pressure Gauges:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

    a. AMETEK, Inc.; U.S. Gauge.
    b. Ashcroft Inc.
    c. Ernst Flow Industries.
    d. Flo Fab Inc.
    e. Marsh Bellofram.
    f. Miljoco Corporation.
    g. Noshok.
    h. Palmer Wahl Instrumentation Group.
    i. REOTEMP Instrument Corporation.
    j. Tel-Tru Manufacturing Company.
    k. Trerice, H. O. Co.
    l. Watts Regulator Co.; a div. of Watts Water Technologies, Inc.
    m. Weiss Instruments, Inc.
    n. WIKA Instrument Corporation - USA.
    o. Winters Instruments - U.S.

2. Standard: ASME B40.100.
3. Case: Liquid-filled type(s); cast aluminum; 6-inch nominal diameter.
4. Pressure-Element Assembly: Bourdon tube unless otherwise indicated.
5. Pressure Connection: Brass, with NPS 1/4 or NPS 1/2, ASME B1.20.1 pipe threads and bottom-outlet type unless back-outlet type is indicated.
6. Movement: Mechanical, with link to pressure element and connection to pointer.
7. Dial: Nonreflective aluminum with permanently etched scale markings graduated in psi.
8. Pointer: Dark-colored metal.
9. Window: Glass.
10. Ring: Stainless steel.
11. Accuracy: Grade A, plus or minus 1 percent of middle half of scale range.

2.5 GAUGE ATTACHMENTS

A. Snubbers: ASME B40.100, brass; with NPS 1/4 or NPS 1/2, ASME B1.20.1 pipe threads and piston-type surge-dampening device. Include extension for use on insulated piping.

B. Valves: stainless steel ball, with NPS 1/4 or NPS 1/2 ASME B1.20.1 pipe threads.

2.6 FLOWMETERS

A. Venturi Flowmeters:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

a. IMI Flow Design

2. Description: Flowmeter with calibrated flow-measuring element, hoses or tubing, fittings, valves, indicator, and conversion chart.
3. Flow Range: Sensor and indicator shall cover operating range of equipment or system served.
4. Sensor: Venturi-type, calibrated, flow-measuring element; for installation in piping.

    a. Design: Differential-pressure-type measurement for water.
    b. Construction: Bronze, brass, or factory-primed steel, with brass fittings and attached tag with flow conversion data.
    c. Minimum Pressure Rating: 250 psig.
    d. Minimum Temperature Rating: 250 deg F.
    e. End Connections for NPS 2 and Smaller: Threaded.
    f. End Connections for NPS 2-1/2 and Larger: Flanged or welded.
    g. Flow Range: Flow-measuring element and flowmeter shall cover operating range of equipment or system served.

5. Permanent Indicators: Meter suitable for wall or bracket mounting, calibrated for connected flowmeter element, and having 6-inch diameter, or equivalent, dial with fittings and copper tubing for connecting to flowmeter element.

    a. Scale: Gallons per minute.
    b. Accuracy: Plus or minus 1 percent between 20 and 80 percent of scale range.

6. Portable Indicators: Hand-held, differential-pressure type, calibrated for connected flowmeter element and having two 12-foot hoses, with carrying case.

    a. Scale: Gallons per minute.
    b. Accuracy: Plus or minus 2 percent between 20 and 80 percent of scale range.

7. Display: Shows rate of flow.
8. Conversion Chart: Flow rate data compatible with sensor.
9. Operating Instructions: Include complete instructions with each flowmeter.

B. Inline Type Electromagnetic Flowmeters:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

    a. Badger Meter
    b. Onicon Ltd.
    c. Engineer Approved Equal.

2. Description: Inline electromagnetic flowmeter with LCD readout, sensors, fittings, valves, etc. as required for a complete installation.
3. Flow Range: Sensor and indicator shall cover operating range of equipment or system served.
4. Sensor: Electromagnetic.

    a. Design: Electronic measurement for water.

b. Construction: Cast-iron body, brass valves with integral check valves and caps, and calibrated nameplate.
c. Minimum Pressure Rating: 125 psig.
d. Minimum Temperature Rating: 250 deg F.

5. Permanent Indicators: Meter suitable for inline mounting, calibrated for connected sensor and having 6-inch diameter, or equivalent, dial with fittings and copper tubing for connecting to sensor.

a. Scale: Gallons per minute.
b. Accuracy: Plus or minus 0.5%.

6. Display: Shows rate of flow.
7. Operating Instructions: Include complete instructions with each flowmeter.

2.7 TEST-PLUG KITS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Flow Design, Inc.
2. Miljoco Corporation.
3. National Meter, Inc.
4. Peterson Equipment Co., Inc.
5. Sisco Manufacturing Company, Inc.
6. Trerice, H. O. Co.
7. Watts Regulator Co.; a div. of Watts Water Technologies, Inc.
8. Weiss Instruments, Inc.

B. Furnish one test-plug kit(s) containing two thermometer(s), one pressure gage and adapter, and carrying case. Thermometer sensing elements, pressure gage, and adapter probes shall be of diameter to fit test plugs and of length to project into piping.

C. Low-Range Thermometer: Small, bimetallic insertion type with 1- to 2-inch diameter dial and tapered-end sensing element. Dial range shall be at least 25 to 125 deg F.

D. High-Range Thermometer: Small, bimetallic insertion type with 1- to 2-inch diameter dial and tapered-end sensing element. Dial range shall be at least 0 to 220 deg F.

E. Pressure Gage: Small, Bourdon-tube insertion type with 2- to 3-inch diameter dial and probe. Dial range shall be at least 0 to 200 psig.

F. Carrying Case: Metal or plastic, with formed instrument padding.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Install thermowells with socket extending a minimum of 2 inches to center of pipe and in vertical position in piping tees.

B. Install thermowells of sizes required to match thermometer connectors. Include bushings if required to match sizes.

C. Install thermowells with extension on insulated piping.

D. Fill thermowells with heat-transfer medium.

E. Install direct-mounted thermometers in thermowells and adjust vertical and tilted positions.

F. Install remote-mounted thermometer bulbs in thermowells and install cases on panels; connect cases with tubing and support tubing to prevent kinks. Use minimum tubing length.

G. Install duct-thermometer mounting brackets in walls of ducts. Attach to duct with screws.

H. Install direct-mounted pressure gauges in piping tees with pressure gauge located on pipe at the most readable position.

I. Install remote-mounted pressure gauges on panel.

J. Install valve and snubber in piping for each pressure gauge for fluids (except steam).

K. Install valve and syphon fitting in piping for each pressure gauge for steam.

L. Install flow indicators in piping systems in accessible positions for easy viewing.

M. Assemble and install connections, tubing, and accessories between flow-measuring elements and flowmeters according to manufacturer's written instructions.

N. Install flowmeter elements in accessible positions in piping systems.

O. Install differential-pressure-type flowmeter elements, with at least minimum straight lengths of pipe, upstream and downstream from element according to manufacturer's written instructions.

P. Install permanent indicators on walls or brackets in accessible and readable positions.

Q. Install connection fittings in accessible locations for attachment to portable indicators.

R. Mount thermal-energy meters on wall if accessible; if not, provide brackets to support meters.

S. Install thermometers in the following locations:

1. Inlet and outlet of each hydronic zone.
2. Inlet and outlet of each hydronic boiler.
3. Two inlets and two outlets of each chiller.

4. Inlet and outlet of each hydronic coil in air-handling units.
5. Two inlets and two outlets of each hydronic heat exchanger.

T. Install pressure gauges in the following locations:

1. Discharge of each pressure-reducing valve.
2. Inlet and outlet of each chiller chilled water and condenser water connection.
3. Inlet and outlet of each boiler hot water connection.
4. Suction and discharge of each pump.

3.2 CONNECTIONS

A. Install meters and gauges adjacent to machines and equipment to allow service and maintenance of meters, gauges, machines, and equipment.

B. Connect flowmeter-system elements to meters.

C. Connect flowmeter transmitters to meters.

3.3 ADJUSTING

A. After installation, calibrate meters according to manufacturer's written instructions.

B. Adjust faces of meters and gauges to proper angle for best visibility.

3.4 THERMOMETER SCHEDULE

A. Thermometers at inlet and outlet of each hydronic zone shall be the following:

1. Industrial-style, liquid-in-glass type.
2. Test plug with chlorosulfonated polyethylene synthetic or EPDM self-sealing rubber inserts.

B. Thermometers at inlet and outlet of each hydronic boiler shall be the following:

1. Industrial-style, liquid-in-glass type.
2. Test plug with chlorosulfonated polyethylene synthetic or EPDM self-sealing rubber inserts.

C. Thermometers at inlets and outlets of each chiller shall be the following:

1. Industrial-style, liquid-in-glass type.
2. Test plug with chlorosulfonated polyethylene synthetic or EPDM self-sealing rubber inserts.

D. Thermometers at inlet and outlet of each hydronic coil in air-handling units shall be the following:

1. Industrial-style, liquid-in-glass type.

2. Test plug with chlorosulfonated polyethylene synthetic or EPDM self-sealing rubber inserts.

E. Thermometers at inlets and outlets of each hydronic heat exchanger shall be the following:

1. Industrial-style, liquid-in-glass type.
2. Test plug with chlorosulfonated polyethylene synthetic or EPDM self-sealing rubber inserts.

F. Thermometers at inlet and outlet of each hydronic heat-recovery unit shall be the following:

1. Industrial-style, liquid-in-glass type.
2. Test plug with chlorosulfonated polyethylene synthetic or EPDM self-sealing rubber inserts.

G. Thermometer stems shall be of length to match thermowell insertion length.

3.5 THERMOMETER SCALE-RANGE SCHEDULE

A. Scale Range for Chilled-Water Piping: 0 to 100 deg F.

B. Scale Range for Condenser-Water Piping: 0 to 100 deg F.

C. Scale Range for Heating, Hot-Water Piping: 0 to 250 deg F.

3.6 PRESSURE-GAUGE SCHEDULE

A. Pressure gages at discharge of each pressure-reducing valve shall be the following:

1. Liquid-filled, direct-mounted, metal case.
2. Test plug with chlorosulfonated polyethylene synthetic or EPDM self-sealing rubber inserts.

B. Pressure gages at inlet and outlet of each chiller chilled-water and condenser-water connection shall be the following:

1. Liquid-filled, direct-mounted, metal case.
2. Test plug with chlorosulfonated polyethylene synthetic or EPDM self-sealing rubber inserts.

C. Pressure gages at suction and discharge of each pump shall be the following:

1. Liquid-filled, direct-mounted, metal case.
2. Test plug with chlorosulfonated polyethylene synthetic or EPDM self-sealing rubber inserts.

3.7 PRESSURE-GAUGE SCALE-RANGE SCHEDULE

A. Scale Range for Chilled-Water Piping: 0 to 160 psi.

B. Scale Range for Condenser-Water Piping: 0 to 160 psi.

C. Scale Range for Heating, Hot-Water Piping: 0 to 160 psi.

3.8 FLOWMETER SCHEDULE

A. Flowmeters for Chilled-Water Piping: See controls drawings.

B. Flowmeters for Condenser-Water Piping: See controls drawings.

C. Flowmeters for Heating-Water Piping: See controls drawings.

END OF SECTION 23 05 19

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SECTION 23 05 23 - GENERAL-DUTY VALVES FOR HVAC PIPING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. Section Includes:

1. Bronze ball valves.
2. Iron single flange butterfly valves.
3. Bronze swing check valves.
4. Iron swing check valves.
5. Iron swing check valves with closure control.
6. Chainwheels.

B. Related Sections:

1. Section "Identification for HVAC Piping and Equipment" for valve tags and schedules.

1.3 DEFINITIONS

A. CWP: Cold working pressure.

B. EPDM: Ethylene propylene copolymer rubber.

C. NBR: Acrylonitrile-butadiene, Buna-N, or nitrile rubber.

D. NRS: Nonrising stem.

E. OS&Y: Outside screw and yoke.

F. RS: Rising stem.

1.4 ACTION SUBMITTALS

A. Product Data: For each type of valve indicated.

1.5 QUALITY ASSURANCE

A. Source Limitations for Valves: Obtain each type of valve from single source from single manufacturer.

B. ASME Compliance:

1. ASME B16.10 and ASME B16.34 for ferrous valve dimensions and design criteria.
2. ASME B31.1 for power piping valves.
3. ASME B31.9 for building services piping valves.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Prepare valves for shipping as follows:

1. Protect internal parts against rust and corrosion.
2. Protect threads, flange faces, grooves, and weld ends.
3. Set ball valves open to minimize exposure of functional surfaces.
4. Set butterfly valves closed or slightly open.
5. Block check valves in either closed or open position.

B. Use the following precautions during storage:

1. Maintain valve end protection.
2. Store valves indoors and maintain at higher than ambient dew point temperature. If outdoor storage is necessary, store valves off the ground in watertight enclosures.

C. Use sling to handle large valves; rig sling to avoid damage to exposed parts. Do not use handwheels or stems as lifting or rigging points.

PART 2 - PRODUCTS

2.1 GENERAL REQUIREMENTS FOR VALVES

A. Refer to HVAC valve schedule articles for applications of valves.

B. Valve Pressure and Temperature Ratings: Not less than indicated and as required for system pressures and temperatures.

C. Valve Sizes: Same as upstream piping unless otherwise indicated.

D. Valve Actuator Types:

1. Gear Actuator: For quarter-turn valves NPS 8 and larger.
2. Handwheel: For valves other than quarter-turn types.
3. Handlever: For quarter-turn valves NPS 6 and smaller.
4. Chainwheel: Device for attachment to valve handwheel, stem, or other actuator; of size and with chain for mounting height, as indicated in the "Valve Installation" Article.

E. Valves in Insulated Piping: With 2-inch stem extensions and the following features:

1. Gate Valves: With rising stem. Ball Valves: With extended operating handle of non-thermal-conductive material, and protective sleeve that allows operation of valve without breaking the vapor seal or disturbing insulation.
2. Butterfly Valves: With extended neck.

F. Valve-End Connections:

1. Flanged: With flanges according to ASME B16.1 for iron valves.
2. Solder Joint: With sockets according to ASME B16.18.
3. Threaded: With threads according to ASME B1.20.1.
4. Grooved: With grooves according to AWWA C606.

2.2 BRONZE BALL VALVES

A. Two-Piece, Full-Port, Bronze Ball Valves with Stainless-Steel Trim:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

a. Milwaukee Valve Company.
b. NIBCO INC.
c. Watts Regulator Co.; a division of Watts Water Technologies, Inc.

2. Description:

a. Standard: MSS SP-110.
b. SWP Rating: 150 psig.
c. CWP Rating: 600 psig.
d. Body Design: Two piece.
e. Body Material: Bronze.
f. Ends: Threaded.
g. Seats: PTFE.
h. Stem: Stainless steel.
i. Ball: Stainless steel, vented.
j. Port: Full.

2.3 IRON, SINGLE-FLANGE BUTTERFLY VALVES

A. 150 CWP, Iron, Single-Flange Butterfly Valves with EPDM Seat and Aluminum-Bronze Disc:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

a. Apollo.
b. Milwaukee Valve Company “M” series.
c. Mueller; a division of SPX Corporation.
d. NIBCO INC.

e. Watts Regulator Co.; a division of Watts Water Technologies, Inc.

2. Description:

a. Standard: MSS SP-67, Type I.
b. CWP Rating: 150 psig.
c. Body Design: Lug type; suitable for bidirectional dead-end service at rated pressure without use of downstream flange.
d. Body Material: ASTM A 126, cast iron or ASTM A 536, ductile iron.
e. Seat: EPDM.
f. Stem: One- or two-piece stainless steel.
g. Disc: Nickel-plated or -coated ductile iron.

B. 200 CWP, Iron, Single-Flange Butterfly Valves with EPDM Seat and Aluminum-Bronze Disc:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

a. Crane Co.; Crane Valve Group;
b. Flo Fab Inc.
c. Milwaukee Valve Company “M” series.
d. Mueller Steam Specialty; a division of SPX Corporation.
e. NIBCO INC.
f. Watts Regulator Co.; a division of Watts Water Technologies, Inc.

2. Description:

a. Standard: MSS SP-67, Type I.
b. CWP Rating: 200 psig.
c. Body Design: Lug type; suitable for bidirectional dead-end service at rated pressure without use of downstream flange.
d. Body Material: ASTM A 126, cast iron or ASTM A 536, ductile iron.
e. Seat: EPDM.
f. Stem: One- or two-piece stainless steel.
g. Disc: Nickel-plated or -coated ductile iron.

2.4 BRONZE SWING CHECK VALVES

A. Class 150, Bronze Swing Check Valves with Bronze Disc:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

a. Crane Co.; Crane Valve Group.
b. Milwaukee Valve Company.
c. NIBCO INC.
d. Watts Regulator Co.; a division of Watts Water Technologies, Inc.
e. Mueller

2. Description:

a. Standard: MSS SP-80, Type 3.
b. CWP Rating: 200 psig.
c. Body Design: Horizontal flow.
d. Body Material: ASTM B 62, bronze.
e. Ends: Threaded.
f. Disc: Bronze.

2.5 IRON, CENTER-GUIDED CHECK VALVES

A. Class 125, Iron, Globe, Center-Guided Check Valves with Resilient Seat:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

a. Mueller “105 MAP”
b. Titan “CV 50-DI”
c. Milwaukee Valve Company.

2. Description:

a. Standard: MSS SP-71, Type I.
b. NPS 2-1/2 to NPS 12, CWP Rating: 200 psig @ 150°F.
c. NPS 14 to NPS 30, CWP Rating: 150 psig @ 150°F.
d. Body Design: Globe Body.
e. Body Material: ASTM A 126 Grade B, Cast Iron or ASTM A536 Ductile Iron
f. Ends: Flanged.
g. Trim: Bronze.
h. Spring: ASTM A276, Series 300 Stainless Steel
i. Gasket: Non-asbestos.
j. Seat: Aluminum Bronze ASTM B148

2.6 BRONZE GLOBE VALVES

A. Class 125, Bronze Globe Valves with Bronze Disc:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

a. Crane Co.; Crane Valve Group; Crane Valves.
b. Milwaukee Valve Company.
c. NIBCO INC.
d. Watts Regulator Co.; a division of Watts Water Technologies, Inc.

2. Description:

a. Standard: MSS SP-80, Type 1.
b. CWP Rating: 200 psig.
c. Body Material: ASTM B 62, bronze with integral seat and screw-in bonnet.
d. Ends: Threaded or solder joint.

e. Stem and Disc: Bronze.
f. Packing: Asbestos free.
g. Handwheel: Malleable iron, bronze, or aluminum.

2.7 CHAINWHEELS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following

1. Babbitt Steam Specialty Co.
2. Roto Hammer Industries.
3. Trumbull Industries.

B. Description: Valve actuation assembly with sprocket rim, brackets, and chain.

1. Brackets: Type, number, size, and fasteners required to mount actuator on valve.
2. Attachment: For connection to butterfly valve stems.
3. Sprocket Rim with Chain Guides: Ductile iron, of type and size required for valve. Include zinc coating.
4. Chain: Hot-dip, galvanized steel, of size required to fit sprocket rim.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine valve interior for cleanliness, freedom from foreign matter, and corrosion. Remove special packing materials, such as blocks, used to prevent disc movement during shipping and handling.

B. Operate valves in positions from fully open to fully closed. Examine guides and seats made accessible by such operations.

C. Examine threads on valve and mating pipe for form and cleanliness.

D. Examine mating flange faces for conditions that might cause leakage. Check bolting for proper size, length, and material. Verify that gasket is of proper size, that its material composition is suitable for service, and that it is free from defects and damage.

E. Do not attempt to repair defective valves; replace with new valves.

3.2 VALVE INSTALLATION

A. Install valves with unions or flanges at each piece of equipment arranged to allow service, maintenance, and equipment removal without system shutdown.

B. Locate valves for easy access and provide separate support where necessary.

C. Install valves in horizontal piping with stem at or above center of pipe.

D. Install valves in position to allow full stem movement.

E. Install chain wheels on operators for ALL valves mounted more than 7’ above floor. Extend chains to 5’ above finished floor.

F. Install swing check valves for proper direction of flow and in horizontal position with hinge pin level.

3.3 ADJUSTING

A. Adjust or replace valve packing after piping systems have been tested and put into service but before final adjusting and balancing. Replace valves if persistent leaking occurs.

3.4 GENERAL REQUIREMENTS FOR VALVE APPLICATIONS

A. If valve applications are not indicated, use the following:

1. Shutoff Service:

    a. NPS 2 and Smaller: Ball valves.
    b. NPS 2-1/2 and Larger: Butterfly valves.

2. Throttling Service, Except Steam: globe or butterfly valves.
3. Pump-Discharge Check Valves:

    a. NPS 1-1/2 and Smaller: Bronze swing check valves with bronze disc.
    b. NPS 2 and Larger: Iron Center-Guided Check Valves: Cast Iron globe body silent check valves.

B. If valves with specified SWP classes or CWP ratings are not available, the same types of valves with higher SWP classes or CWP ratings may be substituted.

C. Select valves, except wafer types, with the following end connections:

1. For Copper Tubing, NPS 2 and Smaller: Threaded ends except where solder-joint valve-end option is indicated in valve schedules below.
2. For Copper Tubing, NPS 2-1/2 to NPS 4: Flanged ends except where threaded valve-end option is indicated in valve schedules below.
3. For Copper Tubing, NPS 5 and Larger: Flanged ends.
4. For Steel Piping, NPS 2 and Smaller: Threaded ends.
5. For Steel Piping, NPS 2-1/2 to NPS 4: Flanged ends except where threaded valve-end option is indicated in valve schedules below.
6. For Steel Piping, NPS 5 and Larger: Flanged ends.

3.5 CHILLED-WATER VALVE SCHEDULE

A. Pipe NPS 2 and Smaller:

1. Bronze Valves: May be provided with solder-joint ends instead of threaded ends.
2. Ball Valves: Two piece, full port, bronze with stainless-steel trim.
3. Bronze Swing Check Valves: Class 150, bronze disc.

B. Pipe NPS 2-1/2 and Larger:

1. Iron Valves, NPS 2-1/2 to NPS 4: May be provided with threaded ends instead of flanged ends.
2. Iron, Single-Flange Butterfly Valves, NPS 2-1/2 to NPS 12: 200 CWP, EPDM seat, ductile-iron disc.
3. Iron Center-Guided Check Valves: Cast Iron globe body silent check valves.

3.6 HEATING-WATER VALVE SCHEDULE

A. Pipe NPS 2 and Smaller:

1. Bronze Valves: May be provided with solder-joint ends instead of threaded ends.
2. Ball Valves: Two piece, full port, bronze with stainless-steel trim.
3. Bronze Swing Check Valves: Class 150, bronze disc.

B. Pipe NPS 2-1/2 and Larger:

1. Iron Valves, NPS 2-1/2 to NPS 4: May be provided with threaded ends instead of flanged ends.
2. Iron, Single-Flange Butterfly Valves, NPS 2-1/2 to NPS 12: 200 CWP, EPDM seat, ductile-iron disc.
3. Iron, Single-Flange Butterfly Valves, NPS 14 to NPS 24: 150 CWP, EPDM seat, ductile-iron disc.
4. Iron Center-Guided Check Valves: Cast Iron globe body silent check valves.

END OF SECTION 23 05 23

SECTION 23 05 29 - HANGERS AND SUPPORTS FOR HVAC PIPING AND EQUIPMENT

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. Section Includes:

1. Metal pipe hangers and supports.
2. Trapeze pipe hangers.
3. Thermal-hanger shield inserts.
4. Fastener systems.
5. Equipment supports.

1.3 PERFORMANCE REQUIREMENTS

A. Delegated Design: Design trapeze pipe hangers and equipment supports, including comprehensive engineering analysis by a qualified professional engineer, using performance requirements and design criteria indicated.

B. Structural Performance: Hangers and supports for HVAC piping and equipment shall withstand the effects of gravity loads and stresses within limits and under conditions indicated according to ASCE/SEI 7 and local building code.

1. Design supports for multiple pipes capable of supporting combined weight of supported systems, system contents, and test water.
2. Design equipment supports capable of supporting combined operating weight of supported equipment and connected systems and components.
3. Design seismic-restraint hangers and supports for piping and equipment.

1.4 ACTION SUBMITTALS

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

B. Shop Drawings: Show fabrication and installation details for the following; include Product Data for components:

1. Trapeze pipe hangers.
2. Equipment supports.

1.5 INFORMATIONAL SUBMITTALS

A. Welding certificates.

1.6 QUALITY ASSURANCE

A. Structural Steel Welding Qualifications: Qualify procedures and personnel according to AWS D1.1/D1.1M, "Structural Welding Code - Steel."

B. Pipe Welding Qualifications: Qualify procedures and operators according to ASME Boiler and Pressure Vessel Code.

PART 2 - PRODUCTS

2.1 METAL PIPE HANGERS AND SUPPORTS

A. Carbon-Steel Pipe Hangers and Supports:

1. Description: MSS SP-58, Types 1 through 58, factory-fabricated components.
2. Galvanized Metallic Coatings: Pregalvanized or hot dipped.
3. Nonmetallic Coatings: Plastic coating, jacket, or liner.
4. Padded Hangers: Hanger with fiberglass or other pipe insulation pad or cushion to support bearing surface of piping.
5. Hanger Rods: Continuous-thread rod, nuts, and washer made of stainless steel.

2.2 TRAPEZE PIPE HANGERS

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

2.3 THERMAL-HANGER SHIELD INSERTS

A. Insulation-Insert Material for Cold Piping: ASTM C 552, Type II cellular glass with 100-psig or ASTM C 591, Type VI, Grade 1 polyisocyanurate with 125-psig minimum compressive strength and vapor barrier.

B. Insulation-Insert Material for Hot Piping: ASTM C 552, Type II cellular glass with 100-psig or ASTM C 591, Type VI, Grade 1 polyisocyanurate with 125-psig minimum compressive strength.

C. For Trapeze or Clamped Systems: Insert and shield shall cover entire circumference of pipe.

D. For Clevis or Band Hangers: Insert and shield shall cover lower 180 degrees of pipe.

E. Insert Length: Extend 2 inches beyond sheet metal shield for piping operating below ambient air temperature.

2.4 FASTENER SYSTEMS

A. Powder-Actuated Fasteners: Threaded-steel stud, for use in hardened portland cement concrete with pull-out, tension, and shear capacities appropriate for supported loads and building materials where used.

B. Mechanical-Expansion Anchors: Insert-wedge-type, zinc-coated steel anchors, for use in hardened portland cement concrete; with pull-out, tension, and shear capacities appropriate for supported loads and building materials where used.

2.5 EQUIPMENT SUPPORTS

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

2.6 MISCELLANEOUS MATERIALS

A. Structural Steel: ASTM A 36/A 36M, carbon-steel plates, shapes, and bars; black and galvanized.

B. Grout: ASTM C 1107, factory-mixed and -packaged, dry, hydraulic-cement, nonshrink and nonmetallic grout; suitable for interior and exterior applications.

1. Properties: Nonstaining, noncorrosive, and nongaseous.
2. Design Mix: 5000-psi, 28-day compressive strength.

PART 3 - EXECUTION

3.1 HANGER AND SUPPORT INSTALLATION

A. Metal 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 the building structure. Install hangers, supports, clamps and attachments to support piping properly from building structure; comply with MSS SP-69. Arrange for grouping of parallel runs of horizontal piping to be supported together on trapeze type hangers where possible. Install supports with maximum spacing complying with MSS SP-69 or as listed herein, whichever is most limiting. Where piping of various sizes is to be supported together by trapeze hangers, space hangers for smallest pipe size or install intermediate supports for smaller diameter pipe. Do not use wire or perforated metal to support piping, and do not support piping from other piping.

1. Horizontal steel pipe and copper tube 1 1/2" diameter and smaller: support on 6 foot centers.

2. Horizontal steel pipe and copper tube over 1 1/2" diameter: support on 10 foot centers.

3. Vertical steel pipe and copper tube: support at alternate floors.

4. Plastic or Aquatherm pipe: support in accordance with manufacturer's recommendations.

5. Horizontal cast iron pipe inside building: support each length of pipe (at the joint).

6. Vertical cast iron pipe: support at each floor and at the base.

B. Metal 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 for individual pipe hangers.
2. Field fabricate from ASTM A 36/A 36M, carbon-steel shapes selected for loads being supported. Weld steel according to AWS D1.1/D1.1M.

C. Thermal-Hanger Shield Installation: Install in pipe hanger or shield for insulated piping.

D. Fastener System Installation:

1. Install powder-actuated fasteners for use in lightweight concrete or concrete slabs less than 4 inches thick in concrete after concrete is placed and completely cured. Use operators that are licensed by powder-actuated tool manufacturer. Install fasteners according to powder-actuated tool manufacturer's operating manual.
2. Install mechanical-expansion anchors in concrete after concrete is placed and completely cured. Install fasteners according to manufacturer's written instructions.

E. Install hangers and supports complete with necessary attachments, inserts, bolts, rods, nuts, washers, and other accessories.

F. Equipment Support Installation: Fabricate from welded-structural-steel shapes.

G. 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.

H. Install lateral bracing with pipe hangers and supports to prevent swaying.

I. Install building attachments within concrete slabs or attach to structural steel. Install additional attachments at concentrated loads, including valves, flanges, and strainers, NPS 2-1/2 and larger and at changes in direction of piping. Install concrete inserts before concrete is placed; fasten inserts to forms and install reinforcing bars through openings at top of inserts.

J. Load Distribution: Install hangers and supports so that piping live and dead loads and stresses from movement will not be transmitted to connected equipment.

K. Pipe Slopes: Install hangers and supports to provide indicated pipe slopes and to not exceed maximum pipe deflections allowed by ASME B31.9 for building services piping.

L. Insulated Piping:

1. Attach clamps and spacers to piping.

    a. Piping Operating above Ambient Air Temperature: Clamp may project through insulation.
    b. Piping Operating below Ambient Air Temperature: Use thermal-hanger shield insert with clamp sized to match OD of insert.
    c. Do not exceed pipe stress limits allowed by ASME B31.9 for building services piping.

2. Install MSS SP-58, Type 39, protection saddles if insulation without vapor barrier is indicated. Fill interior voids with insulation that matches adjoining insulation.

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 3-1/2: 12 inches long and 0.048 inch thick.
    b. NPS 4: 12 inches long and 0.06 inch thick.
    c. NPS 5 and NPS 6: 18 inches long and 0.06 inch thick.
    d. NPS 8 to NPS 14: 24 inches long and 0.075 inch thick.
    e. NPS 16 to NPS 24: 24 inches long and 0.105 inch thick.

5. Pipes NPS 8 and Larger: Include wood inserts of length at least as long as protective shield.

3.2 EQUIPMENT SUPPORTS

A. Fabricate structural-steel stands to suspend equipment from structure overhead or to support equipment above floor.

B. Grouting: Place grout under supports for equipment and make bearing surface smooth.

C. Provide lateral bracing, to prevent swaying, for equipment supports.

D. Concrete housekeeping bases will be provided as work of Division 03. Furnish to Contractor scaled layouts of all required bases, with dimensions of base, and location to column center lines. Furnish templates, anchor bolts, and accessories necessary for base construction.

E. Provide concrete housekeeping bases for all floor mounted equipment furnished as part of the work of Division 15. Size bases to extend minimum of 4" beyond equipment base in any direction; and 4" above finished floor elevation. Construct of reinforced concrete, roughen floor slab beneath base for bond, and provide steel rod anchors between floor and base. Locate anchor bolts using equipment manufacturer's templates. Chamfer top and edge corners.

3.3 METAL FABRICATIONS

A. Cut, drill, and fit miscellaneous metal fabrications for trapeze pipe hangers and equipment supports.

B. Fit exposed connections together to form hairline joints. Field weld connections that cannot be shop welded because of shipping size limitations.

C. Field Welding: Comply with AWS D1.1/D1.1M procedures for shielded, metal arc welding; appearance and quality of welds; and methods used in correcting welding work; and with the following:

1. Use materials and methods that minimize distortion and develop strength and corrosion resistance of base metals.
2. Obtain fusion without undercut or overlap.
3. Remove welding flux immediately.
4. Finish welds at exposed connections so no roughness shows after finishing and so contours of welded surfaces match adjacent contours.

3.4 ADJUSTING

A. Hanger Adjustments: Adjust hangers to distribute loads equally on attachments and to achieve indicated slope of pipe.

B. Trim excess length of continuous-thread hanger and support rods to 1-1/2 inches.

3.5 PAINTING

A. Touchup: Clean field welds and abraded areas of shop paint. Paint exposed areas immediately after erecting hangers and supports. Use same materials as used for shop painting. Comply with SSPC-PA 1 requirements for touching up field-painted surfaces.

1. Apply paint by brush or spray to provide a minimum dry film thickness of 2.0 mils

B. Touchup: Clean and touchup paint of field welds, bolted connections, and abraded areas of shop paint on miscellaneous metal.

C. Galvanized Surfaces: Clean welds, bolted connections, and abraded areas and apply galvanizing-repair paint to comply with ASTM A 780.

3.6 HANGER AND SUPPORT SCHEDULE

A. Specific hanger and support requirements are in Sections specifying piping systems and equipment.

B. Comply with MSS SP-69 for pipe-hanger selections and applications that are not specified in piping system Sections.

C. Use hangers and supports with galvanized metallic coatings for piping and equipment that will not have field-applied finish.

D. Use nonmetallic coatings on attachments for electrolytic protection where attachments are in direct contact with copper tubing.

E. Use carbon-steel pipe hangers and supports and metal trapeze pipe hangers and attachments for general service applications.

F. Use stainless-steel pipe hangers and stainless-steel or corrosion-resistant attachments for hostile environment applications.

G. Use copper-plated pipe hangers and copper or stainless-steel attachments for copper piping and tubing.

H. Use padded hangers for piping that is subject to scratching.

I. Use thermal-hanger shield inserts for insulated piping and tubing.

J. Horizontal-Piping Hangers and Supports: Unless otherwise indicated and except as specified in piping system Sections, install the following types:

1. Adjustable, Steel Clevis Hangers (MSS Type 1): For suspension of noninsulated or insulated, stationary pipes NPS 1/2 to NPS 30.
2. Adjustable, Steel Band Hangers (MSS Type 7): For suspension of noninsulated, stationary pipes NPS 1/2 to NPS 8.
3. U-Bolts (MSS Type 24): For support of heavy pipes NPS 1/2 to NPS 30.
4. Pipe Saddle Supports (MSS Type 36): For support of pipes NPS 4 to NPS 36, with steel-pipe base stanchion support and cast-iron floor flange or carbon-steel plate.
5. Pipe Stanchion Saddles (MSS Type 37): For support of pipes NPS 4 to NPS 36, with steel-pipe base stanchion support and cast-iron floor flange or carbon-steel plate, and with U-bolt to retain pipe.
6. Single-Pipe Rolls (MSS Type 41): For suspension of pipes NPS 1 to NPS 30, from two rods if longitudinal movement caused by expansion and contraction might occur.
7. Complete Pipe Rolls (MSS Type 44): For support of pipes NPS 2 to NPS 42 if longitudinal movement caused by expansion and contraction might occur but vertical adjustment is not necessary.

K. Vertical-Piping Clamps: Unless otherwise indicated and except as specified in piping system Sections, install the following types:

1. Extension Pipe or Riser Clamps (MSS Type 8): For support of pipe risers NPS 3/4 to NPS 24.
2. Carbon- or Alloy-Steel Riser Clamps (MSS Type 42): For support of pipe risers NPS 3/4 to NPS 24 if longer ends are required for riser clamps.

L. Hanger-Rod Attachments: Unless otherwise indicated and except as specified in piping system Sections, install the following types:

1. Steel Turnbuckles (MSS Type 13): For adjustment up to 6 inches for heavy loads.
2. Steel Clevises (MSS Type 14): For 120 to 450 deg F piping installations.

M. Building Attachments: Unless otherwise indicated and except as specified in piping system Sections, install the following types:

1. Steel or Malleable Concrete Inserts (MSS Type 18): For upper attachment to suspend pipe hangers from concrete ceiling.

2. Top-Beam C-Clamps (MSS Type 19): For use under roof installations with bar-joist construction, to attach to top flange of structural shape.
3. Side-Beam or Channel Clamps (MSS Type 20): For attaching to bottom flange of beams, channels, or angles.
4. Center-Beam Clamps (MSS Type 21): For attaching to center of bottom flange of beams.
5. Welded Beam Attachments (MSS Type 22): For attaching to bottom of beams if loads are considerable and rod sizes are large.
6. C-Clamps (MSS Type 23): For structural shapes.
7. 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.

N. Saddles and Shields: Unless otherwise indicated and except as specified in piping system Sections, install the following types:

1. Steel-Pipe-Covering Protection Saddles (MSS Type 39): To fill interior voids with insulation that matches adjoining insulation.
2. Protection Shields (MSS Type 40): Of length recommended in writing by manufacturer to prevent crushing insulation.
3. Thermal-Hanger Shield Inserts: For supporting insulated pipe.

O. Spring Hangers and Supports: Unless otherwise indicated and except as specified in piping system Sections, install the following types:

1. Spring Cushions (MSS Type 48): For light loads if vertical movement does not exceed 1-1/4 inches.
2. Spring-Cushion Roll Hangers (MSS Type 49): For equipping Type 41, roll hanger with springs.
3. Variable-Spring Base Supports (MSS Type 52): Preset to indicated load and limit variability factor to 25 percent to allow expansion and contraction of piping system from base support.

P. Comply with MSS SP-69 for trapeze pipe-hanger selections and applications that are not specified in piping system Sections.

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

END OF SECTION 23 05 29

SECTION 23 05 48 - VIBRATION CONTROLS FOR HVAC PIPING AND EQUIPMENT

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. This Section includes the following:

1. Isolation pads.
2. Isolation mounts.
3. Restrained elastomeric isolation mounts.
4. Freestanding and restrained spring isolators.
5. Housed spring mounts.
6. Elastomeric hangers.
7. Spring hangers.
8. Spring hangers with vertical-limit stops.
9. Pipe riser resilient supports.
10. Resilient pipe guides.
11. Restrained vibration isolation roof-curb rails.

1.3 DEFINITIONS

A. IBC: International Building Code.

B. FBC: Florida Building Code

C. ICC-ES: ICC-Evaluation Service.

1.4 PERFORMANCE REQUIREMENTS

A. Wind-Restraint Loading:

1. Basic Wind Speed and Building Classification Category as defined in Structural design documents.
2. Minimum 10 lb/sq. ft. multiplied by the maximum area of the HVAC component projected on a vertical plane that is normal to the wind direction, and 45 degrees either side of normal.

1.5 ACTION SUBMITTALS

A. Product Data: For the following:

1. Include rated load, rated deflection, and overload capacity for each vibration isolation device.

B. Delegated-Design Submittal: For vibration isolation details indicated to comply with performance requirements and design criteria, including analysis data signed and sealed by the qualified professional engineer responsible for their preparation.

1. Design Calculations: Calculate static and dynamic loading due to equipment weight and operation, and wind forces required to select vibration isolators, wind restraints, and for designing vibration isolation bases.

a. Coordinate design calculations with wind load calculations required for equipment mounted outdoors. Comply with requirements in other Sections for equipment mounted outdoors.

2. Riser Supports: Include riser diagrams and calculations showing anticipated expansion and contraction at each support point, initial and final loads on building structure, and spring deflection changes. Include certification that riser system has been examined for excessive stress and that none will exist.
3. Vibration Isolation Base Details: Detail overall dimensions, including anchorages and attachments to structure and to supported equipment. Include auxiliary motor slides and rails, base weights, equipment static loads, power transmission, component misalignment, and cantilever loads.

1.6 INFORMATIONAL SUBMITTALS

A. Qualification Data: For professional engineer and testing agency.

B. Welding certificates.

C. Field quality-control test reports.

1.7 QUALITY ASSURANCE

A. Testing Agency Qualifications: An independent agency, with the experience and capability to conduct the testing indicated, that is a nationally recognized testing laboratory (NRTL) as defined by OSHA in 29 CFR 1910.7, and that is acceptable to authorities having jurisdiction.

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

PART 2 - PRODUCTS

2.1 VIBRATION ISOLATORS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Ace Mountings Co., Inc.
2. Amber/Booth Company, Inc.
3. California Dynamics Corporation.
4. Isolation Technology, Inc.
5. Kinetics Noise Control.
6. Mason Industries.
7. Vibration Eliminator Co., Inc.
8. Vibration Mountings & Controls, Inc.

B. Pads: Arranged in single or multiple layers of sufficient stiffness for uniform loading over pad area, molded with a nonslip pattern and galvanized-steel baseplates, and factory cut to sizes that match requirements of supported equipment.

1. Resilient Material: Oil- and water-resistant neoprene.

C. Mounts: Double-deflection type, with molded, oil-resistant rubber, hermetically sealed compressed fiberglass, or neoprene isolator elements with factory-drilled, encapsulated top plate for bolting to equipment and with baseplate for bolting to structure. Color-code or otherwise identify to indicate capacity range.

1. Materials: Cast-ductile-iron or welded steel housing containing two separate and opposing, oil-resistant rubber or neoprene elements that prevent central threaded element and attachment hardware from contacting the housing during normal operation.
2. Neoprene: Shock-absorbing materials compounded according to the standard for bridge-bearing neoprene as defined by AASHTO.

D. Spring Isolators: Freestanding, laterally stable, open-spring isolators.

1. Outside Spring Diameter: Not less than 80 percent of the compressed height of the spring at rated load.
2. Minimum Additional Travel: 50 percent of the required deflection at rated load.
3. Lateral Stiffness: More than 80 percent of rated vertical stiffness.
4. Overload Capacity: Support 200 percent of rated load, fully compressed, without deformation or failure.
5. Baseplates: Factory drilled for bolting to structure and bonded to 1/4-inch thick, rubber isolator pad attached to baseplate underside. Baseplates shall limit floor load to 500 psig.
6. Top Plate and Adjustment Bolt: Threaded top plate with adjustment bolt and cap screw to fasten and level equipment.

E. Restrained Spring Isolators: Freestanding, steel, open-spring isolators with limit-stop restraint.

1. Housing: Steel with resilient vertical-limit stops to prevent spring extension due to weight being removed; factory-drilled baseplate bonded to 1/4-inch thick, neoprene or

rubber isolator pad attached to baseplate underside; and adjustable equipment mounting and leveling bolt that acts as blocking during installation.
2. Restraint: Limit stop as required for equipment and authorities having jurisdiction.
3. Outside Spring Diameter: Not less than 80 percent of the compressed height of the spring at rated load.
4. Minimum Additional Travel: 50 percent of the required deflection at rated load.
5. Lateral Stiffness: More than 80 percent of rated vertical stiffness.
6. Overload Capacity: Support 200 percent of rated load, fully compressed, without deformation or failure.

F. Elastomeric Hangers: Single or double-deflection type, fitted with molded, oil-resistant elastomeric isolator elements bonded to steel housings with threaded connections for hanger rods. Color-code or otherwise identify to indicate capacity range.

G. Spring Hangers: Combination coil-spring and elastomeric-insert hanger with spring and insert in compression.

1. Frame: Steel, fabricated for connection to threaded hanger rods and to allow for a maximum of 30 degrees of angular hanger-rod misalignment without binding or reducing isolation efficiency.
2. Outside Spring Diameter: Not less than 80 percent of the compressed height of the spring at rated load.
3. Minimum Additional Travel: 50 percent of the required deflection at rated load.
4. Lateral Stiffness: More than 80 percent of rated vertical stiffness.
5. Overload Capacity: Support 200 percent of rated load, fully compressed, without deformation or failure.
6. Elastomeric Element: Molded, oil-resistant rubber or neoprene. Steel-washer-reinforced cup to support spring and bushing projecting through bottom of frame.
7. Self-centering hanger rod cap to ensure concentricity between hanger rod and support spring coil.

H. Spring Hangers with Vertical-Limit Stop: Combination coil-spring and elastomeric-insert hanger with spring and insert in compression and with a vertical-limit stop.

1. Frame: Steel, fabricated for connection to threaded hanger rods and to allow for a maximum of 30 degrees of angular hanger-rod misalignment without binding or reducing isolation efficiency.
2. Outside Spring Diameter: Not less than 80 percent of the compressed height of the spring at rated load.
3. Minimum Additional Travel: 50 percent of the required deflection at rated load.
4. Lateral Stiffness: More than 80 percent of rated vertical stiffness.
5. Overload Capacity: Support 200 percent of rated load, fully compressed, without deformation or failure.
6. Elastomeric Element: Molded, oil-resistant rubber or neoprene.
7. Adjustable Vertical Stop: Steel washer with neoprene washer "up-stop" on lower threaded rod.
8. Self-centering hanger rod cap to ensure concentricity between hanger rod and support spring coil.

I. Pipe Riser Resilient Support: All-directional, acoustical pipe anchor consisting of 2 steel tubes separated by a minimum of 1/2-inch- thick neoprene. Include steel and neoprene vertical-limit

stops arranged to prevent vertical travel in both directions. Design support for a maximum load on the isolation material of 500 psig (3.45 MPa) and for equal resistance in all directions.

J. Resilient Pipe Guides: Telescopic arrangement of 2 steel tubes or post and sleeve arrangement separated by a minimum of 1/2-inch- thick neoprene. Where clearances are not readily visible, a factory-set guide height with a shear pin to allow vertical motion due to pipe expansion and contraction shall be fitted. Shear pin shall be removable and reinsertable to allow for selection of pipe movement. Guides shall be capable of motion to meet location requirements.

2.2 RESTRAINED VIBRATION ISOLATION ROOF-CURB RAILS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Amber/Booth Company, Inc.
2. California Dynamics Corporation.
3. Isolation Technology, Inc.
4. Kinetics Noise Control.
5. Mason Industries.
6. Thybar Corporation.
7. Vibration Eliminator Co., Inc.
8. Vibration Mountings & Controls, Inc.

B. General Requirements for Restrained Vibration Isolation Roof-Curb Rails: Factory-assembled, fully enclosed, insulated, air- and watertight curb rail designed to resiliently support equipment and to withstand wind forces.

C. Lower Support Assembly: Formed sheet-metal section containing adjustable and removable steel springs that support upper frame. Upper frame shall provide continuous support for equipment and shall be captive to resiliently resist wind forces. Lower support assembly shall have a means for attaching to building structure and a wood nailer for attaching roof materials, and shall be insulated with a minimum of 2 inches (50 mm) of rigid, glass-fiber insulation on inside of assembly.

D. Spring Isolators: Adjustable, restrained spring isolators shall be mounted on 1/4-inch- (6-mm-) thick, elastomeric vibration isolation pads and shall have access ports, for level adjustment, with removable waterproof covers at all isolator locations. Isolators shall be located so they are accessible for adjustment at any time during the life of the installation without interfering with the integrity of the roof.

1. Restrained Spring Isolators: Freestanding, steel, open-spring isolators with wind restraint.

    a. Housing: Steel with resilient vertical-limit stops and adjustable equipment mounting and leveling bolt.
    b. Outside Spring Diameter: Not less than 80 percent of the compressed height of the spring at rated load.
    c. Minimum Additional Travel: 50 percent of the required deflection at rated load.
    d. Lateral Stiffness: More than 80 percent of rated vertical stiffness.

e. Overload Capacity: Support 200 percent of rated load, fully compressed, without deformation or failure.

2. Pads: Arranged in single or multiple layers of sufficient stiffness for uniform loading over pad area, molded with a nonslip pattern and galvanized-steel baseplates, and factory cut to sizes that match requirements of supported equipment.

a. Resilient Material: Oil- and water-resistant standard neoprene.

E. Snubber Bushings: All-directional, elastomeric snubber bushings at least 1/4 inch (6 mm) thick.

F. Water Seal: Galvanized sheet metal with EPDM seals at corners, attached to upper support frame, extending down past wood nailer of lower support assembly, and counterflashed over roof materials.

2.3 VIBRATION ISOLATION EQUIPMENT BASES

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Amber/Booth Company, Inc.
2. California Dynamics Corporation.
3. Isolation Technology, Inc.
4. Kinetics Noise Control.
5. Mason Industries.
6. Vibration Eliminator Co., Inc.
7. Vibration Mountings & Controls, Inc.

B. Inertia Base: Factory-fabricated, welded, structural-steel bases and rails ready for placement of cast-in-place concrete.

1. Design Requirements: Lowest possible mounting height with not less than 1-inch (25-mm) clearance above the floor. Include equipment anchor bolts and auxiliary motor slide bases or rails.

a. Include supports for suction and discharge elbows for pumps.

2. Structural Steel: Steel shapes, plates, and bars complying with ASTM A 36/A 36M. Bases shall have shape to accommodate supported equipment.
3. Support Brackets: Factory-welded steel brackets on frame for outrigger isolation mountings and to provide for anchor bolts and equipment support.
4. Fabrication: Fabricate steel templates to hold equipment anchor-bolt sleeves and anchors in place during placement of concrete. Obtain anchor-bolt templates from supported equipment manufacturer.

2.4 FACTORY FINISHES

A. Finish: Manufacturer's standard prime-coat finish ready for field painting.

B. Finish: Manufacturer's standard paint applied to factory-assembled and -tested equipment before shipping.

1. Powder coating on springs and housings.
2. All hardware shall be galvanized. Hot-dip galvanize metal components for exterior use.
3. Baked enamel or powder coat for metal components on isolators for interior use.
4. Color-code or otherwise mark vibration isolation and wind-control devices to indicate capacity range.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine areas and equipment to receive vibration isolation and wind-control devices for compliance with requirements for installation tolerances and other conditions affecting performance.

B. Examine roughing-in of reinforcement and cast-in-place anchors to verify actual locations before installation.

C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 APPLICATIONS

A. Multiple Pipe Supports: Secure pipes to trapeze member with clamps approved for application by an evaluation service member of ICC-ES.

3.3 VIBRATION-CONTROL DEVICE INSTALLATION

A. Piping Restraints:

1. Comply with requirements in MSS SP-127.
2. Space lateral supports a maximum of 40 feet o.c., and longitudinal supports a maximum of 80 feet o.c.
3. Brace a change of direction longer than 12 feet.

B. Install cables so they do not bend across edges of adjacent equipment or building structure.

C. Install bushing assemblies for anchor bolts for floor-mounted equipment, arranged to provide resilient media between anchor bolt and mounting hole in concrete base.

D. Install bushing assemblies for mounting bolts for wall-mounted equipment, arranged to provide resilient media where equipment or equipment-mounting channels are attached to wall.

E. Attachment to Structure: If specific attachment is not indicated, anchor bracing to structure at flanges of beams, at upper truss chords of bar joists, or at concrete members.

F. Drilled-in Anchors:

1. Identify position of reinforcing steel and other embedded items prior to drilling holes for anchors. Do not damage existing reinforcing or embedded items during coring or drilling. Notify the structural engineer if reinforcing steel or other embedded items are encountered during drilling. Locate and avoid prestressed tendons, electrical and telecommunications conduit, and gas lines.
2. Do not drill holes in concrete or masonry until concrete, mortar, or grout has achieved full design strength.
3. Wedge Anchors: Protect threads from damage during anchor installation. Heavy-duty sleeve anchors shall be installed with sleeve fully engaged in the structural element to which anchor is to be fastened.
4. Adhesive Anchors: Clean holes to remove loose material and drilling dust prior to installation of adhesive. Place adhesive in holes proceeding from the bottom of the hole and progressing toward the surface in such a manner as to avoid introduction of air pockets in the adhesive.
5. Set anchors to manufacturer's recommended torque, using a torque wrench.
6. Install zinc-coated steel anchors for interior and stainless-steel anchors for exterior applications.

3.4 FIELD QUALITY CONTROL

A. Testing Agency: Engage a qualified testing agency to perform tests and inspections.

B. Perform tests and inspections.

C. Tests and Inspections:

1. Provide evidence of recent calibration of test equipment by a testing agency acceptable to authorities having jurisdiction.
2. Schedule test with Owner, through Architect, before connecting anchorage device to restrained component (unless postconnection testing has been approved), and with at least seven days' advance notice.
3. Obtain Architect's approval before transmitting test loads to structure. Provide temporary load-spreading members.
4. Test at least four of each type and size of installed anchors and fasteners selected by Architect.
5. Test to 90 percent of rated proof load of device.
6. Measure isolator restraint clearance.
7. Measure isolator deflection.
8. Verify snubber minimum clearances.
9. If a device fails test, modify all installations of same type and retest until satisfactory results are achieved.

D. Remove and replace malfunctioning units and retest as specified above.

E. Prepare test and inspection reports.

3.5 ADJUSTING

A. Adjust isolators after piping system is at operating weight.

B. Adjust limit stops on restrained spring isolators to mount equipment at normal operating height. After equipment installation is complete, adjust limit stops so they are out of contact during normal operation.

C. Adjust active height of spring isolators.

D. Adjust restraints to permit free movement of equipment within normal mode of operation.

3.6 DEMONSTRATION

A. Engage a factory-authorized service representative to train Owner's maintenance personnel to adjust, operate, and maintain air-mounting systems.

END OF SECTION 23 05 48

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SECTION 23 05 53 – IDENTIFICATION FOR HVAC PIPING AND EQUIPMENT

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. Section Includes:

1. Equipment labels.
2. Warning signs and labels.
3. Pipe labels.
4. Stencils.
5. Valve tags.
6. Warning tags.

1.3 ACTION SUBMITTALS

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

B. Samples: For color, letter style, and graphic representation required for each identification material and device.

C. Equipment Label Schedule: Include a listing of all equipment to be labeled with the proposed content for each label.

D. Valve numbering scheme.

E. Valve Schedules: For each piping system to include in maintenance manuals.

1.4 COORDINATION

A. Coordinate installation of identifying devices with completion of covering and painting of surfaces where devices are to be applied.

B. Coordinate installation of identifying devices with locations of access panels and doors.

C. Install identifying devices before installing acoustical ceilings and similar concealment.

PART 2 - PRODUCTS

2.1 EQUIPMENT LABELS

A. Labels for Indoor Equipment:

1. Material and Thickness: Phenolic with black background, and having predrilled or stamped holes for attachment hardware.
2. Minimum Label Size: Length and width vary for required label content, but not less than 2-1/2 by 3/4 inch.
3. Minimum Letter Size: 1/4 inch for name of units if viewing distance is less than 24 inches, 1/2 inch for viewing distances up to 72 inches, and proportionately larger lettering for greater viewing distances. Include secondary lettering two-thirds to three-fourths the size of principal lettering.
4. Fasteners: Stainless-steel rivets or self-tapping screws.
5. Provide label on the ceiling grid where the equipment or isolation valve is located.

B. Labels for Outdoor Equipment:

1. Material and Thickness: Phenolic with black background, and having predrilled or stamped holes for attachment hardware.
2. Minimum Label Size: Length and width vary for required label content, but not less than 3 by 1-1/2 inch.
3. Minimum Letter Size: 1/2 inch for viewing distances up to 72 inches, and proportionately larger lettering for greater viewing distances. Include secondary lettering two-thirds to three-fourths the size of principal lettering. White background.
4. Fasteners: Stainless-steel rivets or self-tapping screws.

C. Label Content: Include equipment's Drawing designation or unique equipment number, Drawing numbers where equipment is indicated (plans, details, and schedules).

D. Equipment Label Schedule: For each item of equipment to be labeled, on 8-1/2-by-11-inch (A4) bond paper. Tabulate equipment identification number and identify Drawing numbers where equipment is indicated (plans, details, and schedules), plus the Specification Section number and title where equipment is specified. Equipment schedule shall be included in operation and maintenance data.

2.2 WARNING SIGNS AND LABELS

A. Material and Thickness: Multilayer, multicolor, plastic labels for mechanical engraving, 1/8 inch thick, and having predrilled holes for attachment hardware.

B. Letter Color: White.

C. Background Color: Red.

D. Maximum Temperature: Able to withstand temperatures up to 160 deg F.

E. Minimum Label Size: Length and width vary for required label content, but not less than 2-1/2 by 3/4 inch.

F. Minimum Letter Size: 1/4 inch for name of units if viewing distance is less than 24 inches, 1/2 inch for viewing distances up to 72 inches, and proportionately larger lettering for greater viewing distances. Include secondary lettering two-thirds to three-fourths the size of principal lettering.

G. Fasteners: Stainless-steel rivets or self-tapping screws.

H. Label Content: Include caution and warning information, plus emergency notification instructions.

2.3 PIPE LABELS

A. General Requirements for Manufactured Pipe Labels: Preprinted, color-coded, with lettering indicating service, and showing flow direction.

B. Self-Adhesive Pipe Labels: Printed plastic with contact-type, permanent-adhesive backing.

C. Pipe Label Contents: Include identification of piping service using same designations or abbreviations as used on Drawings, pipe size, and an arrow indicating flow direction.

1. Flow-Direction Arrows: Integral with piping system service lettering to accommodate both directions, or as separate unit on each pipe label to indicate flow direction.
2. Lettering Size: At least 1-1/2 inches high.
3. Nomenclature: Large-size primary caption such as “CHILLED WATER SUPPLY,” “CHILLED WATER RETURN,” “HOT WATER SUPPLY,” “HOT WATER RETURN,” “CONDENSER WATER SUPPLY,” “CONDENSER WATER RETURN,” “GAS,” or “MAKE-UP WATER”.

2.4 STENCILS

A. Stencils: Prepared with letter sizes according to ASME A13.1 for piping; minimum letter height of 1-1/4 inches for ducts.

1. Stencil Material: Aluminum.
2. Stencil Paint: Exterior, gloss, black unless otherwise indicated. Paint may be in pressurized spray-can form.
3. Identification Paint: Exterior, in colors according to ASME A13.1 unless otherwise indicated.

2.5 VALVE TAGS

A. Valve Tags: Stamped or engraved with 1/4-inch letters for piping system abbreviation and 1/2-inch numbers.

1. Tag Material: Stainless steel, 0.025-inch minimum thickness, and having predrilled or stamped holes for attachment hardware.
2. Fasteners: Brass beaded chain.

B. Valve Schedules: For each piping system, on 8-1/2-by-11-inch (A4) bond paper. Tabulate valve number, piping system, system abbreviation (as shown on valve tag), location of valve (room or space), normal-operating position (open, closed, or modulating), and variations for identification. Mark valves for emergency shutoff and similar special uses.

1. Valve-tag schedule shall be included in operation and maintenance data.

2.6 WARNING TAGS

A. Warning Tags: Preprinted or partially preprinted, accident-prevention tags, of plasticized card stock with matte finish suitable for writing.

1. Size: 3 by 5-1/4 inches minimum.
2. Fasteners: Brass grommet and wire.
3. Nomenclature: Large-size primary caption such as "DANGER," "CAUTION," or "DO NOT OPERATE."
4. Color: Yellow background with black lettering.

PART 3 - EXECUTION

3.1 PREPARATION

A. Clean piping and equipment surfaces of substances that could impair bond of identification devices, including dirt, oil, grease, release agents, and incompatible primers, paints, and encapsulants.

3.2 EQUIPMENT LABEL INSTALLATION

A. Install or permanently fasten labels on each major item of mechanical equipment.

B. Locate equipment labels where accessible and visible.

3.3 PIPE LABEL INSTALLATION

A. Piping Color-Coding: Painting of piping is specified in Section "Interior Painting"

B. Locate pipe labels where piping is exposed or above accessible ceilings in finished spaces; machine rooms; accessible maintenance spaces such as shafts, tunnels, and plenums; and exterior exposed locations as follows:

1. Near each valve and control device.
2. Near each branch connection, excluding short takeoffs for fixtures and terminal units. Where flow pattern is not obvious, mark each pipe at branch.

3. Near penetrations through walls, floors, ceilings, and inaccessible enclosures.
4. At access doors, manholes, and similar access points that permit view of concealed piping.
5. Near major equipment items and other points of origination and termination.
6. Spaced at maximum intervals of 50 feet along each run. Reduce intervals to 25 feet in areas of congested piping and equipment or in concealed spaces.
7. Pipe stenciling or painting of piping identification is NOT permitted.

C. Pipe Label Color Schedule:

1. Chilled-Water Piping:

   a. Background Color: Green.
   b. Letter Color: White.

2. Condenser-Water Piping:

   a. Background Color: Green.
   b. Letter Color: White.

3. Heating Water Piping:

   a. Background Color: Yellow.
   b. Letter Color: Black.

4. Refrigerant Piping:

   a. Background Color: Yellow.
   b. Letter Color: Black.

5. Gas Piping:

   a. Background Color: Yellow.
   b. Letter Color: Black.

6. Domestic Make-up Piping:

   a. Background Color: Blue.
   b. Letter Color: White.

3.4 DUCT LABEL INSTALLATION

A. Stenciled Duct Label: Stenciled labels, showing service and flow direction.

B. Locate labels near points where ducts enter into concealed spaces and at maximum intervals of 50 feet in each space where ducts are exposed or concealed by removable ceiling system.

3.5 VALVE-TAG INSTALLATION

A. Install tags on valves and control devices in piping systems, except check valves; valves within factory-fabricated equipment units; shutoff valves; faucets; convenience and lawn-watering hose connections; and HVAC terminal devices and similar roughing-in connections of end-use fixtures and units. List tagged valves in a valve schedule.

B. Valve-Tag Application Schedule: Tag valves according to size, shape, and color scheme and with captions similar to those indicated in the following subparagraphs:

1. Valve-Tag Size and Shape:

    a. Chilled Water: 1-1/2 inches, round.
    b. Condenser Water: 1-1/2 inches, round.
    c. Refrigerant: 1-1/2 inches, round.
    d. Hot Water: 1-1/2 inches, round.
    e. Gas: 1-1/2 inches, round.

2. Valve-Tag Color:

    a. Chilled Water: Green.
    b. Condenser Water: Green.
    c. Refrigerant: Yellow.
    d. Hot Water: Yellow.
    e. Gas: Yellow.

3. Letter Color:

    a. Chilled Water: White.
    b. Condenser Water: White.
    c. Refrigerant: Black.
    d. Hot Water: Black.
    e. Gas: Black.

3.6 WARNING-TAG INSTALLATION

A. Write required message on, and attach warning tags to, equipment and other items where required.

END OF SECTION 23 05 53

SECTION 23 05 93 - TESTING, ADJUSTING, AND BALANCING FOR HVAC

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

B. All Test and Balance work shall be performed by one of the following contractor under separate contract agreement with the school district.

1. Southern Balance, Inc.
2. Baldwin Air Design, Inc.

C. Contractor shall coordinate with tab contractor for all required tab activities. This include but not limiting to:
1. Inform the TAB contractor when the ductwork systems are installed for duct leakage test.
2. Inform the TAB contractor when the mechanical systems are completely installed and working properly for TAB process.
3. Repair or replace defective equipment and calibration of equipment as necessary where pointed out by the test and balance contractor (e.g. changing fan motor sheaves or change dirty filters as directed by the test and balance contractor to obtain proper air quantities).
4. Assist the tab to complete all required preliminary test and balance reports and final test and balance reports.
5. Install all specified dampers, P/T ports, temp/pressure gauges, balancing valves, circuit setters, flow meters, and other work required by the construction drawings.

D. The school district selected TAB contractor shall invoice the school district directly for test and balance activities. The TAB contractor shall work for the contractor as their sub-contractor. The contractor shall be responsible for the project completion date to meet project requirements.

E. Preliminary test and balance report shall be given to the engineer of record 7 days prior to the substantial completion.

F. Prior to final completion inspection, the contractor shall complete all TAB punchlist. All re-testing needs to be completed and final report need to be given to the Engineer of Record 7 days prior to final completion.

1.2 SUMMARY

A. All Test and Balance (TAB) work shall be performed to satisfy project requirements. The Contractor for this project shall coordinate with the Test and Balance contractor.

B. The Contractor shall provide coordination that include, but not be limited to informing the Test and Balance contractor when all mechanical systems are installed and working properly, repairing or replacing all defects in the HVAC systems, replacing defective equipment and

calibration of equipment as necessary where pointed out by the Test and Balance contractor. Work shall also include changing of motor sheaves as directed by the Test and Balance contractor to obtain proper air quantities.

C. The Contractor shall install all specified gauges, balancing valves, dampers, and other work required by the Contract Documents. The Contractor shall change all dirty filters where directed by the Test and Balance contractor or by the Commissioning Agent.

D. The following requirements will be performed by a Test and Balance contractor and are listed for informational purposes for the general and mechanical contractor's use.

E. Extent of testing, adjusting, and balancing work (TAB) is indicated by requirements of this section, and also by drawings and schedules, and is defined to include, but is not necessarily limited to, air distribution systems, hydronic distribution systems and associated equipment and apparatus of mechanical work. The work consists of setting speed and volume (flow) adjusting facilities provided for systems, recording data, conducting tests, preparing and submitting reports, and recommending modifications to work as required.

F. Coordination: The Contractor shall be responsible for the HVAC system installation as required to complete the TAB work.

G. Section Includes:

1. Balancing Air Systems:

   a. Constant-volume air systems.
   b. Variable-air-volume systems.

2. Balancing Hydronic Piping Systems:

   a. Constant-flow hydronic systems.
   b. Variable-flow hydronic systems.

1.3 DEFINITIONS

A. AABC: Associated Air Balance Council.

B. NEBB: National Environmental Balancing Bureau.

C. TAB: Testing, adjusting, and balancing.

D. TABB: Testing, Adjusting, and Balancing Bureau.

E. TAB Specialist: An entity engaged to perform TAB Work.

1.4 INFORMATIONAL SUBMITTALS

A. Strategies and Procedures Plan: Within 30 days of Contractor's Notice to Proceed, submit TAB strategies and step-by-step procedures as specified in "Preparation" Article.

B. Certified TAB reports.

1.5 QUALITY ASSURANCE

A. TAB Contractor Qualifications: Engage a TAB entity certified by AABC or NEBB.

1. TAB Field Supervisor: Employee of the TAB contractor and certified by AABC or NEBB
2. TAB Technician: Employee of the TAB contractor and who is certified by AABC or NEBB as a TAB technician.

B. Certify TAB field data reports and perform the following:

1. Review field data reports to validate accuracy of data and to prepare certified TAB reports.
2. Certify that the TAB team complied with the approved TAB plan and the procedures specified and referenced in this Specification.

C. TAB Report Forms: Use standard TAB contractor's forms approved by Architect.

D. Instrumentation Type, Quantity, Accuracy, and Calibration: As described in ASHRAE 111, Section 5, "Instrumentation."

E. ASHRAE Compliance: Applicable requirements in ASHRAE 62.1, Section 7.2.2 - "Air Balancing."

F. ASHRAE/IESNA Compliance: Applicable requirements in ASHRAE/IESNA 90.1, Section 6.7.2.3 - "System Balancing."

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.

B. Examine systems for installed balancing devices, such as test ports, gage cocks, thermometer wells, flow-control devices, balancing valves and fittings, and manual volume dampers. Verify that locations of these balancing devices are accessible.

C. Examine the approved submittals for HVAC systems and equipment.

D. Examine design data including HVAC system descriptions, statements of design assumptions for environmental conditions and systems' output, and statements of philosophies and assumptions about HVAC system and equipment controls.

E. Examine equipment performance data including fan and pump curves.

1. Relate performance data to Project conditions and requirements, including system effects that can create undesired or unpredicted conditions that cause reduced capacities in all or part of a system.
2. Calculate system-effect factors to reduce performance ratings of HVAC equipment when installed under conditions different from the conditions used to rate equipment performance. To calculate system effects for air systems, use tables and charts found in AMCA 201, "Fans and Systems," or in SMACNA's "HVAC Systems - Duct Design." Compare results with the design data and installed conditions.

F. Examine system and equipment installations and verify that field quality-control testing, cleaning, and adjusting specified in individual Sections have been performed.

G. Examine test reports specified in individual system and equipment Sections.

H. Examine HVAC equipment and filters and verify that bearings are greased, belts are aligned and tight, and equipment with functioning controls is ready for operation.

I. Examine terminal units, such as variable-air-volume boxes, and verify that they are accessible and their controls are connected and functioning.

J. Examine strainers. Verify that startup screens are replaced by permanent screens with indicated perforations.

K. Examine three-way valves for proper installation for their intended function of diverting or mixing fluid flows.

L. Examine heat-transfer coils for correct piping connections and for clean and straight fins.

M. Examine system pumps to ensure absence of entrained air in the suction piping.

N. Examine operating safety interlocks and controls on HVAC equipment.

O. Report deficiencies discovered before and during performance of TAB procedures. Observe and record system reactions to changes in conditions. Record default set points if different from indicated values.

3.2 PREPARATION

A. Prepare a TAB plan that includes strategies and step-by-step procedures.

B. Complete system-readiness checks and prepare reports. Verify the following:

1. Permanent electrical-power wiring is complete.
2. Hydronic systems are filled, clean, and free of air.
3. Automatic temperature-control systems are operational.
4. Equipment and duct access doors are securely closed.
5. Balance dampers are open.
6. Isolating and balancing valves are open and control valves are operational.

3.3 GENERAL PROCEDURES FOR TESTING AND BALANCING

A. Perform testing and balancing procedures on each system according to the procedures contained in AABC's "National Standards for Total System Balance", NEBB's "Procedural Standards for Testing, Adjusting, and Balancing of Environmental Systems" and in this Section.

1. Comply with requirements in ASHRAE 62.1, Section 7.2.2 - "Air Balancing."

B. Cut insulation, ducts, pipes, and equipment cabinets for installation of test probes to the minimum extent necessary for TAB procedures.

1. After testing and balancing, patch probe holes in ducts with same material and thickness as used to construct ducts.
2. Install and join new insulation that matches removed materials. Restore insulation, coverings, vapor barrier, and finish according to Section "Duct Insulation," Section "HVAC Equipment Insulation," Section "HVAC Piping Insulation."

C. Mark equipment and balancing devices, including damper-control positions, valve position indicators, fan-speed-control levers, and similar controls and devices, with paint or other suitable, permanent identification material to show final settings.

D. Take and report testing and balancing measurements in inch-pound (IP) units.

3.4 GENERAL PROCEDURES FOR BALANCING AIR SYSTEMS

A. Prepare test reports for both fans and outlets. Obtain manufacturer's outlet factors and recommended testing procedures. Crosscheck the summation of required outlet volumes with required fan volumes.

B. Prepare schematic diagrams of systems' "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.

G. Check for airflow blockages.

H. Check condensate drains for proper connections and functioning.

I. Check for proper sealing of air-handling-unit components.

J. Verify that air duct system is sealed as specified in Section "Metal Ducts."

K. Duct Leakage Testing: Provide leakage test for all installed supply and return ductwork to be within ±2% of the design values. Report any deficiencies observed.

3.5 PROCEDURES FOR CONSTANT-VOLUME AIR SYSTEMS

A. Adjust fans to deliver total indicated airflows within the maximum allowable fan speed listed by fan manufacturer.

1. Measure total airflow.

    a. Where sufficient space in ducts is unavailable for Pitot-tube traverse measurements, measure airflow at terminal outlets and inlets and calculate the total airflow.

2. Measure fan static pressures as follows to determine actual static pressure:

    a. Measure outlet static pressure as far downstream from the fan as practical and upstream from restrictions in ducts such as elbows and transitions.
    b. Measure static pressure directly at the fan outlet or through the flexible connection.
    c. Measure inlet static pressure of single-inlet fans in the inlet duct as near the fan as possible, upstream from the flexible connection, and downstream from duct restrictions.
    d. Measure inlet static pressure of double-inlet fans through the wall of the plenum that houses the fan.

3. Measure static pressure across each component that makes up an air-handling unit, rooftop unit, and other air-handling and -treating equipment.

    a. Report the cleanliness status of filters and the time static pressures are measured.

4. Measure static pressures entering and leaving other devices, such as sound traps, heat-recovery equipment, and air washers, under final balanced conditions.
5. Review Record Documents to determine variations in design static pressures versus actual static pressures. Calculate actual system-effect factors. Recommend adjustments to accommodate actual conditions.
6. Obtain approval from Architect for adjustment of fan speed higher or lower than indicated speed. Comply with requirements in Sections for air-handling units for adjustment of fans, belts, and pulley sizes to achieve indicated air-handling-unit performance.
7. Do not make fan-speed adjustments that result in motor overload. Consult equipment manufacturers about fan-speed safety factors. Modulate dampers and measure fan-motor amperage to ensure that no overload will occur. Measure amperage in full-cooling, full-heating, economizer, and any other operating mode to determine the maximum required brake horsepower.

B. Adjust volume dampers for main duct, submain ducts, and major branch ducts to indicated airflows within specified tolerances.

1. Measure airflow of submain and branch ducts.

    a. Where sufficient space in submain and branch ducts is unavailable for Pitot-tube traverse measurements, measure airflow at terminal outlets and inlets and calculate the total airflow for that zone.

2. Measure static pressure at a point downstream from the balancing damper, and adjust volume dampers until the proper static pressure is achieved.
3. Remeasure each submain and branch duct after all have been adjusted. Continue to adjust submain and branch ducts to indicated airflows within specified tolerances.

C. Measure air outlets and inlets without making adjustments.

1. Measure terminal outlets using a direct-reading hood or outlet manufacturer's written instructions and calculating factors.

D. Adjust air outlets and inlets for each space to indicated airflows within specified tolerances of indicated values. Make adjustments using branch volume dampers rather than extractors and the dampers at air terminals.

1. Adjust each outlet in same room or space to within specified tolerances of indicated quantities without generating noise levels above the limitations prescribed by the Contract Documents.
2. Adjust patterns of adjustable outlets for proper distribution without drafts.

3.6 PROCEDURES FOR VARIABLE-AIR-VOLUME SYSTEMS

A. Compensating for Diversity: When the total airflow of all terminal units is more than the indicated airflow of the fan, place a selected number of terminal units at a minimum set-point airflow with the remainder at maximum airflow condition until the total airflow of the terminal units equals the indicated airflow of the fan. Select the reduced-airflow terminal units so they are distributed evenly among the branch ducts.

B. Pressure-Independent, Variable-Air-Volume Systems: After the fan systems have been adjusted, adjust the variable-air-volume systems as follows:

1. Set outdoor-air dampers at minimum, and set return- and exhaust-air dampers at a position that simulates full-cooling load.
2. Select the terminal unit that is most critical to the supply-fan airflow and static pressure. Measure static pressure. Adjust system static pressure so the entering static pressure for the critical terminal unit is not less than the sum of the terminal-unit manufacturer's recommended minimum inlet static pressure plus the static pressure needed to overcome terminal-unit discharge system losses.
3. Measure total system airflow. Adjust to within indicated airflow.
4. Set terminal units at maximum airflow and adjust controller or regulator to deliver the designed maximum airflow. Use terminal-unit manufacturer's written instructions to make this adjustment. When total airflow is correct, balance the air outlets downstream from terminal units the same as described for constant-volume air systems.
5. Set terminal units at minimum airflow and adjust controller or regulator to deliver the designed minimum airflow. Check air outlets for a proportional reduction in airflow the same as described for constant-volume air systems.

    a. If air outlets are out of balance at minimum airflow, report the condition but leave outlets balanced for maximum airflow.

6. Re-measure the return airflow to the fan while operating at maximum return airflow and minimum outdoor airflow.

    a. Adjust the fan and balance the return-air ducts and inlets the same as described for constant-volume air systems.

7. Measure static pressure at the most critical terminal unit and adjust the static-pressure controller at the main supply-air sensing station to ensure that adequate static pressure is maintained at the most critical unit.
8. Record final fan-performance data.

C. Pressure-Dependent, Variable-Air-Volume Systems without Diversity: After the fan systems have been adjusted, adjust the variable-air-volume systems as follows:

1. Balance variable-air-volume systems the same as described for constant-volume air systems.
2. Set terminal units and supply fan at full-airflow condition.
3. Adjust inlet dampers of each terminal unit to indicated airflow and verify operation of the static-pressure controller. When total airflow is correct, balance the air outlets downstream from terminal units the same as described for constant-volume air systems.
4. Readjust fan airflow for final maximum readings.
5. Measure operating static pressure at the sensor that controls the supply fan if one is installed, and verify operation of the static-pressure controller.
6. Set supply fan at minimum airflow if minimum airflow is indicated. Measure static pressure to verify that it is being maintained by the controller.
7. Set terminal units at minimum airflow and adjust controller or regulator to deliver the designed minimum airflow. Check air outlets for a proportional reduction in airflow the same as described for constant-volume air systems.

    a. If air outlets are out of balance at minimum airflow, report the condition but leave the outlets balanced for maximum airflow.

8. Measure the return airflow to the fan while operating at maximum return airflow and minimum outdoor airflow.

    a. Adjust the fan and balance the return-air ducts and inlets the same as described for constant-volume air systems.

D. Pressure-Dependent, Variable-Air-Volume Systems with Diversity: After the fan systems have been adjusted, adjust the variable-air-volume systems as follows:

1. Set system at maximum indicated airflow by setting the required number of terminal units at minimum airflow. Select the reduced-airflow terminal units so they are distributed evenly among the branch ducts.
2. Adjust supply fan to maximum indicated airflow with the variable-airflow controller set at maximum airflow.
3. Set terminal units at full-airflow condition.
4. Adjust terminal units starting at the supply-fan end of the system and continuing progressively to the end of the system. Adjust inlet dampers of each terminal unit to indicated airflow. When total airflow is correct, balance the air outlets downstream from terminal units the same as described for constant-volume air systems.

5. Adjust terminal units for minimum airflow.
6. Measure static pressure at the sensor.
7. Measure the return airflow to the fan while operating at maximum return airflow and minimum outdoor airflow. Adjust the fan and balance the return-air ducts and inlets the same as described for constant-volume air systems.

3.7 GENERAL PROCEDURES FOR HYDRONIC SYSTEMS

A. Prepare test reports with pertinent design data, and number in sequence starting at pump to end of system. Check the sum of branch-circuit flows against the approved pump flow rate. Correct variations that exceed plus or minus 5 percent.

B. Prepare schematic diagrams of systems' "as-built" piping layouts.

C. Prepare hydronic systems for testing and balancing according to the following, in addition to the general preparation procedures specified above:

1. Open all manual valves for maximum flow.
2. Check liquid level in expansion tank.
3. Check makeup water-station pressure gage for adequate pressure for highest vent.
4. Check flow-control valves for specified sequence of operation, and set at indicated flow.
5. Set differential-pressure control valves at the specified differential pressure. Do not set at fully closed position when pump is positive-displacement type unless several terminal valves are kept open.
6. Set system controls so automatic valves are wide open to heat exchangers.
7. Check pump-motor load. If motor is overloaded, throttle main flow-balancing device so motor nameplate rating is not exceeded.
8. Check air vents for a forceful liquid flow exiting from vents when manually operated.

3.8 PROCEDURES FOR CONSTANT-FLOW HYDRONIC SYSTEMS

A. Measure water flow at pumps. Use the following procedures except for positive-displacement pumps:

1. Verify impeller size by operating the pump with the discharge valve closed. Read pressure differential across the pump. Convert pressure to head and correct for differences in gage heights. Note the point on manufacturer's pump curve at zero flow and verify that the pump has the intended impeller size.

    a. If impeller sizes must be adjusted to achieve pump performance, obtain approval from Architect and comply with requirements in Section "Hydronic Pumps."

2. Check system resistance. With all valves open, read pressure differential across the pump and mark pump manufacturer's head-capacity curve. Adjust pump discharge valve until indicated water flow is achieved.

    a. Monitor motor performance during procedures and do not operate motors in overload conditions.

3. Verify pump-motor brake horsepower. Calculate the intended brake horsepower for the system based on pump manufacturer's performance data. Compare calculated brake horsepower with nameplate data on the pump motor. Report conditions where actual amperage exceeds motor nameplate amperage.
4. Report flow rates that are not within plus or minus 10 percent of design.

B. Measure flow at all automatic flow control valves to verify that valves are functioning as designed.

C. Measure flow at all pressure-independent characterized control valves, with valves in fully open position, to verify that valves are functioning as designed.

D. Set calibrated balancing valves, if installed, at calculated presettings.

E. Measure flow at all stations and adjust, where necessary, to obtain first balance.

1. System components that have Cv rating or an accurately cataloged flow-pressure-drop relationship may be used as a flow-indicating device.

F. Measure flow at main balancing station and set main balancing device to achieve flow that is 5 percent greater than indicated flow.

G. Adjust balancing stations to within specified tolerances of indicated flow rate as follows:

1. Determine the balancing station with the highest percentage over indicated flow.
2. Adjust each station in turn, beginning with the station with the highest percentage over indicated flow and proceeding to the station with the lowest percentage over indicated flow.
3. Record settings and mark balancing devices.

H. Measure pump flow rate and make final measurements of pump amperage, voltage, rpm, pump heads, and systems' pressures and temperatures including outdoor-air temperature.

I. Measure the differential-pressure-control-valve settings existing at the conclusion of balancing.

J. Check settings and operation of each safety valve. Record settings.

3.9 PROCEDURES FOR VARIABLE-FLOW HYDRONIC SYSTEMS

A. Balance systems with automatic two- and three-way control valves by setting systems at maximum flow through heat-exchange terminals and proceed as specified above for hydronic systems.

3.10 PROCEDURES FOR MOTORS

A. Motors, 1/2 HP and Larger: Test at final balanced conditions and record the following data:

1. Manufacturer's name, model number, and serial number.
2. Motor horsepower rating.

3. Motor rpm.
4. 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 manual bypass of the controller to prove proper operation. Record observations including name of controller manufacturer, model number, serial number, and nameplate data.

3.11 PROCEDURES FOR CHILLERS

A. Balance water flow through each evaporator to within specified tolerances of indicated flow with all pumps operating. With only one chiller operating in a multiple chiller installation, do not exceed the flow for the maximum tube velocity recommended by the chiller manufacturer. Measure and record the following data with each chiller operating at design conditions:

1. Evaporator-water entering and leaving temperatures, pressure drop, and water flow.
2. Evaporator and condenser refrigerant temperatures and pressures, using instruments furnished by chiller manufacturer.
3. Power factor if factory-installed instrumentation is furnished for measuring kilowatts.
4. Kilowatt input if factory-installed instrumentation is furnished for measuring kilowatts.
5. Capacity: Calculate in tons of cooling.
6. For air-cooled chillers, verify condenser-fan rotation and record fan and motor data including number of fans and entering- and leaving-air temperatures.

3.12 PROCEDURES FOR COOLING TOWERS

A. Shut off makeup water for the duration of the test, and verify that makeup and blowdown systems are fully operational after tests and before leaving the equipment. Perform the following tests and record the results:

1. Measure condenser-water flow to each cell of the cooling tower.
2. Measure entering- and leaving-water temperatures.
3. Measure wet- and dry-bulb temperatures of entering air.
4. Measure wet- and dry-bulb temperatures of leaving air.
5. Measure condenser-water flow rate recirculating through the cooling tower.
6. Measure cooling-tower spray pump discharge pressure.
7. Adjust water level and feed rate of makeup water system.
8. Measure flow through bypass, if applicable.
9. Measure and record fan and motor operating data.

3.13 PROCEDURES FOR BOILERS

A. Hydronic Boilers:

1. Measure and record entering- and leaving-water temperatures.

2. Measure and record water flow.
3. Record relief valve pressure setting.

3.14 PROCEDURES FOR CONDENSING UNITS

A. Verify proper rotation of fans.

B. Measure entering- and leaving-air temperatures.

C. Record compressor data.

3.15 PROCEDURES FOR HEAT-TRANSFER COILS

A. Measure, adjust, and record the following data for each water coil:

1. Entering- and leaving-water temperature.
2. Water flow rate.
3. Water pressure drop.
4. Dry-bulb temperature of entering and leaving air.
5. Wet-bulb temperature of entering and leaving air for cooling coils.
6. Airflow.
7. Air pressure drop.

B. Measure, adjust, and record the following data for each electric heating coil:

1. Nameplate data.
2. Airflow.
3. Entering- and leaving-air temperature at full load.
4. Voltage and amperage input of each phase at full load and at each incremental stage.
5. Calculated kilowatt at full load.
6. Fuse or circuit-breaker rating for overload protection.

C. Measure, adjust, and record the following data for each steam coil:

1. Dry-bulb temperature of entering and leaving air.
2. Airflow.
3. Air pressure drop.
4. Inlet steam pressure.

D. Measure, adjust, and record the following data for each refrigerant coil:

1. Dry-bulb temperature of entering and leaving air.
2. Wet-bulb temperature of entering and leaving air.
3. Airflow.
4. Air pressure drop.
5. Refrigerant suction pressure and temperature.

3.16 PROCEDURES FOR TESTING, ADJUSTING, AND BALANCING EXISTING SYSTEMS

A. Perform a preconstruction inspection of existing equipment that is to remain and be reused.

1. Measure and record the operating speed, airflow, and static pressure of each fan.
2. Measure motor voltage and amperage. Compare the values to motor nameplate information.
3. Check the condition of filters.
4. Check the condition of coils.
5. Report on the operating condition of the equipment and the results of the measurements taken. Report deficiencies.

B. Before performing testing and balancing of existing systems, inspect existing equipment that is to remain and be reused to verify that existing equipment has been cleaned and refurbished. Verify the following:

1. New filters are installed.
2. Coils are clean and fins combed.
3. Drain pans are clean.
4. Fans are clean.
5. Deficiencies noted in the preconstruction report are corrected.

C. Perform testing and balancing of existing systems to the extent that existing systems are affected by the renovation work.

1. Compare the indicated airflow of the renovated work to the measured fan airflows, and determine the new fan speed and the face velocity of filters and coils.
2. Verify that the indicated airflows of the renovated work result in filter and coil face velocities and fan speeds that are within the acceptable limits defined by equipment manufacturer.
3. If calculations increase or decrease the air flow rates and water flow rates by more than 5 percent, make equipment adjustments to achieve the calculated rates. If increase or decrease is 5 percent or less, equipment adjustments are not required.
4. Adjust fan speeds within the limits of the installed sheaves and belts to achieve design airflow.
5. Balance system to design airflows indicated.

3.17 TOLERANCES

A. Set HVAC system's air flow rates and water flow rates within the following tolerances:

1. Supply, Return, and Exhaust Fans and Equipment with Fans: Plus or minus 10 percent.
2. Air Outlets and Inlets: Plus or minus 10 percent.
3. Heating-Water Flow Rate: Plus or minus 10 percent.
4. Cooling-Water Flow Rate: Plus or minus 10 percent.

3.18 REPORTING

A. Initial Construction-Phase Report: Based on examination of the Contract Documents as specified in "Examination" Article, prepare a report on the adequacy of design for systems' balancing devices. Recommend changes and additions to systems' balancing devices to facilitate proper performance measuring and balancing. Recommend changes and additions to HVAC systems and general construction to allow access for performance measuring and balancing devices.

B. Status Reports: Prepare progress reports to describe completed procedures, procedures in progress, and scheduled procedures. Include a list of deficiencies and problems found in systems being tested and balanced. Prepare a separate report for each system and each building floor for systems serving multiple floors.

3.19 FINAL REPORT

A. General: Prepare a certified written report; tabulate and divide the report into separate sections for tested systems and balanced systems.

1. Include a certification sheet at the front of the report's binder, signed and sealed by the certified testing and balancing engineer.
2. Include a list of instruments used for procedures, along with proof of calibration.

B. Final Report Contents: In addition to certified field-report data, include the following:

1. Pump curves.
2. Fan curves.
3. Manufacturers' test data.
4. Field test reports prepared by system and equipment installers.
5. Other information relative to equipment performance; do not include Shop Drawings and product data.

C. General Report Data: In addition to form titles and entries, include the following data:

1. Title page.
2. Name and address of the TAB contractor.
3. Project name.
4. Project location.
5. Architect's name and address.
6. Engineer's name and address.
7. Contractor's name and address.
8. Report date.
9. Signature of TAB supervisor who certifies the report.
10. Table of Contents with the total number of pages defined for each section of the report. Number each page in the report.
11. Summary of contents including the following:

    a. Indicated versus final performance.
    b. Notable characteristics of systems.

c. Description of system operation sequence if it varies from the Contract Documents.

12. Nomenclature sheets for each item of equipment.
13. Data for terminal units, including manufacturer's name, type, size, and fittings.
14. Notes to explain why certain final data in the body of reports vary from indicated values.
15. Test conditions for fans and pump performance forms including the following:

    a. Settings for outdoor-, return-, and exhaust-air dampers.
    b. Conditions of filters.
    c. Cooling coil, wet- and dry-bulb conditions.
    d. Face and bypass damper settings at coils.
    e. Fan drive settings including settings and percentage of maximum pitch diameter.
    f. Inlet vane settings for variable-air-volume systems.
    g. Settings for supply-air, static-pressure controller.
    h. Other system operating conditions that affect performance.

D. System Diagrams: Include schematic layouts of air and hydronic distribution systems. Present each system with single-line diagram and include the following:

1. Quantities of outdoor, supply, return, and exhaust airflows.
2. Water and steam flow rates.
3. Duct, outlet, and inlet sizes.
4. Pipe and valve sizes and locations.
5. Terminal units.
6. Balancing stations.
7. Position of balancing devices.

3.20 ADDITIONAL TESTS

A. Seasonal Periods: If initial TAB procedures were not performed during near-peak summer and winter conditions, perform additional TAB during near-peak summer and winter conditions.

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SECTION 23 07 13 - DUCT INSULATION

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. Section includes insulating the following duct services:

1. Indoor, concealed supply, return, exhaust and outdoor air.
2. Indoor, exposed supply, return, exhaust and outdoor air.

B. Related Sections:

1. Section "HVAC Piping Insulation."
2. Section "Metal Ducts" for duct liners.

1.3 ACTION SUBMITTALS

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

B. Shop Drawings: Include plans, elevations, sections, details, and attachments to other work.

1. Detail application of protective shields, saddles, and inserts at hangers for each type of insulation and hanger.
2. Detail insulation application at elbows, fittings, dampers, specialties and flanges for each type of insulation.
3. Detail application of field-applied jackets.
4. Detail application at linkages of control devices.

1.4 INFORMATIONAL SUBMITTALS

A. Field quality-control reports.

1.5 QUALITY ASSURANCE

A. Surface-Burning Characteristics: For insulation and related materials, as determined by testing identical products according to ASTM E 84, by a testing agency acceptable to authorities having jurisdiction. Factory label insulation and jacket materials and adhesive, mastic, tapes, and cement material containers, with appropriate markings of applicable testing agency.

1. Insulation Installed Indoors: Flame-spread index of 25 or less, and smoke-developed index of 50 or less.
2. Insulation Installed Outdoors: Flame-spread index of 75 or less, and smoke-developed index of 150 or less.

PART 2 - PRODUCTS

2.1 INSULATION MATERIALS

A. Comply with requirements in "Duct Insulation Schedule, General," "Indoor Duct and Plenum Insulation Schedule," and "Aboveground, Outdoor Duct and Plenum Insulation Schedule" articles for where insulating materials shall be applied.

B. Products shall not contain asbestos, lead, mercury, or mercury compounds.

C. Products that come in contact with stainless steel shall have a leachable chloride content of less than 50 ppm when tested according to ASTM C 871.

D. Insulation materials for use on austenitic stainless steel shall be qualified as acceptable according to ASTM C 795.

E. Foam insulation materials shall not use CFC or HCFC blowing agents in the manufacturing process.

F. Mineral-Fiber Blanket Insulation: Mineral or glass fibers bonded with a thermosetting resin. Comply with ASTM C 553, Type II and ASTM C 1290.

1. Products: Subject to compliance with requirements, provide one of the following:

    a. CertainTeed Corp.; SoftTouch Duct Wrap.
    b. Johns Manville; Microlite.
    c. Knauf Insulation; Friendly Feel Duct Wrap.
    d. Manson Insulation Inc.; Alley Wrap.
    e. Owens Corning; SOFTR All-Service Duct Wrap.

G. Mineral-Fiber Board Insulation: Mineral or glass fibers bonded with a thermosetting resin. Comply with ASTM C 612, Type IA or Type IB. For duct and plenum applications, provide insulation without factory-applied jacket or with factory-applied ASJ as noted in the drawings. Factory-applied jacket requirements are specified in "Factory-Applied Jackets" Article.

1. Products: Subject to compliance with requirements, provide one of the following:

    a. CertainTeed Corp.; Commercial Board.
    b. Fibrex Insulations Inc.; FBX.
    c. Johns Manville; 800 Series Spin-Glas.
    d. Knauf Insulation; Insulation Board.
    e. Manson Insulation Inc.; AK Board.
    f. Owens Corning; Fiberglas 700 Series.

2.2 ADHESIVES

A. Materials shall be compatible with insulation materials, jackets, and substrates and for bonding insulation to itself and to surfaces to be insulated unless otherwise indicated.

B. Mineral-Fiber Adhesive: Comply with MIL-A-3316C, Class 2, Grade A.

1. Products: Subject to compliance with requirements, provide one of the following:

a. Childers Brand, Specialty Construction Brands, Inc., a business of H. B. Fuller Company; CP-127.
b. Eagle Bridges - Marathon Industries; 225.
c. Foster Brand, Specialty Construction Brands, Inc., a business of H. B. Fuller Company; 85-60/85-70.
d. Mon-Eco Industries, Inc.; 22-25.

2.3 MASTICS

A. Materials shall be compatible with insulation materials, jackets, and substrates; comply with MIL-PRF-19565C, Type II.

1. For indoor applications, use mastics that have a VOC content of 50 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).

B. Vapor-Barrier Mastic: Water based; suitable for indoor use on below ambient services.

1. Products: Subject to compliance with requirements, provide one of the following:

a. Foster Brand, Specialty Construction Brands, Inc., a business of H. B. Fuller Company; 30-80/30-90.
b. Vimasco Corporation; 749.

2. Water-Vapor Permeance: ASTM E 96/E 96M, Procedure B, 0.013 perm at 43-mil dry film thickness.
3. Service Temperature Range: Minus 20 to plus 180 deg F.
4. Solids Content: ASTM D 1644, 58 percent by volume and 70 percent by weight.
5. Color: White.

C. Breather Mastic: Water based; suitable for indoor and outdoor use on above ambient services.

1. Products: Subject to compliance with requirements, provide one of the following:

a. Childers Brand, Specialty Construction Brands, Inc., a business of H. B. Fuller Company; CP-10.
b. Eagle Bridges - Marathon Industries; 550.
c. Foster Brand, Specialty Construction Brands, Inc., a business of H. B. Fuller Company; 46-50.
d. Mon-Eco Industries, Inc.; 55-50.
e. Vimasco Corporation; WC-1/WC-5.

2. Water-Vapor Permeance: ASTM F 1249, 1.8 perms at 0.0625-inch dry film thickness.
3. Service Temperature Range: Minus 20 to plus 180 deg F.
4. Solids Content: 60 percent by volume and 66 percent by weight.
5. Color: White.

2.4 SEALANTS

A. ASJ Flashing Sealants, and Vinyl and PVC Jacket Flashing Sealants:

1. Products: Subject to compliance with requirements, provide one of the following:

    a. Childers Brand, Specialty Construction Brands, Inc., a business of H. B. Fuller Company; CP-76.

2. Materials shall be compatible with insulation materials, jackets, and substrates.
3. Fire- and water-resistant, flexible, elastomeric sealant.
4. Service Temperature Range: Minus 40 to plus 250 deg F.
5. Color: White.
6. For indoor applications, sealants shall have a VOC content of 420 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).
7. Sealants shall comply with the testing and product requirements of the California Department of Health Services' "Standard Practice for the Testing of Volatile Organic Emissions from Various Sources Using Small-Scale Environmental Chambers."

2.5 TAPES

A. ASJ Tape: White vapor-retarder tape matching factory-applied jacket with acrylic adhesive, complying with ASTM C 1136.

1. Products: Subject to compliance with requirements, provide one of the following:

    a. ABI, Ideal Tape Division; 428 AWF ASJ.
    b. Avery Dennison Corporation, Specialty Tapes Division; Fasson 0836.
    c. Compac Corporation; 104 and 105.
    d. Venture Tape; 1540 CW Plus, 1542 CW Plus, and 1542 CW Plus/SQ.

2. Width: 3 inches.
3. Thickness: 11.5 mils.
4. Adhesion: 90 ounces force/inch in width.
5. Elongation: 2 percent.
6. Tensile Strength: 40 lbf/inch in width.
7. ASJ Tape Disks and Squares: Precut disks or squares of ASJ tape.

B. Aluminum-Foil Tape: Vapor-retarder tape with acrylic adhesive.

1. Products: Subject to compliance with requirements, provide one of the following:

    a. ABI, Ideal Tape Division; 488 AWF.
    b. Avery Dennison Corporation, Specialty Tapes Division; Fasson 0800.

c. Compac Corporation; 120.
d. Venture Tape; 3520 CW.

2. Width: 2 inches.
3. Thickness: 3.7 mils.
4. Adhesion: 100 ounces force/inch in width.
5. Elongation: 5 percent.
6. Tensile Strength: 34 lbf/inch in width.

2.6 SECUREMENTS

A. Insulation Pins and Hangers:

1. Metal, Adhesively Attached, Perforated-Base Insulation Hangers: Baseplate welded to projecting spindle that is capable of holding insulation, of thickness indicated, securely in position indicated when self-locking washer is in place. Comply with the following requirements:

   a. Baseplate: Perforated, galvanized carbon-steel sheet, 0.030 inch thick by 2 inches square.
   b. Spindle: Copper- or zinc-coated, low-carbon steel, fully annealed, 0.106-inch-diameter shank, length to suit depth of insulation indicated.
   c. Adhesive: Recommended by hanger manufacturer. Product with demonstrated capability to bond insulation hanger securely to substrates indicated without damaging insulation, hangers, and substrates.

2. Nonmetal, Adhesively Attached, Perforated-Base Insulation Hangers: Baseplate fastened to projecting spindle that is capable of holding insulation, of thickness indicated, securely in position indicated when self-locking washer is in place. Comply with the following requirements:

   a. Baseplate: Perforated, nylon sheet, 0.030 inch thick by 1-1/2 inches in diameter.
   b. Spindle: Nylon, 0.106-inch- diameter shank, length to suit depth of insulation indicated, up to 2-1/2 inches.
   c. Adhesive: Recommended by hanger manufacturer. Product with demonstrated capability to bond insulation hanger securely to substrates indicated without damaging insulation, hangers, and substrates.

3. Self-Sticking-Base Insulation Hangers: Baseplate welded to projecting spindle that is capable of holding insulation, of thickness indicated, securely in position indicated when self-locking washer is in place. Comply with the following requirements:

   a. Baseplate: Galvanized carbon-steel sheet, 0.030 inch thick by 2 inches square.
   b. Spindle: Copper- or zinc-coated, low-carbon steel, fully annealed, 0.106-inch-diameter shank, length to suit depth of insulation indicated.
   c. Adhesive-backed base with a peel-off protective cover.

4. Insulation-Retaining Washers: Self-locking washers formed from 0.016-inch- thick, galvanized-steel sheet, with beveled edge sized as required to hold insulation securely in place but not less than 1-1/2 inches in diameter.

a. Protect ends with capped self-locking washers incorporating a spring steel insert to ensure permanent retention of cap in exposed locations.

5. Nonmetal Insulation-Retaining Washers: Self-locking washers formed from 0.016-inch-thick nylon sheet, with beveled edge sized as required to hold insulation securely in place but not less than 1-1/2 inches in diameter.

B. Staples: Outward-clinching insulation staples, nominal 3/4-inch- wide, stainless steel or Monel.

C. Wire: 0.062-inch soft-annealed, galvanized steel.

PART 3 - EXECUTION

3.1 PREPARATION

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

3.2 GENERAL INSTALLATION REQUIREMENTS

A. Install insulation materials, accessories, and finishes with smooth, straight, and even surfaces; free of voids throughout the length of ducts and fittings.

B. Install insulation materials, vapor barriers or retarders, jackets, and thicknesses required for each item of duct system as specified in insulation system schedules.

C. Install accessories compatible with insulation materials and suitable for the service. Install accessories that do not corrode, soften, or otherwise attack insulation or jacket in either wet or dry state.

D. Install insulation with longitudinal seams at top and bottom of horizontal runs.

E. Install multiple layers of insulation with longitudinal and end seams staggered.

F. Keep insulation materials dry during application and finishing.

G. Install insulation with tight longitudinal seams and end joints. Bond seams and joints with adhesive recommended by insulation material manufacturer.

H. Install insulation with least number of joints practical.

I. Where vapor barrier is indicated, seal joints, seams, and penetrations in insulation at hangers, supports, anchors, and other projections with vapor-barrier mastic.

1. Install insulation continuously through hangers and around anchor attachments.
2. For insulation application where vapor barriers are indicated, extend insulation on anchor legs from point of attachment to supported item to point of attachment to structure. Taper and seal ends at attachment to structure with vapor-barrier mastic.

3. Install insert materials and install insulation to tightly join the insert. Seal insulation to insulation inserts with adhesive or sealing compound recommended by insulation material manufacturer.

J. Apply adhesives, mastics, and sealants at manufacturer's recommended coverage rate and wet and dry film thicknesses.

K. Install insulation with factory-applied jackets as follows:

1. Draw jacket tight and smooth.
2. Cover circumferential joints with 3-inch- wide strips, of same material as insulation jacket. Secure strips with adhesive and outward clinching staples along both edges of strip, spaced 4 inches o.c.
3. Overlap jacket longitudinal seams at least 1-1/2 inches. Clean and dry surface to receive self-sealing lap. Staple laps with outward clinching staples along edge at 4 inches o.c.

    a. For below ambient services, apply vapor-barrier mastic over staples.

4. Cover joints and seams with tape, according to insulation material manufacturer's written instructions, to maintain vapor seal.
5. Where vapor barriers are indicated, apply vapor-barrier mastic on seams and joints and at ends adjacent to duct flanges and fittings.

L. Cut insulation in a manner to avoid compressing insulation more than 75 percent of its nominal thickness.

M. Finish installation with systems at operating conditions. Repair joint separations and cracking due to thermal movement.

N. Repair damaged insulation facings by applying same facing material over damaged areas. Extend patches at least 4 inches beyond damaged areas. Adhere, staple, and seal patches similar to butt joints.

3.3 PENETRATIONS

A. Insulation Installation at Interior Wall and Partition Penetrations (That Are Not Fire Rated): Install insulation continuously through walls and partitions.

B. Insulation Installation at Fire-Rated Wall and Partition Penetrations: Terminate insulation at fire damper sleeves for fire-rated wall and partition penetrations. Externally insulate damper sleeves to match adjacent insulation and overlap duct insulation at least 2 inches.

1. Comply with requirements in Section "Penetration Firestopping" for firestopping and fire-resistive joint sealers.

C. Insulation Installation at Floor Penetrations:

1. Duct: For penetrations through fire-rated assemblies, terminate insulation at fire damper sleeves and externally insulate damper sleeve beyond floor to match adjacent duct insulation. Overlap damper sleeve and duct insulation at least 2 inches.

2. Seal penetrations through fire-rated assemblies. Comply with requirements in Section "Penetration Firestopping."

3.4 INSTALLATION OF MINERAL-FIBER INSULATION

A. Blanket Insulation Installation on Ducts and Plenums: Secure with adhesive and insulation pins.

1. Apply adhesives according to manufacturer's recommended coverage rates per unit area, for 50 percent coverage of duct and plenum surfaces.
2. Apply adhesive to entire circumference of ducts and to all surfaces of fittings and transitions.
3. Install either capacitor-discharge-weld pins and speed washers or cupped-head, capacitor-discharge-weld pins on sides and bottom of horizontal ducts and sides of vertical ducts as follows:

    a. On duct sides with dimensions 18 inches and smaller, place pins along longitudinal centerline of duct. Space 3 inches maximum from insulation end joints, and 16 inches o.c.
    b. On duct sides with dimensions larger than 18 inches, place pins 16 inches o.c. each way, and 3 inches maximum from insulation joints. Install additional pins to hold insulation tightly against surface at cross bracing.
    c. Pins may be omitted from top surface of horizontal, rectangular ducts and plenums.
    d. Do not overcompress insulation during installation.
    e. Impale insulation over pins and attach speed washers.
    f. Cut excess portion of pins extending beyond speed washers or bend parallel with insulation surface. Cover exposed pins and washers with tape matching insulation facing.

4. Overlap unfaced blankets a minimum of 2 inches on longitudinal seams and end joints. At end joints, secure with steel bands spaced a maximum of 18 inches o.c.
5. Install insulation on rectangular duct elbows and transitions with a full insulation section for each surface. Install insulation on round and flat-oval duct elbows with individually mitered gores cut to fit the elbow.
6. Insulate duct stiffeners, hangers, and flanges that protrude beyond insulation surface with 6-inch- wide strips of same material used to insulate duct. Secure on alternating sides of stiffener, hanger, and flange with pins spaced 6 inches o.c.

B. Board Insulation Installation on Ducts and Plenums: Secure with adhesive and insulation pins.

1. Apply adhesives according to manufacturer's recommended coverage rates per unit area, for 50 percent coverage of duct and plenum surfaces.
2. Apply adhesive to entire circumference of ducts and to all surfaces of fittings and transitions.
3. Install either capacitor-discharge-weld pins and speed washers or cupped-head, capacitor-discharge-weld pins on sides and bottom of horizontal ducts and sides of vertical ducts as follows:

a. On duct sides with dimensions 18 inches and smaller, place pins along longitudinal centerline of duct. Space 3 inches maximum from insulation end joints, and 16 inches o.c.
b. On duct sides with dimensions larger than 18 inches, space pins 16 inches o.c. each way, and 3 inches maximum from insulation joints. Install additional pins to hold insulation tightly against surface at cross bracing.
c. Pins may be omitted from top surface of horizontal, rectangular ducts and plenums.
d. Do not overcompress insulation during installation.
e. Cut excess portion of pins extending beyond speed washers or bend parallel with insulation surface. Cover exposed pins and washers with tape matching insulation facing.

4. For ducts and plenums with surface temperatures below ambient, install a continuous unbroken vapor barrier. Create a facing lap for longitudinal seams and end joints with insulation by removing 2 inches from one edge and one end of insulation segment. Secure laps to adjacent insulation section with 1/2-inch outward-clinching staples, 1 inch o.c. Install vapor barrier consisting of factory- or field-applied jacket, adhesive, vapor-barrier mastic, and sealant at joints, seams, and protrusions.

   a. Repair punctures, tears, and penetrations with tape or mastic to maintain vapor-barrier seal.
   b. Install vapor stops for ductwork and plenums operating below 50 deg F at 18-foot intervals. Vapor stops shall consist of vapor-barrier mastic applied in a Z-shaped pattern over insulation face, along butt end of insulation, and over the surface. Cover insulation face and surface to be insulated a width equal to two times the insulation thickness, but not less than 3 inches.

5. Install insulation on rectangular duct elbows and transitions with a full insulation section for each surface. Groove and score insulation to fit as closely as possible to outside and inside radius of elbows. Install insulation on round and flat-oval duct elbows with individually mitered gores cut to fit the elbow.
6. Insulate duct stiffeners, hangers, and flanges that protrude beyond insulation surface with 6-inch- wide strips of same material used to insulate duct. Secure on alternating sides of stiffener, hanger, and flange with pins spaced 6 inches o.c.

3.5 FINISHES

A. Insulation with ASJ or Other Paintable Jacket Material: Paint jacket with paint system identified below and as specified in Section "Exterior Painting" and Section "Interior Painting."

   1. Flat Acrylic Finish: Two finish coats over a primer that is compatible with jacket material and finish coat paint. Add fungicidal agent to render fabric mildew proof.

      a. Finish Coat Material: Interior, flat, latex-emulsion size.

B. Color: Final color as selected by Architect. Vary first and second coats to allow visual inspection of the completed Work.

C. Do not field paint aluminum or stainless-steel jackets.

3.6 FIELD QUALITY CONTROL

A. Perform tests and inspections.

B. Tests and Inspections:

1. Inspect ductwork, randomly selected by Architect, by removing field-applied jacket and insulation in layers in reverse order of their installation. Extent of inspection shall be limited to one location for each duct system defined in the "Duct Insulation Schedule, General" Article.

C. All insulation applications will be considered defective Work if sample inspection reveals noncompliance with requirements.

3.7 DUCT INSULATION SCHEDULE, GENERAL

A. Plenums and Ducts Requiring Insulation:

1. Indoor, concealed supply, return, exhaust and outdoor air.
2. Indoor, exposed supply, return, exhaust and outdoor air.

B. Items Not Insulated:

1. Fibrous-glass ducts.
2. Metal ducts with duct liner of sufficient thickness to comply with energy code and ASHRAE/IESNA 90.1.
3. Factory-insulated flexible ducts.
4. Factory-insulated plenums and casings.
5. Flexible connectors.
6. Vibration-control devices.
7. Factory-insulated access panels and doors.
8. Double wall supply ducts.

3.8 INDOOR DUCT AND PLENUM INSULATION SCHEDULE

A. Concealed, Supply-Air, Return-Air, Exhaust-Air, Outdoor-Air Duct and Plenum Insulation: Mineral-fiber blanket, 2 inches thick and 0.75-lb/cu. ft. nominal density.

B. Exposed, Supply-Air, Return-Air, Exhaust-Air, Outdoor-Air Duct and Plenum Insulation: Mineral-fiber board, 1-1/2 inches thick and 1.5-lb/cu. ft. nominal density.

END OF SECTION 23 07 13

SECTION 23 07 16 - HVAC EQUIPMENT INSULATION

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. Section includes insulating the following HVAC equipment that is not factory insulated:

1. Chilled-water pumps.
2. Heating, hot-water pumps.
3. Expansion tanks and Chemical Feeders.
4. Air separators.

B. Related Sections:

1. Section "Duct Insulation."
2. Section "HVAC Piping Insulation."

1.3 ACTION SUBMITTALS

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

B. Shop Drawings: Include plans, elevations, sections, details, and attachments to other work.

1. Detail application of protective shields, saddles, and inserts at hangers for each type of insulation and hanger.
2. Detail attachment and covering of heat tracing inside insulation.
3. Detail removable insulation at equipment connections.
4. Detail application of field-applied jackets.
5. Detail application at linkages of control devices.
6. Detail field application for each equipment type.

1.4 INFORMATIONAL SUBMITTALS

A. Field quality-control reports.

1.5 QUALITY ASSURANCE

A. Surface-Burning Characteristics: For insulation and related materials, as determined by testing identical products according to ASTM E 84, by a testing agency acceptable to authorities

having jurisdiction. Factory label insulation and jacket materials and adhesive, mastic, tapes, and cement material containers, with appropriate markings of applicable testing agency.

1. Insulation Installed Indoors: Flame-spread index of 25 or less, and smoke-developed index of 50 or less.

PART 2 - PRODUCTS

2.1 INSULATION MATERIALS

A. Products shall not contain asbestos, lead, mercury, or mercury compounds.

B. Products that come in contact with stainless steel shall have a leachable chloride content of less than 50 ppm when tested according to ASTM C 871.

C. Insulation materials for use on austenitic stainless steel shall be qualified as acceptable according to ASTM C 795.

D. Foam insulation materials shall not use CFC or HCFC blowing agents in the manufacturing process.

E. Cellular Glass: Inorganic, incombustible, foamed or cellulated glass with annealed, rigid, hermetically sealed cells. Factory-applied jacket requirements are specified in "Factory-Applied Jackets" Article.

1. Products: Subject to compliance with requirements, provide one of the following:

    a. Pittsburgh Corning Corporation; Foamglas.
    b. Engineer Approved Equal.

2. Block Insulation: ASTM C 552, Type I.
3. Special-Shaped Insulation: ASTM C 552, Type III.
4. Board Insulation: ASTM C 552, Type IV.
5. Factory fabricate shapes according to ASTM C 450 and ASTM C 585.

F. Flexible Elastomeric Insulation: Closed-cell, sponge- or expanded-rubber materials. Comply with ASTM C 534, Type I for tubular materials and Type II for sheet materials.

1. Products: Subject to compliance with requirements, provide one of the following:

    a. Aeroflex USA, Inc.; Aerocel.
    b. Armacell LLC; AP Armaflex.
    c. K-Flex USA; Insul-Sheet and K-FLEX LS.

2.2 ADHESIVES

A. Materials shall be compatible with insulation materials, jackets, and substrates and for bonding insulation to itself and to surfaces to be insulated unless otherwise indicated.

B. Cellular-Glass Adhesive: Two-component, thermosetting urethane adhesive containing no flammable solvents, with a service temperature range of minus 100 to plus 200 deg F.

1. Products: Subject to compliance with requirements, provide one of the following:

a. Foster Brand, Specialty Construction Brands, Inc., a business of H. B. Fuller Company; 81-84.
b. Engineer Approved Equal.

2. For indoor applications, adhesive shall have a VOC content of 50 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).

C. Flexible Elastomeric Adhesive: Comply with MIL-A-24179A, Type II, Class I.

1. Products: Subject to compliance with requirements, provide one of the following:

a. Aeroflex USA, Inc.; Aeroseal.
b. Armacell LLC; Armaflex 520 Adhesive.
c. Foster Brand, Specialty Construction Brands, Inc., a business of H. B. Fuller Company; 85-75.
d. K-Flex USA; R-373 Contact Adhesive.

2. For indoor applications, adhesive shall have a VOC content of 50 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).

D. PVC Jacket Adhesive: Compatible with PVC jacket.

1. Products: Subject to compliance with requirements, provide one of the following

a. Dow Corning Corporation; 739, Dow Silicone.
b. Johns Manville; Zeston Perma-Weld, CEEL-TITE Solvent Welding Adhesive.
c. P.I.C. Plastics, Inc.; Welding Adhesive.
d. Speedline Corporation; Polyco VP Adhesive.

2. For indoor applications, adhesive shall have a VOC content of 50 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).

2.3 MASTICS

A. Materials shall be compatible with insulation materials, jackets, and substrates; comply with MIL-PRF-19565C, Type II.

1. For indoor applications, use mastics that have a VOC content of 50 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).

B. Vapor-Barrier Mastic: Water based; suitable for indoor and outdoor use on below ambient services.

1. Products: Subject to compliance with requirements, provide one of the following:

a. Foster Brand, Specialty Construction Brands, Inc., a business of H .B. Fuller Company; 30-80/30-90.
b. Vimasco Corporation; 749.

2. Water-Vapor Permeance: ASTM E 96/E 96M, Procedure B, 0.013 perm at 43-mil dry film thickness.
3. Service Temperature Range: Minus 20 to plus 180 deg F.
4. Solids Content: ASTM D 1644, 58 percent by volume and 70 percent by weight.
5. Color: White.

2.4 SEALANTS

A. Joint Sealants:

1. Joint Sealants for Cellular-Glass Products: Subject to compliance with requirements, provide one of the following:

a. Childers Brand, Specialty Construction Brands, Inc., a business of H. B. Fuller Company; CP-76.
b. Eagle Bridges - Marathon Industries; 405.
c. Foster Brand, Specialty Construction Brands, Inc., a business of H. B. Fuller Company; 30-45.
d. Mon-Eco Industries, Inc.; 44-05.
e. Pittsburgh Corning Corporation; Pittseal 444.

2. Materials shall be compatible with insulation materials, jackets, and substrates.
3. Permanently flexible, elastomeric sealant.
4. Service Temperature Range: Minus 100 to plus 300 deg F.
5. Color: White or gray.
6. For indoor applications, sealants shall have a VOC content of 420 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).

B. Metal Jacket Flashing Sealants:

1. Products: Subject to compliance with requirements, provide one of the following:

a. Childers Brand, Specialty Construction Brands, Inc., a business of H. B. Fuller Company; CP-76.
b. Eagle Bridges - Marathon Industries; 405.
c. Foster Brand, Specialty Construction Brands, Inc., a business of H. B. Fuller Company; 95-44.
d. Mon-Eco Industries, Inc.; 44-05.

2. Materials shall be compatible with insulation materials, jackets, and substrates.
3. Fire- and water-resistant, flexible, elastomeric sealant.
4. Service Temperature Range: Minus 40 to plus 250 deg F.
5. Color: Aluminum.
6. For indoor applications, sealants shall have a VOC content of 420 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).

2.5 FIELD-APPLIED JACKETS

A. Field-applied jackets shall comply with ASTM C 921, Type I, unless otherwise indicated.

B. PVC Jacket: High-impact-resistant, UV-resistant PVC complying with ASTM D 1784, Class 16354-C; thickness as scheduled; roll stock ready for shop or field cutting and forming. Thickness is indicated in field-applied jacket schedules.

1. Products: Subject to compliance with requirements, provide one of the following:

    a. Johns Manville; Zeston.
    b. P.I.C. Plastics, Inc.; FG Series.
    c. Proto Corporation; LoSmoke.
    d. Speedline Corporation; SmokeSafe.

2. Adhesive: As recommended by jacket material manufacturer.
3. Color: White.
4. Factory-fabricated tank heads and tank side panels.

C. Aluminum Jacket: Comply with ASTM B 209, Alloy 3003, 3005, 3105, or 5005, Temper H-14.

1. Products: Subject to compliance with requirements, provide one of the following:

    a. Childers Brand, Specialty Construction Brands, Inc., a business of H. B. Fuller Company; Metal Jacketing Systems.
    b. ITW Insulation Systems; Aluminum and Stainless Steel Jacketing.
    c. RPR Products, Inc.; Insul-Mate.

2. Sheet and roll stock ready for shop or field sizing.
3. Finish and thickness are indicated in field-applied jacket schedules.
4. Moisture Barrier for Indoor Applications: 1-mil- thick, heat-bonded polyethylene and kraft paper.
5. Moisture Barrier for Outdoor Applications: 3-mil- thick, heat-bonded polyethylene and kraft paper.
6. Factory-Fabricated Fitting Covers:

    a. Same material, finish, and thickness as jacket.
    b. Preformed two-piece or gore, 45- and 90-degree, short- and long-radius elbows.
    c. Tee covers.
    d. Flange and union covers.
    e. End caps.
    f. Beveled collars.
    g. Valve covers.
    h. Field fabricate fitting covers only if factory-fabricated fitting covers are not available.

D. Self-Adhesive Outdoor Jacket: 60-mil-thick, laminated vapor barrier and waterproofing membrane for installation over insulation located aboveground outdoors; consisting of a rubberized bituminous resin on a crosslaminated polyethylene film covered with stucco-embossed aluminum-foil facing.

1. Products: Subject to compliance with requirements, provide the following:

    a. Polyguard Products, Inc.; Alumaguard 60.

2.6 TAPES

A. ASJ Tape: White vapor-retarder tape matching factory-applied jacket with acrylic adhesive, complying with ASTM C 1136.

1. Products: Subject to compliance with requirements, provide one of the following:

    a. ABI, Ideal Tape Division; 428 AWF ASJ.
    b. Avery Dennison Corporation, Specialty Tapes Division; Fasson 0836.
    c. Compac Corporation; 104 and 105.
    d. Venture Tape; 1540 CW Plus, 1542 CW Plus, and 1542 CW Plus/SQ.

2. Width: 3 inches.
3. Thickness: 11.5 mils.
4. Adhesion: 90 ounces force/inch in width.
5. Elongation: 2 percent.
6. Tensile Strength: 40 lbf/inch in width.
7. ASJ Tape Disks and Squares: Precut disks or squares of ASJ tape.

B. PVC Tape: White vapor-retarder tape matching field-applied PVC jacket with acrylic adhesive; suitable for indoor and outdoor applications.

1. Products: Subject to compliance with requirements, provide one of the following:

    a. ABI, Ideal Tape Division; 370 White PVC tape.
    b. Compac Corporation; 130.
    c. Venture Tape; 1506 CW NS.

2. Width: 2 inches.
3. Thickness: 6 mils.
4. Adhesion: 64 ounces force/inch in width.
5. Elongation: 500 percent.
6. Tensile Strength: 18 lbf/inch in width.

C. Aluminum-Foil Tape: Vapor-retarder tape with acrylic adhesive.

1. Products: Subject to compliance with requirements, provide one of the following:

    a. ABI, Ideal Tape Division; 488 AWF.
    b. Avery Dennison Corporation, Specialty Tapes Division; Fasson 0800.
    c. Compac Corporation; 120.
    d. Venture Tape; 3520 CW.

2. Width: 2 inches.
3. Thickness: 3.7 mils.
4. Adhesion: 100 ounces force/inch in width.

5. Elongation: 5 percent.
6. Tensile Strength: 34 lbf/inch in width.

2.7 SECUREMENTS

A. Aluminum Bands: ASTM B 209, Alloy 3003, 3005, 3105, or 5005; Temper H-14, 0.020 inch thick, 1/2 inch wide with wing seal or closed seal.

1. Products: Subject to compliance with requirements, provide one of the following:

a. ITW Insulation Systems; Gerrard Strapping and Seals.
b. RPR Products, Inc.; Insul-Mate Strapping, Seals, and Springs.

B. Insulation Pins and Hangers:

1. Metal, Adhesively Attached, Perforated-Base Insulation Hangers: Baseplate welded to projecting spindle that is capable of holding insulation, of thickness indicated, securely in position indicated when self-locking washer is in place.

a. Products: Subject to compliance with requirements, provide one of the following:

1) AGM Industries, Inc.; Tactoo Perforated Base Insul-Hangers.
2) GEMCO; Perforated Base.
3) Midwest Fasteners, Inc.; Spindle.

b. Baseplate: Perforated, galvanized carbon-steel sheet, 0.030 inch thick by 2 inches square.
c. Spindle: Aluminum, fully annealed, 0.106-inch-diameter shank, length to suit depth of insulation indicated.
d. Adhesive: Recommended by hanger manufacturer. Product with demonstrated capability to bond insulation hanger securely to substrates indicated without damaging insulation, hangers, and substrates.

2. Self-Sticking-Base Insulation Hangers: Baseplate welded to projecting spindle that is capable of holding insulation, of thickness indicated, securely in position indicated when self-locking washer is in place.

a. Products: Subject to compliance with requirements, provide one of the following:

1) AGM Industries, Inc.; Tactoo Self-Adhering Insul-Hangers, Series.
2) GEMCO; Peel & Press.
3) Midwest Fasteners, Inc.; Self Stick.

b. Baseplate: Galvanized carbon-steel sheet, 0.030 inch thick by 2 inches square.
c. Spindle: Aluminum, fully annealed, 0.106-inch-diameter shank, length to suit depth of insulation indicated.
d. Adhesive-backed base with a peel-off protective cover.

3. Insulation-Retaining Washers: Self-locking washers formed from 0.016-inch- thick, aluminum sheet, with beveled edge sized as required to hold insulation securely in place but not less than 1-1/2 inches in diameter.

    a. Products: Subject to compliance with requirements, provide one of the following:

        1) AGM Industries, Inc.; RC-150.
        2) GEMCO; R-150.
        3) Midwest Fasteners, Inc.; WA-150.
        4) Nelson Stud Welding; Speed Clips.

    b. Protect ends with capped self-locking washers incorporating a spring steel insert to ensure permanent retention of cap in exposed locations.

C. Staples: Outward-clinching insulation staples, nominal 3/4-inch- wide, stainless steel or Monel.

D. Wire: 0.062-inch soft-annealed, stainless steel or 0.062-inch soft-annealed, galvanized steel.

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

    a. C & F Wire.

2.8 CORNER ANGLES

A. PVC Corner Angles: 30 mils thick, minimum 1 by 1 inch, PVC according to ASTM D 1784, Class 16354-C. White or color-coded to match adjacent surface.

B. Aluminum Corner Angles: 0.040 inch thick, minimum 1 by 1 inch, aluminum according to ASTM B 209 , Alloy 3003, 3005, 3105, or 5005; Temper H-14.

PART 3 - EXECUTION

3.1 PREPARATION

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

B. Coordinate insulation installation with the trade installing heat tracing. Comply with requirements for heat tracing that apply to insulation.

C. Mix insulating cements with clean potable water; if insulating cements are to be in contact with stainless-steel surfaces, use demineralized water.

3.2 GENERAL INSTALLATION REQUIREMENTS

A. Install insulation materials, accessories, and finishes with smooth, straight, and even surfaces; free of voids throughout the length of equipment.

B. Install insulation materials, forms, vapor barriers or retarders, jackets, and thicknesses required for each item of equipment as specified in insulation system schedules.

C. Install accessories compatible with insulation materials and suitable for the service. Install accessories that do not corrode, soften, or otherwise attack insulation or jacket in either wet or dry state.

D. Install insulation with longitudinal seams at top and bottom of horizontal runs.

E. Install multiple layers of insulation with longitudinal and end seams staggered.

F. Keep insulation materials dry during application and finishing.

G. Install insulation with tight longitudinal seams and end joints. Bond seams and joints with adhesive recommended by insulation material manufacturer.

H. Install insulation with least number of joints practical.

I. Where vapor barrier is indicated, seal joints, seams, and penetrations in insulation at hangers, supports, anchors, and other projections with vapor-barrier mastic.

1. Install insulation continuously through hangers and around anchor attachments.
2. For insulation application where vapor barriers are indicated, extend insulation on anchor legs from point of attachment to supported item to point of attachment to structure. Taper and seal ends at attachment to structure with vapor-barrier mastic.
3. Install insert materials and install insulation to tightly join the insert. Seal insulation to insulation inserts with adhesive or sealing compound recommended by insulation material manufacturer.
4. Cover inserts with jacket material matching adjacent insulation. Install shields over jacket, arranged to protect jacket from tear or puncture by hanger, support, and shield.

J. Apply adhesives, mastics, and sealants at manufacturer's recommended coverage rate and wet and dry film thicknesses.

K. Install insulation with factory-applied jackets as follows:

1. Draw jacket tight and smooth.
2. Cover circumferential joints with 3-inch- wide strips, of same material as insulation jacket. Secure strips with adhesive and outward clinching staples along both edges of strip, spaced 4 inches o.c.
3. Overlap jacket longitudinal seams at least 1-1/2 inches. Clean and dry surface to receive self-sealing lap. Staple laps with outward clinching staples along edge at 4 inches o.c.

    a. For below ambient services, apply vapor-barrier mastic over staples.

4. Cover joints and seams with tape, according to insulation material manufacturer's written instructions, to maintain vapor seal.
5. Where vapor barriers are indicated, apply vapor-barrier mastic on seams and joints.

L. Cut insulation in a manner to avoid compressing insulation more than 75 percent of its nominal thickness.

M. Finish installation with systems at operating conditions. Repair joint separations and cracking due to thermal movement.

N. Repair damaged insulation facings by applying same facing material over damaged areas. Extend patches at least 4 inches beyond damaged areas. Adhere, staple, and seal patches similar to butt joints.

O. For above ambient services, do not install insulation to the following:

1. Vibration-control devices.
2. Testing agency labels and stamps.
3. Nameplates and data plates.
4. Manholes.
5. Handholes.
6. Cleanouts.

3.3 INSTALLATION OF EQUIPMENT, TANK, AND VESSEL INSULATION

A. Pipe and Tank Insulation Installation for Tanks and Vessels: Secure insulation with adhesive and anchor pins and speed washers.

1. Apply adhesives according to manufacturer's recommended coverage rates per unit area, for 100 percent coverage of tank and vessel surfaces.
2. Groove and score insulation materials to fit as closely as possible to equipment, including contours. Bevel insulation edges for cylindrical surfaces for tight joints. Stagger end joints.
3. Protect exposed corners with secured corner angles.
4. Install adhesively attached or self-sticking insulation hangers and speed washers on sides of tanks and vessels as follows:

    a. Do not weld anchor pins to ASME-labeled pressure vessels.
    b. Select insulation hangers and adhesives that are compatible with service temperature and with substrate.
    c. On tanks and vessels, maximum anchor-pin spacing is 3 inches from insulation end joints, and 16 inches o.c. in both directions.
    d. Do not over compress insulation during installation.
    e. Cut and miter insulation segments to fit curved sides and domed heads of tanks and vessels.
    f. Impale insulation over anchor pins and attach speed washers.
    g. Cut excess portion of pins extending beyond speed washers or bend parallel with insulation surface. Cover exposed pins and washers with tape matching insulation facing.

5. Secure each layer of insulation with stainless-steel or aluminum bands. Select band material compatible with insulation materials.
6. Where insulation hangers on equipment and vessels are not permitted or practical and where insulation support rings are not provided, install a girdle network for securing insulation. Stretch prestressed aircraft cable around the diameter of vessel and make taut with clamps, turnbuckles, or breather springs. Place one circumferential girdle around equipment approximately 6 inches from each end. Install wire or cable between two circumferential girdles 12 inches o.c. Install a wire ring around each end and around outer periphery of center openings, and stretch prestressed aircraft cable radially from the wire ring to nearest circumferential girdle. Install additional circumferential girdles along the body of equipment or tank at a minimum spacing of 48 inches o.c. Use this network for securing insulation with tie wire or bands.
7. Stagger joints between insulation layers at least 3 inches.
8. Install insulation in removable segments on equipment access doors, manholes, handholes, and other elements that require frequent removal for service and inspection.
9. Bevel and seal insulation ends around manholes, handholes, ASME stamps, and nameplates.
10. For equipment with surface temperatures below ambient, apply mastic to open ends, joints, seams, breaks, and punctures in insulation.

B. Cellular Glass Thermal Insulation Installation for Tanks and Vessels: Install insulation over entire surface of tanks and vessels.

1. Apply 100 percent coverage of adhesive to surface with manufacturer's recommended adhesive.
2. Seal longitudinal seams and end joints.

C. Insulation Installation on Pumps:

1. Fabricate metal boxes lined with insulation. Fit boxes around pumps and coincide box joints with splits in pump casings. Fabricate joints with outward bolted flanges. Bolt flanges on 6-inch centers, starting at corners. Install 3/8-inch diameter fasteners with wing nuts. Alternatively, secure the box sections together using a latching mechanism.
2. Fabricate boxes from aluminum, at least 0.040 inch thick.
3. For below ambient or chilled water services, install a vapor barrier at seams, joints, and penetrations. Seal between flanges with replaceable gasket material to form a vapor barrier.
4. ALTERNATIVE: Insulate chilled water pumps with flexible elastomeric. Insulation shall be applied to all surfaces of pump impeller housing.

3.4 FINISHES

A. Equipment Insulation with ASJ, Glass-Cloth, or Other Paintable Jacket Material: Paint jacket with paint system identified below and as specified in Section "Exterior Painting" and Section "Interior Painting."

1. Flat Acrylic Finish: Two finish coats over a primer that is compatible with jacket material and finish coat paint. Add fungicidal agent to render fabric mildew proof.

a. Finish Coat Material: Interior, flat, latex-emulsion size.

B. Flexible Elastomeric Thermal Insulation: After adhesive has fully cured, apply two coats of insulation manufacturer's recommended protective coating.

C. Color: Final color as selected by Architect. Vary first and second coats to allow visual inspection of the completed Work.

D. Do not field paint aluminum or stainless-steel jackets.

3.5 FIELD QUALITY CONTROL

A. Perform tests and inspections.

B. Tests and Inspections: Inspect field-insulated equipment, randomly selected by Architect, by removing field-applied jacket and insulation in layers in reverse order of their installation. Extent of inspection shall be limited to one location(s) for each type of equipment defined in the "Equipment Insulation Schedule" Article. For large equipment, remove only a portion adequate to determine compliance.

C. All insulation applications will be considered defective Work if sample inspection reveals noncompliance with requirements.

3.6 EQUIPMENT INSULATION SCHEDULE

A. Insulation materials and thicknesses are identified below. If more than one material is listed for a type of equipment, selection from materials listed is Contractor's option.

B. Insulate indoor and outdoor equipment that is not factory insulated.

C. Chilled-water pump insulation shall be one of the following:

1. Flexible Elastomeric: 2 inches thick. Insulation shall be applied to all surfaces of pump impeller housing.

D. Chilled-water expansion/chemical feeder tank insulation shall be one of the following:

1. Cellular Glass: 2 inches thick.

E. Heating-Hot-Water Expansion/Compression Tank Insulation: Cellular Glass Pipe and Tank: 2 inch thick.

F. Chilled-water air-separator insulation shall be one of the following:

1. Cellular Glass: 2 inches thick.

G. Heating-Hot-Water Air-Separator Insulation: Cellular Glass Pipe and Tank: 2 inches thick.

3.7 INDOOR, FIELD-APPLIED JACKET SCHEDULE

A. Install jacket over insulation material. For insulation with factory-applied jacket, install the field-applied jacket over the factory-applied jacket. Unless noted otherwise, provide as noted below.

B. Equipment, Concealed:

1. Aluminum, Stucco Embossed: 0.016 inch thick.

C. Equipment, Exposed, up to 48 Inches in Diameter or with Flat Surfaces up to 72 Inches:

1. Aluminum, Stucco Embossed: 0.016 inch thick.

3.8 OUTDOOR, FIELD-APPLIED JACKET SCHEDULE

A. Install jacket over insulation material. For insulation with factory-applied jacket, install the field-applied jacket over the factory-applied jacket.

B. Equipment, Exposed:

1. Aluminum, Stucco Embossed: 0.016 inch thick.

END OF SECTION 23 07 16

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SECTION 23 07 19 - HVAC PIPING INSULATION

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. Section includes insulating the following HVAC piping systems:

1. Chilled-water piping, indoors and outdoors.
2. Heating hot-water piping, indoors and outdoors.
3. Refrigerant suction piping, indoors and outdoors.

B. Related Sections:

1. Section "Duct Insulation."
2. Section "HVAC Equipment Insulation."

1.3 ACTION SUBMITTALS

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

B. Shop Drawings: Include plans, elevations, sections, details, and attachments to other work.

1. Detail application of protective shields, saddles, and inserts at hangers for each type of insulation and hanger.
2. Detail attachment and covering of heat tracing inside insulation.
3. Detail insulation application at pipe expansion joints for each type of insulation.
4. Detail insulation application at elbows, fittings, flanges, valves, and specialties for each type of insulation.
5. Detail removable insulation at piping specialties.
6. Detail application of field-applied jackets.
7. Detail application at linkages of control devices.

1.4 INFORMATIONAL SUBMITTALS

A. Field quality-control reports.

1.5 QUALITY ASSURANCE

A. Surface-Burning Characteristics: For insulation and related materials, as determined by testing identical products according to ASTM E 84, by a testing and inspecting agency acceptable to authorities having jurisdiction. Factory label insulation and jacket materials and adhesive, mastic, tapes, and cement material containers, with appropriate markings of applicable testing agency.

1. Insulation Installed Indoors: Flame-spread index of 25 or less, and smoke-developed index of 50 or less.
2. Insulation Installed Outdoors: Flame-spread index of 75 or less, and smoke-developed index of 150 or less.

PART 2 - PRODUCTS

2.1 INSULATION MATERIALS

A. Products shall not contain asbestos, lead, mercury, or mercury compounds.

B. Products that come in contact with stainless steel shall have a leachable chloride content of less than 50 ppm when tested according to ASTM C 871.

C. Insulation materials for use on austenitic stainless steel shall be qualified as acceptable according to ASTM C 795.

D. Foam insulation materials shall not use CFC or HCFC blowing agents in the manufacturing process.

E. Cellular Glass: Inorganic, incombustible, foamed or cellulated glass with annealed, rigid, hermetically sealed cells. Factory-applied jacket requirements are specified in "Factory-Applied Jackets" Article.

1. Products: Subject to compliance with requirements, provide the following:

a. Pittsburgh Corning Corporation; Foamglas.
b. Engineer Approved Equal.

2. Block Insulation: ASTM C 552, Type I.
3. Special-Shaped Insulation: ASTM C 552, Type III.
4. Board Insulation: ASTM C 552, Type IV.
5. Preformed Pipe Insulation without Jacket: Comply with ASTM C 552, Type II, Class 1.
6. Preformed Pipe Insulation with Factory-Applied ASJ: Comply with ASTM C 552, Type II, Class 2.
7. Factory fabricate shapes according to ASTM C 450 and ASTM C 585.

F. Flexible Elastomeric Insulation: Closed-cell, sponge- or expanded-rubber materials. Comply with ASTM C 534, Type I for tubular materials.

1. Products: Subject to compliance with requirements, provide the following:

a. Aeroflex USA, Inc.; Aerocel.
b. Armacell LLC; AP Armaflex.
c. K-Flex USA; Insul-Lock, Insul-Tube, and K-FLEX LS.

G. Mineral-Fiber, Preformed Pipe Insulation:

1. Products: Subject to compliance with requirements, provide the following:

a. Fibrex Insulations Inc.; Coreplus 1200.
b. Johns Manville; Micro-Lok.
c. Knauf Insulation; 1000-Degree Pipe Insulation.
d. Manson Insulation Inc.; Alley-K.
e. Owens Corning; Fiberglas Pipe Insulation.

2. Type I, 850 deg F (454 deg C) Materials: Mineral or glass fibers bonded with a thermosetting resin. Comply with ASTM C 547, Type I, Grade A, with factory-applied ASJ. Factory-applied jacket requirements are specified in "Factory-Applied Jackets" Article.

2.2 INSULATING CEMENTS

A. Mineral-Fiber, Hydraulic-Setting Insulating and Finishing Cement: Comply with ASTM C 449.

1. Products: Subject to compliance with requirements, provide the following:

a. Ramco Insulation, Inc.; Ramcote 1200 and Quik-Cote.

2.3 ADHESIVES

A. Materials shall be compatible with insulation materials, jackets, and substrates and for bonding insulation to itself and to surfaces to be insulated unless otherwise indicated.

B. Cellular-Glass Adhesive: Two-component, thermosetting urethane adhesive containing no flammable solvents, with a service temperature range of minus 100 to plus 200 deg F.

1. Products: Subject to compliance with requirements, provide the following:

a. Foster Brand, Specialty Construction Brands, Inc., a business of H. B. Fuller Company; 81-84.

2. For indoor applications, adhesive shall have a VOC content of 50 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).
3. Adhesive shall comply with the testing and product requirements of the California Department of Health Services' "Standard Practice for the Testing of Volatile Organic Emissions from Various Sources Using Small-Scale Environmental Chambers."

C. Flexible Elastomeric Adhesive: Comply with MIL-A-24179A, Type II, Class I.

1. Products: Subject to compliance with requirements, provide the following:

a. Aeroflex USA, Inc.; Aeroseal.
b. Armacell LLC; Armaflex 520 Adhesive.
c. Foster Brand, Specialty Construction Brands, Inc., a business of H. B. Fuller Company; 85-75.
d. K-Flex USA; R-373 Contact Adhesive.

2. For indoor applications, adhesive shall have a VOC content of 50 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).
3. Adhesive shall comply with the testing and product requirements of the California Department of Health Services' "Standard Practice for the Testing of Volatile Organic Emissions from Various Sources Using Small-Scale Environmental Chambers."

D. Mineral-Fiber Adhesive: Comply with MIL-A-3316C, Class 2, Grade A.

1. Products: Subject to compliance with requirements, provide the following:

a. Childers Brand, Specialty Construction Brands, Inc., a business of H. B. Fuller Company; CP-127.
b. Eagle Bridges - Marathon Industries; 225.
c. Foster Brand, Specialty Construction Brands, Inc., a business of H. B. Fuller Company; 85-60/85-70.
d. Mon-Eco Industries, Inc.; 22-25.

2. For indoor applications, adhesive shall have a VOC content of 80 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).
3. Adhesive shall comply with the testing and product requirements of the California Department of Health Services' "Standard Practice for the Testing of Volatile Organic Emissions from Various Sources Using Small-Scale Environmental Chambers."

E. ASJ Adhesive: Comply with MIL-A-3316C, Class 2, Grade A for bonding insulation jacket lap seams and joints.

1. Products: Subject to compliance with requirements, provide the following:

a. Childers Brand, Specialty Construction Brands, Inc., a business of H. B. Fuller Company; CP-82.
b. Eagle Bridges - Marathon Industries; 225.
c. Foster Brand, Specialty Construction Brands, Inc., a business of H. B. Fuller Company; 85-50.
d. Mon-Eco Industries, Inc.; 22-25.

2. For indoor applications, adhesive shall have a VOC content of 50 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).
3. Adhesive shall comply with the testing and product requirements of the California Department of Health Services' "Standard Practice for the Testing of Volatile Organic Emissions from Various Sources Using Small-Scale Environmental Chambers."

F. PVC Jacket Adhesive: Compatible with PVC jacket.

1. Products: Subject to compliance with requirements, provide the following:

a. Dow Corning Corporation; 739, Dow Silicone.
b. Johns Manville; Zeston Perma-Weld, CEEL-TITE Solvent Welding Adhesive.
c. P.I.C. Plastics, Inc.; Welding Adhesive.
d. Speedline Corporation; Polyco VP Adhesive.

2. For indoor applications, adhesive shall have a VOC content of 50 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).
3. Adhesive shall comply with the testing and product requirements of the California Department of Health Services' "Standard Practice for the Testing of Volatile Organic Emissions from Various Sources Using Small-Scale Environmental Chambers."

2.4 MASTICS

A. Materials shall be compatible with insulation materials, jackets, and substrates; comply with MIL-PRF-19565C, Type II.

1. For indoor applications, use mastics that have a VOC content of 50 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).

B. Vapor-Barrier Mastic: Water based; suitable for indoor use on below-ambient services.

1. Products: Subject to compliance with requirements, provide the following:

a. Foster Brand, Specialty Construction Brands, Inc., a business of H. B. Fuller Company; 30-80/30-90.
b. Vimasco Corporation; 749.

2. Water-Vapor Permeance: ASTM E 96/E 96M, Procedure B, 0.013 perm at 43-mil dry film thickness.
3. Service Temperature Range: Minus 20 to plus 180 deg F.
4. Solids Content: ASTM D 1644, 58 percent by volume and 70 percent by weight.
5. Color: White.

2.5 SEALANTS

A. Joint Sealants:

1. Joint Sealants for Cellular-Glass Products: Subject to compliance with requirements, provide the following:

a. Childers Brand, Specialty Construction Brands, Inc., a business of H. B. Fuller Company; CP-76.
b. Eagle Bridges - Marathon Industries; 405.
c. Foster Brand, Specialty Construction Brands, Inc., a business of H. B. Fuller Company; 30-45.
d. Mon-Eco Industries, Inc.; 44-05.
e. Pittsburgh Corning Corporation; Pittseal 444.

2. Materials shall be compatible with insulation materials, jackets, and substrates.

3. Permanently flexible, elastomeric sealant.
4. Service Temperature Range: Minus 100 to plus 300 deg F.
5. Color: White or gray.
6. For indoor applications, sealants shall have a VOC content of 420 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).
7. Sealants shall comply with the testing and product requirements of the California Department of Health Services' "Standard Practice for the Testing of Volatile Organic Emissions from Various Sources Using Small-Scale Environmental Chambers."

B. Metal Jacket Flashing Sealants:

1. Products: Subject to compliance with requirements, provide the following:

   a. Childers Brand, Specialty Construction Brands, Inc., a business of H. B. Fuller Company; CP-76.
   b. Eagle Bridges - Marathon Industries; 405.
   c. Foster Brand, Specialty Construction Brands, Inc., a business of H. B. Fuller Company; 95-44.
   d. Mon-Eco Industries, Inc.; 44-05.

2. Materials shall be compatible with insulation materials, jackets, and substrates.
3. Fire- and water-resistant, flexible, elastomeric sealant.
4. Service Temperature Range: Minus 40 to plus 250 deg F.
5. Color: Aluminum.
6. For indoor applications, sealants shall have a VOC content of 420 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).
7. Sealants shall comply with the testing and product requirements of the California Department of Health Services' "Standard Practice for the Testing of Volatile Organic Emissions from Various Sources Using Small-Scale Environmental Chambers."

2.6 FIELD-APPLIED JACKETS

A. Field-applied jackets shall comply with ASTM C 921, Type I, unless otherwise indicated.

B. PVC Jacket: High-impact-resistant, UV-resistant PVC complying with ASTM D 1784, Class 16354-C; thickness as scheduled; roll stock ready for shop or field cutting and forming. Thickness is indicated in field-applied jacket schedules.

1. Products: Subject to compliance with requirements, provide one of the following:

   a. Johns Manville; Zeston.
   b. P.I.C. Plastics, Inc.; FG Series.
   c. Proto Corporation; LoSmoke.
   d. Speedline Corporation; SmokeSafe.

2. Adhesive: As recommended by jacket material manufacturer.
3. Color: Color-code jackets based on system. Color as selected by Architect. See Construction Drawings.
4. Factory-fabricated fitting covers to match jacket if available; otherwise, field fabricate.

a. Shapes: 45- and 90-degree, short- and long-radius elbows, tees, valves, flanges, unions, reducers, end caps, soil-pipe hubs, traps, mechanical joints, and P-trap and supply covers for lavatories.

C. Aluminum Jacket: Comply with ASTM B 209, Alloy 3003, 3005, 3105, or 5005, Temper H-14.

1. Products: Subject to compliance with requirements, provide one of the following:

a. Childers Brand, Specialty Construction Brands, Inc., a business of H. B. Fuller Company; Metal Jacketing Systems.
b. ITW Insulation Systems; Aluminum and Stainless Steel Jacketing.
c. RPR Products, Inc.; Insul-Mate.

2. Sheet and roll stock ready for shop or field sizing.
3. Finish and thickness are indicated in field-applied jacket schedules.
4. Moisture Barrier for Indoor Applications: 1-mil- thick, heat-bonded polyethylene and kraft paper.
5. Moisture Barrier for Outdoor Applications: 3-mil- thick, heat-bonded polyethylene and kraft paper.
6. Factory-Fabricated Fitting Covers:

a. Same material, finish, and thickness as jacket.
b. Preformed 2-piece or gore, 45- and 90-degree, short- and long-radius elbows.
c. Tee covers.
d. Flange and union covers.
e. End caps.
f. Beveled collars.
g. Valve covers.
h. Field fabricate fitting covers only if factory-fabricated fitting covers are not available.

D. Self-Adhesive Outdoor Jacket: 60-mil- thick, laminated vapor barrier and waterproofing membrane for installation over insulation located aboveground outdoors; consisting of a rubberized bituminous resin on a crosslaminated polyethylene film covered with stucco-embossed aluminum-foil facing.

1. Products: Subject to compliance with requirements, provide the following:

a. Polyguard Products, Inc.; Alumaguard 60.

2.7 TAPES

A. ASJ Tape: White vapor-retarder tape matching factory-applied jacket with acrylic adhesive, complying with ASTM C 1136.

1. Products: Subject to compliance with requirements, provide one of the following:

a. ABI, Ideal Tape Division; 428 AWF ASJ.
b. Avery Dennison Corporation, Specialty Tapes Division; Fasson 0836.

c. Compac Corporation; 104 and 105.
d. Venture Tape; 1540 CW Plus, 1542 CW Plus, and 1542 CW Plus/SQ.

2. Width: 3 inches.
3. Thickness: 11.5 mils.
4. Adhesion: 90 ounces force/inch in width.
5. Elongation: 2 percent.
6. Tensile Strength: 40 lbf/inch in width.
7. ASJ Tape Disks and Squares: Precut disks or squares of ASJ tape.

B. PVC Tape: White vapor-retarder tape matching field-applied PVC jacket with acrylic adhesive; suitable for indoor and outdoor applications.

1. Products: Subject to compliance with requirements, provide one of the following:

a. ABI, Ideal Tape Division; 370 White PVC tape.
b. Compac Corporation; 130.
c. Venture Tape; 1506 CW NS.

2. Width: 2 inches.
3. Thickness: 6 mils.
4. Adhesion: 64 ounces force/inch in width.
5. Elongation: 500 percent.
6. Tensile Strength: 18 lbf/inch in width.

C. Aluminum-Foil Tape: Vapor-retarder tape with acrylic adhesive.

1. Products: Subject to compliance with requirements, provide one of the following:

a. ABI, Ideal Tape Division; 488 AWF.
b. Avery Dennison Corporation, Specialty Tapes Division; Fasson 0800.
c. Compac Corporation; 120.
d. Venture Tape; 3520 CW.

2. Width: 2 inches.
3. Thickness: 3.7 mils.
4. Adhesion: 100 ounces force/inch in width.
5. Elongation: 5 percent.
6. Tensile Strength: 34 lbf/inch in width.

2.8 SECUREMENTS

A. Aluminum Bands: ASTM B 209, Alloy 3003, 3005, 3105, or 5005; Temper H-14, 0.020 inch thick, 1/2 inch wide with wing seal or closed seal.

1. Products: Subject to compliance with requirements, provide one of the following:

a. ITW Insulation Systems; Gerrard Strapping and Seals.
b. RPR Products, Inc.; Insul-Mate Strapping, Seals, and Springs.

B. Staples: Outward-clinching insulation staples, nominal 3/4-inch- wide, stainless steel or Monel.

C. Wire: 0.062-inch soft-annealed, stainless steel or 0.062-inch soft-annealed, galvanized steel.

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

a. C & F Wire.

PART 3 - EXECUTION

3.1 PREPARATION

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

B. Coordinate insulation installation with the trade installing heat tracing. Comply with requirements for heat tracing that apply to insulation.

C. Mix insulating cements with clean potable water; if insulating cements are to be in contact with stainless-steel surfaces, use demineralized water.

3.2 GENERAL INSTALLATION REQUIREMENTS

A. Install insulation materials, accessories, and finishes with smooth, straight, and even surfaces; free of voids throughout the length of piping including fittings, valves, and specialties.

B. Install insulation materials, forms, vapor barriers or retarders, jackets, and thicknesses required for each item of pipe system as specified in insulation system schedules.

C. Install accessories compatible with insulation materials and suitable for the service. Install accessories that do not corrode, soften, or otherwise attack insulation or jacket in either wet or dry state.

D. Install insulation with longitudinal seams at top and bottom of horizontal runs.

E. Install multiple layers of insulation with longitudinal and end seams staggered.

F. Do not weld brackets, clips, or other attachment devices to piping, fittings, and specialties.

G. Keep insulation materials dry during application and finishing.

H. Install insulation with tight longitudinal seams and end joints. Bond seams and joints with adhesive recommended by insulation material manufacturer.

I. Install insulation with least number of joints practical.

J. Where vapor barrier is indicated, seal joints, seams, and penetrations in insulation at hangers, supports, anchors, and other projections with vapor-barrier mastic.

1. Install insulation continuously through hangers and around anchor attachments.
2. For insulation application where vapor barriers are indicated, extend insulation on anchor legs from point of attachment to supported item to point of attachment to structure. Taper and seal ends at attachment to structure with vapor-barrier mastic.
3. Install insert materials and install insulation to tightly join the insert. Seal insulation to insulation inserts with adhesive or sealing compound recommended by insulation material manufacturer.
4. Cover inserts with jacket material matching adjacent pipe insulation. Install shields over jacket, arranged to protect jacket from tear or puncture by hanger, support, and shield.

K. Apply adhesives, mastics, and sealants at manufacturer's recommended coverage rate and wet and dry film thicknesses.

L. Install insulation with factory-applied jackets as follows:

1. Draw jacket tight and smooth.
2. Cover circumferential joints with 3-inch-wide strips, of same material as insulation jacket. Secure strips with adhesive and outward clinching staples along both edges of strip, spaced 4 inches o.c.
3. Overlap jacket longitudinal seams at least 1-1/2 inches. Install insulation with longitudinal seams at bottom of pipe. Clean and dry surface to receive self-sealing lap. Staple laps with outward clinching staples along edge at 4 inches o.c.

    a. For below-ambient services, apply vapor-barrier mastic over staples.

4. Cover joints and seams with tape, according to insulation material manufacturer's written instructions, to maintain vapor seal.
5. Where vapor barriers are indicated, apply vapor-barrier mastic on seams and joints and at ends adjacent to pipe flanges and fittings.

M. Cut insulation in a manner to avoid compressing insulation more than 75 percent of its nominal thickness.

N. Finish installation with systems at operating conditions. Repair joint separations and cracking due to thermal movement.

O. Repair damaged insulation facings by applying same facing material over damaged areas. Extend patches at least 4 inches beyond damaged areas. Adhere, staple, and seal patches similar to butt joints.

P. For above-ambient services, do not install insulation to the following:

1. Vibration-control devices.
2. Testing agency labels and stamps.
3. Nameplates and data plates.
4. Manholes.
5. Handholes.
6. Cleanouts.

3.3 PENETRATIONS

A. Insulation Installation at Roof Penetrations: Install insulation continuously through roof penetrations.

1. Seal penetrations with flashing sealant.
2. For applications requiring only indoor insulation, terminate insulation above roof surface and seal with joint sealant. For applications requiring indoor and outdoor insulation, install insulation for outdoor applications tightly joined to indoor insulation ends. Seal joint with joint sealant.
3. Extend jacket of outdoor insulation outside roof flashing at least 2 inches below top of roof flashing.
4. Seal jacket to roof flashing with flashing sealant.

B. Insulation Installation at Underground Exterior Wall Penetrations: Terminate insulation flush with sleeve seal. Seal terminations with flashing sealant.

C. Insulation Installation at Aboveground Exterior Wall Penetrations: Install insulation continuously through wall penetrations.

1. Seal penetrations with flashing sealant.
2. For applications requiring only indoor insulation, terminate insulation inside wall surface and seal with joint sealant. For applications requiring indoor and outdoor insulation, install insulation for outdoor applications tightly joined to indoor insulation ends. Seal joint with joint sealant.
3. Extend jacket of outdoor insulation outside wall flashing and overlap wall flashing at least 2 inches.
4. Seal jacket to wall flashing with flashing sealant.

D. Insulation Installation at Interior Wall and Partition Penetrations (That Are Not Fire Rated): Install insulation continuously through walls and partitions.

E. Insulation Installation at Fire-Rated Wall and Partition Penetrations: Install insulation continuously through penetrations of fire-rated walls and partitions.

1. Comply with requirements in Section "Penetration Firestopping" for firestopping and fire-resistive joint sealers.

F. Insulation Installation at Floor Penetrations:

1. Pipe: Install insulation continuously through floor penetrations.
2. Seal penetrations through fire-rated assemblies. Comply with requirements in Section "Penetration Firestopping."

3.4 GENERAL PIPE INSULATION INSTALLATION

A. Requirements in this article generally apply to all insulation materials except where more specific requirements are specified in various pipe insulation material installation articles.

B. Insulation Installation on Fittings, Valves, Strainers, Flanges, and Unions:

1. Install insulation over fittings, valves, strainers, flanges, unions, and other specialties with continuous thermal and vapor-retarder integrity unless otherwise indicated.
2. Insulate pipe elbows using preformed fitting insulation or mitered fittings made from same material and density as adjacent pipe insulation. Each piece shall be butted tightly against adjoining piece and bonded with adhesive. Fill joints, seams, voids, and irregular surfaces with insulating cement finished to a smooth, hard, and uniform contour that is uniform with adjoining pipe insulation.
3. Insulate tee fittings with preformed fitting insulation or sectional pipe insulation of same material and thickness as used for adjacent pipe. Cut sectional pipe insulation to fit. Butt each section closely to the next and hold in place with tie wire. Bond pieces with adhesive.
4. Insulate valves using preformed fitting insulation or sectional pipe insulation of same material, density, and thickness as used for adjacent pipe. Overlap adjoining pipe insulation by not less than two times the thickness of pipe insulation, or one pipe diameter, whichever is thicker. For valves, insulate up to and including the bonnets, valve stuffing-box studs, bolts, and nuts. Fill joints, seams, and irregular surfaces with insulating cement.
5. Insulate strainers using preformed fitting insulation or sectional pipe insulation of same material, density, and thickness as used for adjacent pipe. Overlap adjoining pipe insulation by not less than two times the thickness of pipe insulation, or one pipe diameter, whichever is thicker. Fill joints, seams, and irregular surfaces with insulating cement. Insulate strainers so strainer basket flange or plug can be easily removed and replaced without damaging the insulation and jacket. Provide a removable reusable insulation cover. For below-ambient services, provide a design that maintains vapor barrier.
6. Insulate flanges and unions using a section of oversized preformed pipe insulation. Overlap adjoining pipe insulation by not less than two times the thickness of pipe insulation, or one pipe diameter, whichever is thicker.
7. Cover segmented insulated surfaces with a layer of finishing cement and coat with a mastic. Install vapor-barrier mastic for below-ambient services and a breather mastic for above-ambient services. Reinforce the mastic with fabric-reinforcing mesh. Trowel the mastic to a smooth and well-shaped contour.
8. For services not specified to receive a field-applied jacket except for flexible elastomeric and polyolefin, install fitted PVC cover over elbows, tees, strainers, valves, flanges, and unions. Terminate ends with PVC end caps. Tape PVC covers to adjoining insulation facing using PVC tape.

C. Insulate instrument connections for thermometers, pressure gages, pressure temperature taps, test connections, flow meters, sensors, switches, and transmitters on insulated pipes. Shape insulation at these connections by tapering it to and around the connection with insulating cement and finish with finishing cement, mastic, and flashing sealant.

D. Install removable insulation covers at locations indicated. Installation shall conform to the following:

1. Make removable flange and union insulation from sectional pipe insulation of same thickness as that on adjoining pipe. Install same insulation jacket as adjoining pipe insulation.
2. When flange and union covers are made from sectional pipe insulation, extend insulation from flanges or union long at least two times the insulation thickness over adjacent pipe

insulation on each side of flange or union. Secure flange cover in place with stainless-steel or aluminum bands. Select band material compatible with insulation and jacket.

3. Construct removable valve insulation covers in same manner as for flanges, except divide the two-part section on the vertical center line of valve body.
4. When covers are made from block insulation, make two halves, each consisting of mitered blocks wired to stainless-steel fabric. Secure this wire frame, with its attached insulation, to flanges with tie wire. Extend insulation at least 2 inches over adjacent pipe insulation on each side of valve. Fill space between flange or union cover and pipe insulation with insulating cement. Finish cover assembly with insulating cement applied in two coats. After first coat is dry, apply and trowel second coat to a smooth finish.
5. Unless a PVC jacket is indicated in field-applied jacket schedules, finish exposed surfaces with a metal jacket.

3.5 INSTALLATION OF CELLULAR-GLASS INSULATION

A. Insulation Installation on Straight Pipes and Tubes:

1. Secure each layer of insulation to pipe with wire or bands and tighten bands without deforming insulation materials.
2. Where vapor barriers are indicated, seal longitudinal seams, end joints, and protrusions with vapor-barrier mastic and joint sealant.
3. For insulation with factory-applied jackets on above-ambient services, secure laps with outward-clinched staples at 6 inches o.c.
4. For insulation with factory-applied jackets on below-ambient services, do not staple longitudinal tabs. Instead, secure tabs with additional adhesive as recommended by insulation material manufacturer and seal with vapor-barrier mastic and flashing sealant.

B. Insulation Installation on Pipe Flanges:

1. Install preformed pipe insulation to outer diameter of pipe flange.
2. Make width of insulation section same as overall width of flange and bolts, plus twice the thickness of pipe insulation.
3. Fill voids between inner circumference of flange insulation and outer circumference of adjacent straight pipe segments with cut sections of cellular-glass block insulation of same thickness as pipe insulation.
4. Install jacket material with manufacturer's recommended adhesive, overlap seams at least 1 inch, and seal joints with flashing sealant.

C. Insulation Installation on Pipe Fittings and Elbows:

1. Install preformed sections of same material as straight segments of pipe insulation when available. Secure according to manufacturer's written instructions.
2. When preformed sections of insulation are not available, install mitered sections of cellular-glass insulation. Secure insulation materials with wire or bands.

D. Insulation Installation on Valves and Pipe Specialties:

1. Install preformed sections of cellular-glass insulation to valve body.
2. Arrange insulation to permit access to packing and to allow valve operation without disturbing insulation.

3. Install insulation to flanges as specified for flange insulation application.

3.6 INSTALLATION OF FLEXIBLE ELASTOMERIC INSULATION

A. Seal longitudinal seams and end joints with manufacturer's recommended adhesive to eliminate openings in insulation that allow passage of air to surface being insulated.

B. Insulation Installation on Pipe Flanges:

1. Install pipe insulation to outer diameter of pipe flange.
2. Make width of insulation section same as overall width of flange and bolts, plus twice the thickness of pipe insulation.
3. Fill voids between inner circumference of flange insulation and outer circumference of adjacent straight pipe segments with cut sections of sheet insulation of same thickness as pipe insulation.
4. Secure insulation to flanges and seal seams with manufacturer's recommended adhesive to eliminate openings in insulation that allow passage of air to surface being insulated.

C. Insulation Installation on Pipe Fittings and Elbows:

1. Install mitered sections of pipe insulation.
2. Secure insulation materials and seal seams with manufacturer's recommended adhesive to eliminate openings in insulation that allow passage of air to surface being insulated.

D. Insulation Installation on Valves and Pipe Specialties:

1. Install preformed valve covers manufactured of same material as pipe insulation when available.
2. When preformed valve covers are not available, install cut sections of pipe and sheet insulation to valve body. Arrange insulation to permit access to packing and to allow valve operation without disturbing insulation.
3. Install insulation to flanges as specified for flange insulation application.
4. Secure insulation to valves and specialties and seal seams with manufacturer's recommended adhesive to eliminate openings in insulation that allow passage of air to surface being insulated.

3.7 INSTALLATION OF MINERAL-FIBER PREFORMED PIPE INSULATION

A. Insulation Installation on Straight Pipes and Tubes:

1. Secure each layer of preformed pipe insulation to pipe with wire or bands and tighten bands without deforming insulation materials.
2. Where vapor barriers are indicated, seal longitudinal seams, end joints, and protrusions with vapor-barrier mastic and joint sealant.
3. For insulation with factory-applied jackets on above-ambient surfaces, secure laps with outward-clinched staples at 6 inches o.c.
4. For insulation with factory-applied jackets on below-ambient surfaces, do not staple longitudinal tabs. Instead, secure tabs with additional adhesive as recommended by insulation material manufacturer and seal with vapor-barrier mastic and flashing sealant.

B. Insulation Installation on Pipe Flanges:

1. Install preformed pipe insulation to outer diameter of pipe flange.
2. Make width of insulation section same as overall width of flange and bolts, plus twice the thickness of pipe insulation.
3. Fill voids between inner circumference of flange insulation and outer circumference of adjacent straight pipe segments with mineral-fiber blanket insulation.
4. Install jacket material with manufacturer's recommended adhesive, overlap seams at least 1 inch, and seal joints with flashing sealant.

C. Insulation Installation on Pipe Fittings and Elbows:

1. Install preformed sections of same material as straight segments of pipe insulation when available.
2. When preformed insulation elbows and fittings are not available, install mitered sections of pipe insulation, to a thickness equal to adjoining pipe insulation. Secure insulation materials with wire or bands.

D. Insulation Installation on Valves and Pipe Specialties:

1. Install preformed sections of same material as straight segments of pipe insulation when available.
2. When preformed sections are not available, install mitered sections of pipe insulation to valve body.
3. Arrange insulation to permit access to packing and to allow valve operation without disturbing insulation.
4. Install insulation to flanges as specified for flange insulation application.

3.8 FIELD-APPLIED JACKET INSTALLATION

A. Where PVC jackets are indicated, install with 1-inch overlap at longitudinal seams and end joints; for horizontal applications. Seal with manufacturer's recommended adhesive.

1. Apply two continuous beads of adhesive to seams and joints, one bead under lap and the finish bead along seam and joint edge.

B. Where metal jackets are indicated, install with 2-inch overlap at longitudinal seams and end joints. Overlap longitudinal seams arranged to shed water. Seal end joints with weatherproof sealant recommended by insulation manufacturer. Secure jacket with stainless-steel bands 12 inches o.c. and at end joints.

3.9 FINISHES

A. Pipe Insulation with ASJ or Other Paintable Jacket Material: Paint jacket with paint system identified below and as specified in Section "Exterior Painting" and Section "Interior Painting."

1. Flat Acrylic Finish: Two finish coats over a primer that is compatible with jacket material and finish coat paint. Add fungicidal agent to render fabric mildew proof.

a. Finish Coat Material: Interior, flat, latex-emulsion size.

B. Flexible Elastomeric Thermal Insulation: After adhesive has fully cured, apply two coats of insulation manufacturer's recommended protective coating.

C. Color: Final color as selected by Architect. Vary first and second coats to allow visual inspection of the completed Work.

D. Do not field paint aluminum or stainless-steel jackets.

3.10 FIELD QUALITY CONTROL

A. Perform tests and inspections.

B. Tests and Inspections:

1. Inspect pipe, fittings, strainers, and valves, randomly selected by Architect, by removing field-applied jacket and insulation in layers in reverse order of their installation. Extent of inspection shall be limited to two locations of straight pipe, two locations of threaded fittings, two locations of welded fittings, two locations of threaded strainers, two locations of welded strainers, two locations of threaded valves, and two locations of flanged valves for each pipe service defined in the "Piping Insulation Schedule, General" Article.

C. All insulation applications will be considered defective Work if sample inspection reveals noncompliance with requirements.

3.11 PIPING INSULATION SCHEDULE, GENERAL

A. Acceptable preformed pipe and tubular insulation materials and thicknesses are identified for each piping system and pipe size range. If more than one material is listed for a piping system, selection from materials listed is Contractor's option.

B. Items Not Insulated: Unless otherwise indicated, do not install insulation on the following:

1. Drainage piping located in crawl spaces.
2. Chrome-plated pipes and fittings unless there is a potential for personnel injury.

3.12 INDOOR PIPING INSULATION SCHEDULE

A. Chilled Water Supply and Return, above 40 Deg F: Insulation shall be the following:

1. Cellular Glass: smaller than 8" pipe – 1-1/2 inches thick, 10" and larger pipe – 2 inches thick.

B. Heating-Hot-Water Supply and Return, 200 Deg F and Below: Insulation shall be one of the following:

1. Cellular Glass: smaller than 6" pipe – 1-1/2 inches thick, 6" and larger pipe – 2 inches thick.
2. Mineral-Fiber, Preformed Pipe, Type I: 2 inches thick.

C. Refrigerant Suction Piping: Flexible elastomeric, 3/4 inch thick.

D. Domestic potable water: Flexible elastomeric, 1/2 inch thick.

3.13 OUTDOOR, ABOVEGROUND PIPING INSULATION SCHEDULE

A. Chilled Water Supply and Return: Insulation shall be the following:

1. Cellular Glass: 2 inches thick.

B. Heating-Hot-Water Supply and Return, 200 Deg F and Below: Insulation shall be the following:

1. Cellular Glass: 2 inches thick.

C. Refrigerant Suction Piping: Flexible Elastomeric: 3/4 inches thick.

D. Domestic potable water: Flexible Elastomeric, 1/2 inch thick.

3.14 INDOOR, FIELD-APPLIED JACKET SCHEDULE

A. Install jacket over insulation material. For insulation with factory-applied jacket, install the field-applied jacket over the factory-applied jacket.

B. If more than one material is listed, selection from materials listed is Contractor's option.

C. Piping, Concealed:

1. None.

D. Piping, Exposed:

1. Exposed Room application: PVC: 20 mils thick.
2. Mechanical Room application: Aluminum, Stucco Embossed: 0.016 inch thick.

3.15 OUTDOOR, FIELD-APPLIED JACKET SCHEDULE

A. Install jacket over insulation material. For insulation with factory-applied jacket, install the field-applied jacket over the factory-applied jacket. Unless noted otherwise, provide as noted below.

B. Piping, Concealed:

1. Aluminum, Stucco Embossed: 0.024 inch thick.

C. Piping, Exposed:

1. Aluminum, Stucco Embossed: 0.024 inch thick.

END OF SECTION 23 07 19

SECTION 23 08 00 - COMMISSIONING OF HVAC

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. Section includes commissioning process requirements for HVAC&R systems, assemblies, and equipment.

B. Commissioning shall be provided by Owner under separate contract.

1.3 DEFINITIONS

A. Commissioning Plan: A document that outlines the organization, schedule, allocation of resources, and documentation requirements of the commissioning process.

B. CxA: Commissioning Authority.

C. HVAC&R: Heating, Ventilating, Air Conditioning, and Refrigeration.

D. Systems, Subsystems, Equipment, and Components: Where these terms are used together or separately, they shall mean "as-built" systems, subsystems, equipment, and components.

1.4 CONTRACTOR'S RESPONSIBILITIES

A. Perform commissioning tests at the direction of the CxA.

B. Attend construction phase controls coordination meeting.

C. Attend testing, adjusting, and balancing review and coordination meeting.

D. Participate in HVAC&R systems, assemblies, equipment, and component maintenance orientation and inspection as directed by the CxA.

E. Provide information requested by the CxA for final commissioning documentation.

F. Provide measuring instruments and logging devices to record test data, and provide data acquisition equipment to record data for the complete range of testing for the required test period.

1.5 CxA'S RESPONSIBILITIES

A. Provide Project-specific construction checklists and commissioning process test procedures for actual HVAC&R systems, assemblies, equipment, and components to be furnished and installed as part of the construction contract.

B. Direct commissioning testing.

C. Verify testing, adjusting, and balancing of Work are complete.

D. Provide test data, inspection reports, and certificates in Systems Manual.

1.6 COMMISSIONING DOCUMENTATION

A. Provide the following information to the CxA for inclusion in the commissioning plan:

1. Plan for delivery and review of submittals, systems manuals, and other documents and reports.
2. Identification of installed systems, assemblies, equipment, and components including design changes that occurred during the construction phase.
3. Process and schedule for completing construction checklists and manufacturer's prestart and startup checklists for HVAC&R systems, assemblies, equipment, and components to be verified and tested.
4. Certificate of readiness, signed by the Contractor, certifying that HVAC&R systems, assemblies, equipment, components, and associated controls are ready for testing.
5. Certificate of completion certifying that installation, prestart checks, and startup procedures have been completed.
6. Certificate of readiness certifying that HVAC&R systems, subsystems, equipment, and associated controls are ready for testing.
7. Test and inspection reports and certificates.
8. Corrective action documents.
9. Verification of testing, adjusting, and balancing reports.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION

3.1 TESTING PREPARATION

A. Certify that HVAC&R systems, subsystems, and equipment have been installed, calibrated, and started and are operating according to the Contract Documents.

B. Certify that HVAC&R instrumentation and control systems have been completed and calibrated, that they are operating according to the Contract Documents, and that pretest set points have been recorded.

C. Certify that testing, adjusting, and balancing procedures have been completed and that testing, adjusting, and balancing reports have been submitted, discrepancies corrected, and corrective work approved.

D. Set systems, subsystems, and equipment into operating mode to be tested (e.g., normal shutdown, normal auto position, normal manual position, unoccupied cycle, emergency power, and alarm conditions).

E. Inspect and verify the position of each device and interlock identified on checklists.

F. Check safety cutouts, alarms, and interlocks with life-safety systems during each mode of operation.

G. Testing Instrumentation: Install measuring instruments and logging devices to record test data as directed by the CxA.

3.2 TESTING AND BALANCING VERIFICATION

A. Prior to performance of testing and balancing Work, provide copies of reports, sample forms, checklists, and certificates to the CxA.

B. Notify the CxA at least **10** days in advance of testing and balancing Work, and provide access for the CxA to witness testing and balancing Work.

C. Provide technicians, instrumentation, and tools to verify testing and balancing of HVAC&R systems at the direction of the CxA.

1. The CxA will notify testing and balancing Contractor 10 days in advance of the date of field verification. Notice will not include data points to be verified.
2. The testing and balancing Subcontractor shall use the same instruments (by model and serial number) that were used when original data were collected.
3. Failure of an item includes, other than sound, a deviation of more than 10 percent. Failure of more than 10 percent of selected items shall result in rejection of final testing, adjusting, and balancing report.
4. Remedy the deficiency and notify the CxA so verification of failed portions can be performed.

3.3 GENERAL TESTING REQUIREMENTS

A. Provide technicians, instrumentation, and tools to perform commissioning test at the direction of the CxA.

B. Scope of HVAC&R testing shall include entire HVAC&R installation, from central equipment for heat generation and refrigeration through distribution systems to each conditioned space. Testing shall include measuring capacities and effectiveness of operational and control functions.

C. Test all operating modes, interlocks, control responses, and responses to abnormal or emergency conditions, and verify proper response of building automation system controllers and sensors.

D. The CxA along with the HVAC&R Contractor, testing and balancing Contractor, and HVAC&R Instrumentation and Control Contractor shall prepare detailed testing plans, procedures, and checklists for HVAC&R systems, subsystems, and equipment.

E. Tests will be performed using design conditions whenever possible.

F. Simulated conditions may need to be imposed using an artificial load when it is not practical to test under design conditions. Before simulating conditions, calibrate testing instruments. Provide equipment to simulate loads. Set simulated conditions as directed by the CxA and document simulated conditions and methods of simulation. After tests, return settings to normal operating conditions.

G. The CxA may direct that set points be altered when simulating conditions is not practical.

H. The CxA may direct that sensor values be altered with a signal generator when design or simulating conditions and altering set points are not practical.

I. If tests cannot be completed because of a deficiency outside the scope of the HVAC&R system, document the deficiency and report it to the Owner. After deficiencies are resolved, reschedule tests.

J. If the testing plan indicates specific seasonal testing, complete appropriate initial performance tests and documentation and schedule seasonal tests.

3.4 HVAC&R SYSTEMS, SUBSYSTEMS, AND EQUIPMENT TESTING PROCEDURES

A. HVAC&R Instrumentation and Control System Testing: Field testing plans and testing requirements are specified in Section 23 09 00 "Instrumentation and Control for HVAC" and Construction Drawings - "Sequence and Operations for HVAC Controls." Assist the CxA with preparation of testing plans.

B. Refrigeration System Testing: Provide technicians, instrumentation, tools, and equipment to test performance of chillers, cooling towers, refrigerant compressors and condensers, heat pumps, and other refrigeration systems. The CxA shall determine the sequence of testing and testing procedures for each equipment item and pipe section to be tested.

C. HVAC&R Distribution System Testing: Provide technicians, instrumentation, tools, and equipment to test performance of air, steam, and hydronic distribution systems; special exhaust; and other distribution systems, including HVAC&R terminal equipment and unitary equipment.

END OF SECTION 23 08 00

SECTION 23 09 00 – DIRECT DIGITAL CONTROL SYSTEM

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 control equipment for HVAC systems and components, including control components for terminal heating and cooling units not supplied with factory-wired controls.

B. See Construction Drawings "Sequence of Operations for HVAC Controls" for requirements that relate to this Section.

C. The project includes Third Party Commissioning (separate contract and direct with Owner). Refer to section 23 08 00 “Commissioning of HVAC” for further details and requirements.

1.3 ACTION SUBMITTALS

A. Product Data: For each control device indicated.

B. Shop Drawings:

1. Schematic flow diagrams. Showing equipment, fans, pumps, coils, dampers, valves, and control devices.
2. Power, signal, and control wiring diagrams.
3. Details of control panel faces.
4. Damper schedule.
5. Valve schedule.
6. DDC System Hardware: Wiring diagrams, schematic floor plans, and schematic control diagrams.
7. Control System Software: Schematic diagrams, written descriptions, and points list.
8. Indicate all required electrical wiring. Clearly differentiate between portions of wiring that are factory-installed and portions to be field-installed. The point-to-point wiring diagram shall show all interconnections.
9. Written description of Sequence of Operation.

1.4 INFORMATIONAL SUBMITTALS

A. Field quality-control test and/or progress reports.

1.5 CLOSEOUT SUBMITTALS

A. Operation and maintenance data.

B. Software and firmware operational documentation.

C. Maintenance Data: Submit maintenance instructions and spare parts lists for each type of control device. Include that type data, and a copy of all approval submittals in O&M Manual.

D. System Manual: In addition to the maintenance data requirements, provide a DDC Owner's Manual in a separate binder specifically for this project. This manual shall provide a description of the information flow to and from panels and devices and shall describe the overall communications network. The manual shall also include operating instructions, block diagrams, schematics, schedules, and system descriptions. Instruct Owner's personnel with this manual during the required training periods.

E. Software: Submit a copy of all software.

F. Service: Submit name, address, and telephone number of company that will provide service and training for the system.

1.6 QUALITY ASSURANCE

A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.

B. All work done under this contract shall be performed in accordance with the most recent issue of the following codes, standards and guidelines.

1. NEC National Electric Code
2. NFPA National Fire Protection Association
3. FBC Florida Building Code
4. TIA/EIA 568-B Commercial Building Telecommunications Cabling Standard

1.7 WARRANTY

A. All equipment including material used in the installation thereof shall be warranted for one (1) full year by the contractor against mechanical, electrical, and workmanship defects. In the event defects become evident within the warranty period, the contractor shall repair or replace the defective parts and materials at no additional cost to the School District.

B. Where controllers and other control devices are provided with a standard warranty in excess of one year by the manufacturer, the DDC Contractor shall provide an extended labor and materials warranty for each such item equal in length of time to the manufacturer’s warranty.

C. The warranty period shall start with the date of Final Acceptance for each individual project.

D. The warranty shall apply to all equipment provided under the provisions of this contract regardless of the location or project type.

E. Extended warranties longer than one year shall be provided where required by the Owner.

F. It shall be the responsibility of the Contractor to maintain records of dates of installation and warranty periods including dates of Substantial Completion and Final Acceptance for all projects. The Contractor shall provide the Owner a copy of this information, updated monthly.

PART 2 - PRODUCTS

2.1 CONTROL SYSTEM

A. Manufacturers:

1. Refer to Construction Drawings for project DDC requirements.

B. Controls contractor shall be a Subcontractor to the Mechanical Contractor for this work. Refer to Section “Allowance”.

C. Provide EMCS/DDC control products in sizes and capacities indicated, consisting of valves, dampers, sensors, controllers and other components as required for complete installation. Except as otherwise indicated, provide manufacturer's standard control system components as indicated by published product information, designed and constructed as recommended by manufacturer. Provide an EMCS/DDC controls system with the following functional and construction features as indicated.

2.2 DDC EQUIPMENT

A. Control Units: Modular, comprising processor board with programmable, nonvolatile, random-access memory; local operator access and display panel; integral interface equipment; and backup power source.

1. Units monitor or control each I/O point; process information; execute commands from other control units, devices, and operator stations; and download from or upload to operator workstation.
2. Stand-alone mode control functions operate regardless of network status. Functions include the following:

a. Global communications.
b. Discrete/digital, analog, and pulse I/O.
c. Monitoring, controlling, or addressing data points.
d. Software applications, scheduling, and alarm processing.
e. Testing and developing control algorithms without disrupting field hardware and controlled environment.

B. Local Control Units: Modular, comprising processor board with electronically programmable, nonvolatile, read-only memory; and backup power source.

1. Units monitor or control each I/O point, process information, and download from or upload to operator workstation or diagnostic terminal unit.

2. Stand-alone mode control functions operate regardless of network status. Functions include the following:

    a. Global communications.
    b. Discrete/digital, analog, and pulse I/O.
    c. Monitoring, controlling, or addressing data points.

3. Local operator interface provides for download from or upload to operator workstation.

C. I/O Interface: Hardwired inputs and outputs may tie into system through controllers. Protect points so that shorting will cause no damage to controllers.

1. Binary Inputs: Allow monitoring of on-off signals without external power.
2. Pulse Accumulation Inputs: Accept up to 10 pulses per second.
3. Analog Inputs: Allow monitoring of low-voltage (0- to 10-V dc), current (4 to 20 mA), or resistance signals.
4. Binary Outputs: Provide on-off or pulsed low-voltage signal, selectable for normally open or normally closed operation.
5. Analog Outputs: Provide modulating signal, either low voltage (0- to 10-V dc) or current (4 to 20 mA).
6. Tri-State Outputs: Provide two coordinated binary outputs for control of three-point, floating-type electronic actuators.
7. Universal I/Os: Provide software selectable binary or analog outputs.

2.3 UNITARY CONTROLLERS

A. Unitized, capable of stand-alone operation with sufficient memory to support its operating system, database, and programming requirements, and with sufficient I/O capacity for the application.

1. Configuration: Local keypad and display; diagnostic LEDs for power, communication, and processor; wiring termination to terminal strip or card connected with ribbon cable; memory with bios; and 72-hour battery backup.
2. Operating System: Manage I/O communication to allow distributed controllers to share real and virtual object information and allow central monitoring and alarms. Perform automatic system diagnostics; monitor system and report failures.
3. Enclosure: Dustproof rated for operation at 32 to 120 deg F.

2.4 ANALOG CONTROLLERS

A. Step Controllers: 6- or 10-stage type, with heavy-duty switching rated to handle loads and operated by electric motor.

B. Electric, Outdoor-Reset Controllers: Remote-bulb or bimetal rod-and-tube type, proportioning action with adjustable throttling range, adjustable set point, scale range minus 10 to plus 70 deg F, and single- or double-pole contacts.

C. Electronic Controllers: Wheatstone-bridge-amplifier type, in steel enclosure with provision for remote-resistance readjustment. Identify adjustments on controllers, including proportional band and authority.

2.5 ELECTRONIC SENSORS

A. Description: Vibration and corrosion resistant; for wall, immersion, or duct mounting as required.

B. Thermistor Temperature Sensors and Transmitters:

1. Manufacturers:

    a. Belimo.
    b. Ebtron, Inc.
    c. Engineer Approved Equal

2. Accuracy: Plus or minus 0.5 deg F at calibration point.
3. Wire: Twisted, shielded-pair cable.
4. Insertion Elements in Ducts: Single point, 8 inches long; use where not affected by temperature stratification or where ducts are smaller than 9 sq. ft.
5. Averaging Elements in Ducts: between 36 inches long, flexible; use where prone to temperature stratification or where ducts are larger than 10 sq. ft. (1 sq. m).
6. Insertion Elements for Liquids: Brass or stainless-steel socket with minimum insertion length of 2-1/2 inches.
7. Room Sensor Cover Construction: Manufacturer's standard locking covers.
8. Outside-Air Sensors: Watertight inlet fitting, shielded from direct sunlight.

C. Humidity Sensors: Bulk polymer sensor element.

1. Manufacturers:

    a. Veris
    b. Engineer Approved Equal

2. Room Sensor Cover Construction: Manufacturer's standard locking covers.
3. Accuracy at 25°C from 10-80% RH: ±1% at 20 to 40% RH in mA output mode.
4. HS Element Digitally profiled thin-film capacitive.
5. Operating Humidity Range 0 to 100% RH (non-condensing)
6. Scaling 0-100% RH
7. Operating Temperature Range -40° to 122°F

D. Pressure Transmitters/Transducers:

1. Manufacturers:

    a. Veris
    b. Engineer Approved Equal

2. Static-Pressure Transmitter: Nondirectional sensor with suitable range for expected input, and temperature compensated.

    a. Accuracy: 2 percent of full scale with repeatability of 0.5 percent.
    b. Output: 4 to 20 mA.
    c. Building Static-Pressure Range: 0- to 0.25-inch wg.
    d. Duct Static-Pressure Range: 0- to 5-inch wg.

3. Water Pressure Transducers: Stainless-steel diaphragm construction, suitable for service; minimum 150-psig operating pressure; linear output 4 to 20 mA.
4. Water Differential-Pressure Transducers: Stainless-steel diaphragm construction, suitable for service; minimum 150-psig operating pressure and tested to 300-psig; linear output 4 to 20 mA.
5. Differential-Pressure Switch (Air or Water): Snap acting, with pilot-duty rating and with suitable scale range and differential.
6. Pressure Transmitters: Direct acting for gas or liquid service; range suitable for system; linear output 4 to 20 mA.

E. Room sensor accessories include the following:

1. Insulating Bases: For sensors located on exterior walls.
2. Guards: Metal wire, tamperproof for locker room/gymnasium application.
3. Adjusting Key: As required for calibration and cover screws.

2.6 STATUS SENSORS

A. Status Inputs for Fans: Differential-pressure switch with pilot-duty rating and with adjustable range of 0- to 5-inch w.g.

B. Status Inputs for Pumps: Differential-pressure switch with pilot-duty rating and with adjustable pressure-differential range of 8 to 60 psig, piped across pump.

C. Status Inputs for Electric Motors: Comply with ISA 50.00.01, current-sensing fixed- or split-core transformers with self-powered transmitter, adjustable and suitable for 175 percent of rated motor current.

D. Voltage Transmitter (100- to 600-V ac): Comply with ISA 50.00.01, single-loop, self-powered transmitter, adjustable, with suitable range and 1 percent full-scale accuracy.

E. Power Monitor: 3-phase type with disconnect/shorting switch assembly, listed voltage and current transformers, with pulse kilowatt hour output and 4- to 20-mA kW output, with maximum 2 percent error at 1.0 power factor and 2.5 percent error at 0.5 power factor.

F. Current Switches: Self-powered, solid-state with adjustable trip current, selected to match current and system output requirements.

G. Electronic Valve/Damper Position Indicator: Visual scale indicating percent of travel and 2- to 10-V dc, feedback signal.

2.7 GAS DETECTION EQUIPMENT

A. Manufacturers:

1. Ebtron, Inc.
2. Honeywell International Inc.; Home & Building Control.
3. TSI Incorporated.
4. Engineer Approved Equal.

B. Carbon Dioxide Sensor and Transmitter: Single detectors using solid-state infrared sensors; suitable over a temperature range of 23 to 130 deg F and calibrated for 0 to 2 percent, with continuous or averaged reading, 4- to 20-mA output;, for wall mounting.

C. Occupancy Sensor: Passive infrared, with time delay, daylight sensor lockout, sensitivity control, and 180-degree field of view with vertical sensing adjustment; for flush mounting.

2.8 THERMOSTATS

A. Electric, solid-state, microcomputer-based room thermostat with remote sensor.

1. Automatic switching from heating to cooling.
2. Preferential rate control to minimize overshoot and deviation from set point.
3. Instant override of set point for continuous or timed period.

2.9 ACTUATORS

A. Electric Motors: Size to operate with sufficient reserve power to provide smooth modulating action or two-position action.

1. Comply with requirements in Section "Common Motor Requirements for HVAC Equipment."
2. Permanent Split-Capacitor or Shaded-Pole Type: Gear trains completely oil immersed and sealed. Equip spring-return motors with integral spiral-spring mechanism in housings designed for easy removal for service or adjustment of limit switches, auxiliary switches, or feedback potentiometer.
3. Nonspring-Return Motors for Valves Larger Than NPS 2-1/: Size for running torque of 150 in. x lbf and breakaway torque of 300 in. x lbf.
4. Spring-Return Motors for Valves Larger Than NPS 2-1/2: Size for running and breakaway torque of 150 in. x lbf.
5. Nonspring-Return Motors for Dampers Larger Than 25 Sq. Ft.: Size for running torque of 150 in. x lbf and breakaway torque of 300 in. x lbf.
6. Spring-Return Motors for Dampers Larger Than 25 Sq. Ft.: Size for running and breakaway torque of 180 in. x lbf.

B. Electronic Actuators: Direct-coupled type designed for minimum 60,000 full-stroke cycles at rated torque. Provide with 5 year warranty.

1. Manufacturers:

a. Belimo Aircontrols (USA), Inc.
b. Engineer Approved Equal.

2. Valves: Size for torque required for valve close off at maximum pump differential pressure.
3. Dampers: Size for running torque calculated as follows:

a. Parallel-Blade Damper with Edge Seals: 7 inch-lb/sq. ft. of damper.
b. Opposed-Blade Damper with Edge Seals: 5 inch-lb/sq. ft. of damper.
c. Dampers with 2- to 3-Inch wg of Pressure Drop or Face Velocities of 1,000 to 2,500 fpm: Increase running torque by 1.5.
d. Dampers with 3- to 4-Inch wg of Pressure Drop or Face Velocities of 2,500 to 3,000 fpm: Increase running torque by 2.0.

4. Coupling: V-bolt and V-shaped, toothed cradle.
5. Overload Protection: Electronic overload or digital rotation-sensing circuitry.
6. Fail-Safe Operation: Mechanical, spring-return mechanism. Provide external, manual gear release on nonspring-return actuators.
7. Power Requirements (Two-Position Spring Return): 24-V ac.
8. Power Requirements (Modulating): Maximum 10 VA at 24-V ac or 8 W at 24-V dc.
9. Proportional Signal: 2- to 10-V dc or 4 to 20 mA, and 2- to 10-V dc position feedback signal.
10. Temperature Rating: 40 to 104 deg F.
11. Temperature Rating (Smoke Dampers): Minus 22 to plus 250 deg F.
12. Run Time: 120 seconds.

2.10 CONTROL VALVES

A. Manufacturers:

1. Danfoss Inc.; Air Conditioning & Refrigeration Div.
2. Belimo.
3. Engineer Approved Equal.

B. Two Way - Control Valves: Factory fabricated pressure independent with internal differential pressure regulator (DPRV) which automatically adjusts to normal changes in system pressure and provides 100 percent control valve authority at all positions of the valve; maintain proportional/linear flow coil characteristics; and maintain a liner flow characteristic. The PICV shall accurately control the flow from 0-100 percent full rated flow with an operating pressure differential range of 3 to 60 PSIG, FCI 70-2 Class 4 shut-off on all sizes and field serviceable. Control valve shall incorporate control, balancing and flow limiting. Hydronic system pressure independent control valve bodies shall meet ASME B16.34 or ASME B16.15 pressure and temperature class ratings based on the design operating temperature and 150 percent of the system design operating pressure and shall have the following characteristics:

1. NPS 2 and Smaller: Class 150 bronze or brass body with union connections, stainless steel trim, stainless steel rising stem, stainless steel disc or ball, and screwed ends with back seating capacity repackable under pressure.

2. NPS 2-1/2 and Larger: Class 125 iron or ductile iron body, stainless steel trim, stainless steel rising stem, stainless steel disc or ball, flanged ends with back seating capacity repackable under pressure.

3. Pressure Control Seat: Brass construction with vulcanized EPDM.

4. Retain one or both sub-paragraphs below.

5. Maximum pressure drop of up to 5 psig (35 kPa) is usually acceptable. Show pressure drop on Drawings where critical.

6. Fittings and Components: All Fittings and Components shall meet ANSI standards and be totally compatible with readily available components in North America (except as allowed for 8" valves and above – Proper Companion Flanges must be supplied).

7. Close-Off (Differential) Pressure Rating: Combination of actuator, DPRV action, and trim shall provide minimum close-off pressure rating of 150 percent of total system (pump) head.

8. Valves shall be manufactured by one manufacturer throughout the project.

9. PICV's shall be supplied by the PICV manufacturer only; "branded or 3rd party" PICV's (those products which have been purchased from a manufacturer and labelled as manufactured by a supplier) are not acceptable.

C. Three Way – Control Valves: Characterized control valve. Equal to Belimo B3 Series. Forged brass, nickel plated body, stainless steel ball and stem. PTFE Seats with 2 EPDM O-rings, lubricated. 400 PSI pressure rating. 200 PSI close off pressure rating. 50 PSI maximum differential pressure.

D. Electronic Actuator: Direct-mounted self-calibrating type designed for minimum 60,000 full-stroke cycles at rated force and shall be from the same manufacturer as the pressure independent control valve; branded or 3rd party actuators must be submitted and approved prior to bid. The actuator shall provide visible position indication. Fail positions on power failure shall include in-place, open or closed as noted in the construction drawings.

1. Valves: Sized for maximum circuit flow rate, generally line sized.

2. Actuator to Coil Characteristics: Actuators shall be matched to provide the Heat Exchanger or Coil Characteristics of the product to be controlled – either Linear or Equal Percentage. Actuators for Equal Percentage Characteristic coils shall be field set to Equal Percentage characteristics or possess built in adjustment features to provide an Alpha (α) Characteristic matching theα Characteristic of the coil or Heat Exchanger.

3. Overload Protection: Electronic overload or digital rotation-sensing circuitry.

4. Fail-Safe Operation: Mechanical, spring-return mechanism or Capacitance return. Power Requirements (Two-Position Spring Return): 24-V ac.

5. Power Requirements (Modulating): Maximum 10 VA at 24-V ac or 8 W at 24-V dc.

6. Proportional Signal: 0 to 10Vdc or 2 to 10-V dc or 4 to 20 mA, and 2- to 10-V dc position feedback signal.

7. Actuators for service above Ceilings shall possess UL listings and Approvals.

8. Temperature Rating: 40 to 104 Degrees F.

9. 3rd Party Test Results: The manufacturer shall submit in his submittal documentation package a set of 3rd Party test reports from a recognized testing agency verifying the accuracy and operation of the submitted valves and associated actuators. Separate reports for valves and actuators will not be acceptable.

2.11 DAMPERS

A. Manufacturers:

1. TAMCO (T. A. Morrison & Co. Inc.).
2. Ruskin.
3. Greenheck.
4. Pottorff.
5. Engineer Approved Equal.

B. Dampers: AMCA-rated, parallel or opposed-blade design; 0.125-inch- minimum thick, extruded-aluminum frames with holes for duct mounting; damper blades shall be extruded aluminum airfoil with maximum blade width of 8 inches and length of 48 inches.

1. Secure blades to 1/2-inch- diameter, zinc-plated axles using zinc-plated hardware, with oil-impregnated sintered bronze or nylon blade bearings, blade-linkage hardware of zinc-plated steel and brass, ends sealed against spring-stainless-steel blade bearings, and thrust bearings at each end of every blade.
2. Operating Temperature Range: From minus 40 to plus 200 deg F.
3. Edge Seals, Low-Leakage Applications: Use extruded silicone blade seals or replaceable rubber blade seals and spring-loaded stainless-steel side seals, rated for leakage at less than 10 cfm per sq. ft. of damper area, at differential pressure of 4-inch wg when damper is held by torque of 50 in. x lbf; when tested according to AMCA 500D.
4. Unless noted otherwise, provide min. 10”x10” access door adjacent to each damper for inspection.

2.12 CONTROL CABLE

A. Electronic and fiber-optic cables for control wiring are specified in Section "Communications Horizontal Cabling."

2.13 CONTROL CABINET

A. Construction: Totally enclosed, 16 gauge steel. NEMA rated panel for exterior application. Mount top of panel at approx. 6 ft above grade for ease of maintenance. Welded piano hinge, key operated latch, tamper resistant door.

PART 3 - EXECUTION

3.1 EXAMINATION OF SITES AND TOTAL SYSTEM RESPONSIBILITY

A. The contractor shall visit the proposed sites of work to become familiar with any local condition that may in any manner affect the work to be performed.

B. No allowances shall be made because of lack of knowledge of these conditions. Failure to visit the site shall not relieve the contractor of his liability and obligations under the contract.

C. Any additional equipment and accessories required for the installation and operation of the complete operating system not specifically required by the bid documents shall be provided and the cost borne by the contractor.

D. The Contractor shall have total system responsibility to assure a "turnkey" operational system including any necessary interfaces with the DDC Management System provided by others under separate contract.

E. The Contractor remains the owner of all equipment provided under this contract and is responsible for all risk of loss or damage to the equipment from any source up to and including the date and time of final acceptance by the Owner. After the date of final acceptance, the Owner shall assume full ownership of the equipment.

3.2 INSTALLATION

A. Verify location of thermostats, humidistats, and other exposed control sensors with Drawings and room details before installation.

1. Install averaging elements in ducts and plenums in crossing or zigzag pattern.

B. Install guards on thermostats and humidistats in the following locations:

1. Entrances.
2. Public areas.
3. Where indicated.

C. Install automatic dampers according to Section "Air Duct Accessories."

D. Install damper motors on outside of duct in warm areas, not in locations exposed to outdoor temperatures.

E. Install labels and nameplates to identify control components according to Section "Identification for HVAC Piping and Equipment."

F. Install hydronic instrument wells, valves, and other accessories according to Section "Hydronic Piping."

G. Install refrigerant instrument wells, valves, and other accessories according to Section "Refrigerant Piping."

H. Install duct volume-control dampers according to Section "Metal Ducts".

I. Install electronic and fiber-optic cables according to Section "Communications Horizontal Cabling."

3.3 ELECTRICAL WIRING AND CONNECTION INSTALLATION

A. Install raceways, boxes, and cabinets according to Section "Raceways and Boxes for Electrical Systems."

B. Install building wire and cable according to Section "Low-Voltage Electrical Power Conductors and Cables."

C. Install signal and communication cable according to Section "Communications Horizontal Cabling."

1. Conceal cable, except in mechanical rooms and areas where other conduit and piping are exposed.
2. Install exposed cable in raceway.
3. Install concealed cable in raceway.
4. Bundle and harness multiconductor instrument cable in place of single cables where several cables follow a common path.
5. Fasten flexible conductors, bridging cabinets and doors, along hinge side; protect against abrasion. Tie and support conductors.
6. Number-code or color-code conductors for future identification and service of control system, except local individual room control cables.
7. Install wire and cable with sufficient slack and flexible connections to allow for vibration of piping and equipment.

D. Connect manual-reset limit controls independent of manual-control switch positions. Automatic duct heater resets may be connected in interlock circuit of power controllers.

E. Connect hand-off-auto selector switches to override automatic interlock controls when switch is in hand position.

3.4 FIELD QUALITY CONTROL

A. Manufacturer's Field Service: Engage a factory-authorized service representative to inspect, test, and adjust field-assembled components and equipment installation, including connections, and to assist in field testing. Report results in writing.

B. Perform the following field tests and inspections and prepare test reports:

1. Operational Test: After electrical circuitry has been energized, start units to confirm proper unit operation. Remove and replace malfunctioning units and retest.
2. Test and adjust controls and safeties.
3. Test calibration of controllers by disconnecting input sensors and stimulating operation with compatible signal generator.

4. Test each point through its full operating range to verify that safety and operating control set points are as required.
5. Test each control loop to verify stable mode of operation and compliance with sequence of operation. Adjust PID actions.
6. Test each system for compliance with sequence of operation.
7. Test software and hardware interlocks.

C. DDC Verification:

1. **Coordinate this process with Commissioning Agent.** Verify that instruments are installed before calibration, testing, and loop or leak checks.
2. Check instruments for proper location and accessibility.
3. Check instrument installation for direction of flow, elevation, orientation, insertion depth, and other applicable considerations.
4. Check instrument tubing for proper fittings, slope, material, and support.
5. Check pressure instruments, piping slope, installation of valve manifold, and self-contained pressure regulators.
6. Check temperature instruments and material and length of sensing elements.
7. Check control valves. Verify that they are in correct direction.
8. Check air-operated dampers. Verify that pressure gages are provided and that proper blade alignment, either parallel or opposed, has been provided.
9. Check DDC system as follows:

    a. Verify that DDC controller power supply is from emergency power supply, if applicable.
    b. Verify that wires at control panels are tagged with their service designation and approved tagging system.
    c. Verify that spare I/O capacity has been provided.
    d. Verify that DDC controllers are protected from power supply surges.

D. Replace damaged or malfunctioning controls and equipment and repeat testing procedures.

3.5 SUBMITTALS, DELIVERY, INSTALLATION, CALIBRATION, PROGRAMMING, CUTOVER, CHECKOUT and COMMISSIONING – SUBSTANTIAL COMPLETION

A. The Contractor shall engineer, prepare drawings submittals, deliver, install, calibrate, program, cutover, checkout and commission and otherwise Substantially Complete each system within the time specified in each work order for an individual project following receipt of written purchase order or notice to proceed. The system shall be available for a Substantial Completion inspection by the School District and the Engineer on the date so specified for Substantial Completion. Submittals: Submit the producer's standard descriptive data sheets for each type of product being provided. Provide products in accordance with the drawings. Provide complete data sheets bearing the printed logo or trademark of the manufacturer. Mark each copy of the data sheets for the specific product being provided with an identifying mark, arrow, or highlighting. Complete information regarding each and every component and sub-component listed on the drawings and required for the system shall be provided.

B. Drawings: As part of the system installation, the Contractor shall provide detailed documentation of the DDC system to facilitate system administration, maintenance, and future moves, adds and changes. Drawings shall be provided which incorporate all information in the

Contract Drawings, and which fully document any and all approved changes in materials and methods made by the contractor. Drawings are not required if no changes are made to the design. Three copies of drawings shall be submitted to the Engineer for review and approval prior to commencing work.

C. Drawings shall include Control System Schematics, ladder diagrams, point schedules, sequences of operation, logic diagrams, internal panels layouts, control panel cover layouts, thermostat and VAV box schedules, and valve and damper schedules.

D. Delivery: Protect materials and equipment from physical or environmental damage during shipping, storage and installation. Equipment and materials shall be received at the site in new condition and shall be maintained in new condition throughout the installation process. Damaged or deteriorated equipment and materials will not be acceptable. The Contractor shall be responsible for the safety and condition of all materials and equipment, whether stored or installed, until final acceptance by the Engineer and the Owner.

E. Products: All materials, equipment and devices shall, as a minimum, meet the requirements of UL where UL standards are established for those items, and the requirements of NFPA 70. All like items of equipment shall be a standard product of the same manufacturer. All equipment shall be a standard catalogued product of a manufacturer regularly engaged in the manufacture of similar products. Refer to drawings for all product specifications.

F. Installation and Programming: The installation shall be in strict accordance with all applicable codes and standards, the respective manufacturer's written recommendations, and the contract drawings and these specifications. All materials, equipment, and devices shall be new and unused, of current manufacture and of the highest grade, free from defects. Workmanship shall be of the highest grade in accordance with modern practice. The installed system shall be neat, clean, and well organized in appearance. Provide working clearances for normal system operation, reconfiguration and repair. The cost of engineering, preparation of drawings, installation, programming, cutover and checkout shall be included in the bid cost of the equipment. All cabling shall be installed in a neat and workmanlike manner and as indicated on the drawings.

G. Cutover: Subsequent to system installation and prior to checkout, the system shall be cutover and made fully operational. The cutover shall be made at a time, approved in writing by the School District, when school is not in regular session. A weekend cutover may be required, and if so shall be provided at no additional cost to the School District. The contractor shall have a certified technician present at the site for the first day of school following the cutover to train/assist school personnel and to verify/fine tune system operation. The certified technician shall make follow-up visits as required to bring the system into full operating condition to the satisfaction of the school principal, the School District, and the Engineer.

H. System Testing: Proof of performance of the DDC System shall be conducted in the presence of the Commissioning Agent and the Owner's representative. Prior to conducting System Testing the DDC Contractor shall complete a Systems Readiness Checklist provided by the Commissioning Agent that will document proper checkout of the system prior to field-testing by the commissioning provider. All applicable test equipment shall be supplied by the Contractor for all tests. Any equipment or material not meeting specifications shall be remedied or replaced with other equipment to the satisfaction of the Commissioning Agent, Engineer, and Owner’s representative. These tests shall be conducted after the Contractor has adjusted the

system to his satisfaction. The Commissioning Agent reserves the right to conduct any test in addition to those prescribed in this specification.

I. Checkout: Subsequent to cutover and prior to the first day of normal school operation following cutover, the contractor shall be responsible for "checking out" the system to verify that it is operating properly and performing in compliance with the equipment manufacturer's specifications and the attached specifications. The checkout shall utilize a System Inspection Checklist to fully document checkout.

J. Commissioning: The Owner shall provide a 3rd party commissioning provider under separate contract to commission the installation of all DDC systems. The scope of commissioning work for each project shall be described in the contract documents for the project. The DDC contractor shall provide all labor and coordination as required per the commissioning specification included with each project.

END OF SECTION 23 09 00

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SECTION 23 09 15 - VARIABLE FREQUENCY DRIVES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of Contract, including General and Supplementary Conditions and Division-1 Specification sections, apply to work of this section.

1.2 SUMMARY

A. Division-23 “Mechanical General” and “Direct Digital Control System” sections apply to work of this section.

B. Extent of variable frequency drive work required by this section is indicated on drawings and schedules, and by requirements of this section. Motor characteristics are specified in Division-23 section “Motors”.

C. Refer to other Division-23 sections for installation of pumps, AHUs, pressure taps, and flow stations in mechanical systems; not work of this section. Coordinate with pump and air handling unit suppliers.

D. Refer to Division-26 sections for the following work; not work of this section.

E. Power supply wiring for power source to power connection on pumps, air handling units, drives, controls and/or unit control panels.

F. Provide the following electrical work as work of this section, complying with requirements of Division-16 sections: Control wiring and signal wiring between field-installed controls, indicating devices, and unit control panels.

1.3 CODES AND STANDARDS:

A. Florida Building Code or International Building Code as noted in the drawings.

B. Electrical Standards: Provide electrical products which have been tested, listed and labeled by UL and comply with NEMA standards.

C. NEMA Compliance: Comply with NEMA standards pertaining to components and devices for electric control systems.

D. NFPA Compliance: Comply with NFPA 90A "Standard for the Installation of Air Conditioning and Ventilating Systems" where applicable to controls and control sequences.

E. NEC Compliance: Comply with NFPA 70 National Electric Code.

F. TIA/EIA 568-B: Commercial Building Telecommunications Cabling Standard.

1.4 ACTION SUBMITTALS:

A. Product Data: Submit manufacturer's technical product data for each type of drive furnished, indicating dimensions, capacities, performance characteristics including harmonic contributions, electrical characteristics, finishes of materials, and including installation instructions and start-up instructions.

1.5 TEST REPORTS AND VERIFICATION SUBMITTALS:

A. Submit manufacturer's representative startup report.

1.6 O&M Data:

A. Submit maintenance instructions and spare parts lists. Include this data, a copy of approval data in O&M manual.

PART 2 - PRODUCTS

2.1 Variable Frequency Drives shall be provided by the DDC Controls Contractor and installed by the electrical contractor. Acceptable Manufacturers: Subject to compliance with requirements, provide drives of one of the following:

1. Yaskawa
2. ABB
3. Engineer Approved Equal

2.2 General: Provide products in sizes and capacities indicated, consisting of variable frequency drives, controllers, sensors, transmitters, and other components as required for a complete installation. Except as otherwise indicated, provide manufacturer's standard system components as indicated by published product information, designed and constructed as recommended by manufacturer. The VFD shall be provided with integral disconnect and mechanical bypass. The DDC contractor shall setup, program, furnish and complete all control connections to the VFDs.

2.3 Variable Frequency Drives: Provide UL or ETL approved, variable torque, variable frequency drives capable of being used with AC induction motors without causing overheating or excessive noises. Drives shall be housed in NEMA 1 enclosures. The supplier shall perform all necessary electric power analyses as required to ensure the drives operate properly in the service indicated. Provide the following performance and construction features:

A. The drive may be either voltage or current source, but current source drives must incorporate a voltage clamping circuit. Drives must be able to be tested under no-load conditions.

B. The controller shall accept power as indicated on the drawings and provide a variable frequency output for speed control from 10% to 100% of base speed (1,800 rpm nominal). Provide fused input.

C. The drive shall produce a variable frequency, adjustable voltage output with a constant input power factor of at least 0.95 and a variable-torque constant volts/Hz ratio. The input stage

shall use a full wave diode bridge. Provide DC switching power supply.

D. The drive shall maintain an overall efficiency from input to output of at least 95% over the full range of operation.

E. The output stages shall not generate unacceptable line noise, motor noise, or radio frequency interference. Any isolation transformers, filters, or other devices required to prevent these problems, or to enable the drive to function properly with the available utility power shall be provided by the manufacturer.

F. All units shall be warranted for a period of 12 months. All drives shall be pre-tested before shipment.

G. Drive features:

1. Minimum and maximum speed adjustment.
2. Separately adjustable acceleration and deceleration.
3. Adjustable current limit.
4. Short circuit protection and ground fault protection. Over current protection for driven load shall comply with NEC.
5. 4-20 mA current follower circuitry.
6. Under voltage and over voltage protection.
7. Over temperature protection.
8. Automatic restarting of the drive after a power outage or power dip.
9. Drive status indicator lights and digital display.
10. Mode selector switch (manual, off, automatic).
11. Manual speed potentiometer.
12. Speed indicator and ammeter to indicate full range of operation.
13. Motor starter circuit complying with NEC Article 430.
14. Phase loss protection (input and output) and surge suppression.
15. Start/stop control in any mode from a remote signal or contact closure.
16. Auxiliary contact indicating run status.
17. RS-232 interface.
18. Internal diagnostics displayed on unit panel.
19. Drives shall be able to catch and drive into a spinning load.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Examine areas and conditions under which variable volume systems are to be installed. Do not proceed with work until unsatisfactory conditions have been corrected in a manner acceptable to Installer. Contractor shall protect all VFDs to prevent any damage from construction dust and debris.

B. Install the variable frequency drives where shown on the drawings in accordance with the manufacturer's printed instructions. Provide additional disconnect switch complying with the requirements of Division 16 and NEC Article 430.

C. Provide slotted angles or channel bars with mounting hardware for securing drives to the wall. Combustible materials are not permitted.

D. Refer to Division-26 sections for motor connections and testing requirements.

3.2 VARIABLE AIR VOLUME SYSTEMS

A. Verify that the drives control the air handling unit speeds properly over the full range of operation in response to control signals. Coordinate drive operation with final sheave selection.

3.3 START-UP

A. Start-up, test, and adjust variable volume systems in presence of manufacturer's authorized representative. Demonstrate compliance with requirements. Replace damaged or malfunctioning controls and equipment.

3.4 OWNER'S INSTRUCTIONS

A. Refer to section “Direct Digital Control System”.

3.5 SYSTEM VERIFICATION

A. Refer to section “Direct Digital Control System”.

END OF SECTION 23 09 15

SECTION 23 21 13 - HYDRONIC PIPING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. This Section includes pipe and fitting materials, joining methods, special-duty valves, and specialties for the following:

1. Hot-water heating piping.
2. Chilled-water piping.
3. Makeup-water piping.
4. Condensate-drain piping.
5. Blowdown-drain piping.
6. Air-vent piping.
7. Safety-valve-inlet and -outlet piping.

B. See Section "Hydronic Pumps" for pumps, motors, and accessories for hydronic piping.

C. See Section "HVAC Equipment Insulation."

D. See Section "HVAC Piping Insulation."

1.3 PERFORMANCE REQUIREMENTS

A. Hydronic piping components and installation shall be capable of withstanding the following minimum working pressure and temperature:

1. Hot-Water Heating Piping: 150 psig at 200 deg F.
2. Chilled-Water Piping: 150 psig at 200 deg. F.

1.4 ACTION SUBMITTALS

A. Product Data: For each type of the following:

1. Plastic pipe and fittings with solvent cement.
2. Valves. Include flow and pressure drop curves based on manufacturer's testing for calibrated-orifice balancing valves and automatic flow-control valves.
3. Air control devices.
4. Chemical treatment.
5. Hydronic specialties.

B. Shop Drawings: Detail, at 1/4" scale, the piping layout, fabrication of pipe anchors, hangers, supports for multiple pipes, alignment guides, expansion joints and loops, and attachments of the same to the building structure. Detail location of anchors, alignment guides, and expansion joints and loops.

1.5 INFORMATIONAL SUBMITTALS

A. Field quality-control test reports.

B. Qualification Data: For Installer.

C. Welding certificates.

D. Field quality-control test reports.

E. Water Analysis: Submit a copy of the water analysis to illustrate water quality available at Project site.

1.6 CLOSEOUT SUBMITTALS

A. Operation and maintenance data. For air control devices, hydronic specialties, and special-duty valves to include in emergency, operation, and maintenance manuals.

1.7 MAINTENANCE MATERIAL SUBMITTALS

A. Water-Treatment Chemicals: Furnish enough chemicals for initial system startup and for preventive maintenance for one year from date of Substantial Completion.

B. Differential Pressure Meter: For each type of balancing valve and automatic flow control valve, include flowmeter, probes, hoses, flow charts, and carrying case.

1.8 DELIVERY, STORAGE, AND HANDLING

A. Accept valves on site in shipping containers with labeling in place. Inspect for damage.

B. Provide temporary end caps and closures on piping and fittings. Maintain in place until installation.

C. Protect piping components from entry of foreign materials by temporary covers, completing sections of the work, and isolating parts of completed system.

1.9 QUALITY ASSURANCE

A. ASME Compliance: Comply with ASME B31.9, "Building Services Piping," for materials, products, and installation. Safety valves and pressure vessels shall bear the appropriate ASME label. Fabricate and stamp air separators and expansion tanks to comply with ASME Boiler and Pressure Vessel Code: Section VIII, Division 1.

B. Installer Qualifications:

1. Installers of Pressure-Sealed Joints: Installers shall be certified by the pressure-seal joint manufacturer as having been trained and qualified to join piping with pressure-seal pipe couplings and fittings.

C. Steel Support Welding: Qualify processes and operators according to AWS D1.1/D1.1M, "Structural Welding Code - Steel."

D. Welding: Qualify processes and operators according to ASME Boiler and Pressure Vessel Code: Section IX.

1. Comply with provisions in ASME B31 Series, "Code for Pressure Piping."
2. Certify that each welder has passed AWS qualification tests for welding processes involved and that certification is current.

PART 2 - PRODUCTS

2.1 COPPER TUBE AND FITTINGS

A. Drawn-Temper Copper Tubing: ASTM B 88, Type M.

B. Annealed-Temper Copper Tubing: ASTM B 88, Type K.

C. DWV Copper Tubing: ASTM B 306, Type DWV.

D. Wrought-Copper Fittings: ASME B16.22.

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

a. Anvil International, Inc.
b. S. P. Fittings; a division of Star Pipe Products.
c. Victaulic Company.

2. Grooved-End Copper Fittings: ASTM B 75, copper tube or ASTM B 584, bronze casting.
3. Grooved-End-Tube Couplings: Rigid pattern, unless otherwise indicated; gasketed fitting. Ductile-iron housing with keys matching pipe and fitting grooves, prelubricated EPDM gasket rated for minimum 230 deg F for use with housing, and steel bolts and nuts.

E. Wrought-Copper Unions: ASME B16.22.

2.2 STEEL PIPE AND FITTINGS

A. Steel Pipe: ASTM A 53/A 53M, black steel with plain ends; type, grade, and wall thickness as indicated in Part 3 "Piping Applications" Article.

B. Cast-Iron Threaded Fittings: ASME B16.4; Classes 125 and 250 as indicated in Part 3 "Piping Applications" Article.

C. Malleable-Iron Threaded Fittings: ASME B16.3, Classes 150 and 300 as indicated in Part 3 "Piping Applications" Article.

D. Malleable-Iron Unions: ASME B16.39; Classes 150, 250, and 300 as indicated in Part 3 "Piping Applications" Article.

E. Cast-Iron Pipe Flanges and Flanged Fittings: ASME B16.1, Classes 25, 125, and 250; raised ground face, and bolt holes spot faced as indicated in Part 3 "Piping Applications" Article.

F. Wrought Cast- and Forged-Steel Flanges and Flanged Fittings: ASME B16.5, including bolts, nuts, and gaskets of the following material group, end connections, and facings:

1. Material Group: 1.1.
2. End Connections: Butt welding.
3. Facings: Raised face.

G. Grooved Mechanical-Joint Fittings and Couplings:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

   a. Anvil International, Inc.
   b. Central Sprinkler Company; a division of Tyco Fire & Building Products.
   c. National Fittings, Inc.
   d. S. P. Fittings; a division of Star Pipe Products.
   e. Victaulic Company.

2. Joint Fittings: ASTM A 536, Grade 65-45-12 ductile iron; ASTM A 47/A 47M, Grade 32510 malleable iron; ASTM A 53/A 53M, Type F, E, or S, Grade B fabricated steel; or ASTM A 106, Grade B steel fittings with grooves or shoulders constructed to accept grooved-end couplings; with nuts, bolts, locking pin, locking toggle, or lugs to secure grooved pipe and fittings.
3. Couplings: Ductile- or malleable-iron housing and synthetic rubber gasket of central cavity pressure-responsive design; with nuts, bolts, locking pin, locking toggle, or lugs to secure grooved pipe and fittings.

2.3 JOINING MATERIALS

A. Pipe-Flange Gasket Materials: Suitable for chemical and thermal conditions of piping system contents.

1. ASME B16.21, nonmetallic, flat, asbestos free, 1/8-inch maximum thickness unless thickness or specific material is indicated.

   a. Full-Face Type: For flat-face, Class 125, cast-iron and cast-bronze flanges.
   b. Narrow-Face Type: For raised-face, Class 250, cast-iron and steel flanges.

B. Flange Bolts and Nuts: ASME B18.2.1, carbon steel, 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, copper-phosphorus alloys for joining copper with copper; or BAg-1, silver alloy for joining copper with bronze or steel.

E. Gasket Material: Thickness, material, and type suitable for fluid to be handled and working temperatures and pressures.

2.4 DIELECTRIC FITTINGS

A. General Requirements: Assembly of copper alloy and ferrous materials with separating nonconductive insulating material. Include end connections compatible with pipes to be joined.

B. Dielectric Unions:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

    a. Capitol Manufacturing Company.
    b. Central Plastics Company.
    c. Hart Industries International, Inc.
    d. Jomar International Ltd.
    e. Matco-Norca, Inc.
    f. McDonald, A. Y. Mfg. Co.
    g. Watts Regulator Co.; a division of Watts Water Technologies, Inc.
    h. Wilkins; a Zurn company.

2. Description:

    a. Standard: ASSE 1079.
    b. Pressure Rating: 150 psig.
    c. End Connections: Solder-joint copper alloy and threaded ferrous.

C. Dielectric-Flange Insulating Kits:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

    a. Advance Products & Systems, Inc.
    b. Calpico, Inc.
    c. Central Plastics Company.
    d. Pipeline Seal and Insulator, Inc.

2. Description:

    a. Nonconducting materials for field assembly of companion flanges.
    b. Pressure Rating: 150 psig.
    c. Gasket: Neoprene or phenolic.

d. Bolt Sleeves: Phenolic or polyethylene.
e. Washers: Phenolic with steel backing washers.

2.5 VALVES

A. Gate, Globe, Check, Ball, and Butterfly Valves: Comply with requirements specified in Section "General-Duty Valves for HVAC Piping."

B. Automatic Temperature-Control Valves, Actuators, and Sensors: Comply with requirements specified in Section "Instrumentation and Control for HVAC."

C. Bronze, Calibrated-Orifice, Balancing Valves:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

    a. IMI Flow Design Inc.

2. Body: Bronze, ball or plug type with calibrated orifice or venturi.
3. Ball: Brass or stainless steel.
4. Plug: Resin.
5. Seat: PTFE.
6. End Connections: Threaded or socket.
7. Pressure Gage Connections: Integral seals for portable differential pressure meter.
8. Handle Style: Lever, with memory stop to retain set position.
9. CWP Rating: Minimum 125 psig.
10. Maximum Operating Temperature: 250 deg F.

D. Cast-Iron or Steel, Calibrated-Orifice, Balancing Valves:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

    a. Bell & Gossett Domestic Pump; a division of ITT Industries.
    b. IMI Flow Design Inc.
    c. Gerand Engineering Co.
    d. Griswold Controls.
    e. Taco.
    f. Nexus.
    g. NuTech.

2. Body: Cast-iron or steel body, ball, plug, or globe pattern with calibrated orifice or venturi.
3. Ball: Brass or stainless steel.
4. Stem Seals: EPDM O-rings.
5. Disc: Glass and carbon-filled PTFE.
6. Seat: PTFE.
7. End Connections: Flanged or grooved.
8. Pressure Gage Connections: Integral seals for portable differential pressure meter.
9. Handle Style: Lever, with memory stop to retain set position.

10. CWP Rating: Minimum 125 psig.
11. Maximum Operating Temperature: 250 deg F.

E. Automatic Flow-Control Valves:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

    a. IMI Flow Design Inc.

2. Body: Brass or ferrous metal.
3. Piston and Spring Assembly: Stainless steel or Corrosion resistant, tamper proof, self cleaning, and removable.
4. Combination Assemblies: Include bonze or brass-alloy ball valve.
5. Identification Tag: Marked with zone identification, valve number, and flow rate.
6. Size: Same as pipe in which installed.
7. Performance: Maintain constant flow, plus or minus 5 percent over system pressure fluctuations.
8. Minimum CWP Rating: 175 psig.
9. Maximum Operating Temperature: 250 deg F.

F. Diaphragm-Operated, Pressure-Reducing Valves:

1. Subject to compliance with requirements, provide a comparable product by one of the following:

    a. Amtrol, Inc.
    b. Taco.
    c. Bell & Gossett Domestic Pump; a division of ITT Industries.
    d. Watts Regulator Co.; a division of Watts Water Technologies, Inc.

2. Body: Bronze or brass.
3. Disc: Glass and carbon-filled PTFE.
4. Seat: Brass.
5. Stem Seals: EPDM O-rings.
6. Diaphragm: EPT.

2.6 AIR CONTROL DEVICES

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Watson McDaniel

B. Manual Air Vents:

1. Body: Bronze.
2. Internal Parts: Nonferrous.
3. Operator: Screwdriver or thumbscrew.
4. Inlet Connection: NPS 1/2.

5. Discharge Connection: NPS 1/8.
6. CWP Rating: 150 psig.
7. Maximum Operating Temperature: 225 deg F.

C. Automatic Air Vents:

1. Body: Stainless Steel
2. Internal Parts: Nonferrous.
3. Operator: Noncorrosive metal float.
4. Inlet Connection: NPS 1/2.
5. Discharge Connection: NPS 1/4.
6. CWP Rating: 150 psig.
7. Maximum Operating Temperature: 240 deg F.

2.7 HYDRONIC PIPING SPECIALTIES

A. Y-Pattern Strainers:

1. Body: ASTM A 126, Class B, cast iron with bolted cover and bottom drain connection.
2. End Connections: Threaded ends for NPS 2 and smaller; flanged ends for NPS 2-1/2 and larger.
3. Strainer Screen: 40-mesh startup strainer, and perforated stainless-steel basket with 50 percent free area.
4. CWP Rating: 125 psig.

B. Stainless-Steel Flexible Connectors:

1. Flanged Connector with braided corrugated metal hose.
2. Stainless Steel hose and braid construction.
3. Carbon Steel flange construction.
4. Working pressures up to 315-psig pressure rating at 250°F.
5. Flexible connectors shall be provided at the line size of the system piping and shall not be reduced in size to match the pump connections. Provide stainless steel flexible connectors as manufactured by Mason Industries, Southeastern Hose SECF or engineer approved equal.

C. Expansion fittings are specified in Section "Expansion Fittings and Loops for HVAC Piping."

PART 3 - EXECUTION

3.1 PIPING APPLICATIONS

A. Hot-water heating piping, aboveground, NPS 2 and smaller, shall be any of the following:

1. Type K, drawn-temper copper tubing, wrought-copper fittings, and brazed joints.
2. Schedule 40 steel pipe; Class 125, cast-iron fittings; cast-iron flanges and flange fittings; and threaded joints.

B. Hot-water heating piping, aboveground, NPS 2-1/2 and larger, shall be any of the following:

1. Schedule 40 steel pipe, wrought-steel fittings and wrought-cast or forged-steel flanges and flange fittings, and welded and flanged joints.
2. Schedule 40 steel pipe; grooved, mechanical joint coupling and fittings; and grooved, mechanical joints.

C. Chilled-water piping, aboveground, NPS 2 and smaller, shall be any of the following:

1. Type K, drawn-temper copper tubing, wrought-copper fittings, and brazed joints.
2. Schedule 40 steel pipe; Class 125, cast-iron fittings; cast-iron flanges and flange fittings; and threaded joints.

D. Chilled-water piping, aboveground, NPS 2-1/2 and larger, shall be any of the following:

1. Schedule 40 steel pipe, wrought-steel fittings and wrought-cast or forged-steel flanges and flange fittings, and welded and flanged joints.
2. Schedule 40 steel pipe; grooved, mechanical joint coupling and fittings; and grooved, mechanical joints.

E. Makeup-water piping installed aboveground shall be the following:

1. Type L, drawn-temper copper tubing, wrought-copper fittings, and brazed joints.

F. Makeup-Water Piping Installed Belowground and within Slabs shall be any of the following:

1. Type K, annealed-temper copper tubing, wrought-copper fittings, and soldered joints. Use the fewest possible joints.
2. Schedule 40 PVC plastic pipe and fittings and solvent-welded joints.

G. Condensate-Drain Piping shall be any of the following:

1. Type M DWV, drawn-temper copper tubing, wrought-copper fittings, and soldered joints
2. Schedule 40 PVC DWV plastic pipe and fittings and solvent-welded joints.

H. Blowdown-Drain Piping: Same materials and joining methods as for piping specified for the service in which blowdown drain is installed.

I. Air-Vent Piping:

1. Inlet: Same as service where installed with metal-to-plastic transition fittings for plastic piping systems according to the piping manufacturer's written instructions.
2. Outlet: Type K, annealed-temper copper tubing with soldered or flared joints.

J. Safety-Valve-Inlet and -Outlet Piping for Hot-Water Piping: Same materials and joining methods as for piping specified for the service in which safety valve is installed with metal-to-plastic transition fittings for plastic piping systems according to the piping manufacturer's written instructions.

3.2 VALVE APPLICATIONS

A. Install shutoff-duty valves at each branch connection to supply mains, and at supply connection to each piece of equipment.

B. Install calibrated-orifice, balancing valves at each branch connection to return main.

C. Install calibrated-orifice, balancing valves in the return pipe of each heating or cooling terminal.

D. Install check valves at each pump discharge and elsewhere as required to control flow direction.

E. Install safety valves at hot-water generators and elsewhere as required by ASME Boiler and Pressure Vessel Code. Install drip-pan elbow on safety-valve outlet and pipe without valves to the outdoors; and pipe drain to nearest floor drain or as indicated on Drawings. Comply with ASME Boiler and Pressure Vessel Code: Section VIII, Division 1, for installation requirements.

F. Install pressure-reducing valves at makeup-water connection to regulate system fill pressure.

G. Install balancing valves and flow-control valves to meet manufacturer's piping installation requirements of upstream and downstream piping diameter for rated accuracy level.

3.3 PIPING INSTALLATIONS

A. Drawing plans, schematics, and diagrams indicate general location and arrangement of piping systems. Indicate piping locations and arrangements if such were used to size pipe and calculate friction loss, expansion, pump sizing, and other design considerations. Install piping as indicated unless deviations to layout are approved on Coordination Drawings.

B. Install piping in concealed locations, unless otherwise indicated and except in equipment rooms and service areas.

C. Install piping indicated to be exposed and piping in equipment rooms and service areas at right angles or parallel to building walls. Diagonal runs are prohibited unless specifically indicated otherwise.

D. Install piping above accessible ceilings to allow sufficient space for ceiling panel removal.

E. Install piping to permit valve servicing.

F. Install piping at indicated slopes.

G. Install piping free of sags and bends.

H. Install fittings for changes in direction and branch connections.

I. Install piping to allow application of insulation.

J. Select system components with pressure rating equal to or greater than system operating pressure.

K. Install groups of pipes parallel to each other, spaced to permit applying insulation and servicing of valves.

L. Install drains, consisting of a tee fitting, NPS 3/4 ball valve, and short NPS 3/4 threaded nipple with cap, at low points in piping system mains and elsewhere as required for system drainage.

M. Install piping at a uniform grade of 0.2 percent upward in direction of flow.

N. Reduce pipe sizes using eccentric reducer fitting installed with level side up.

O. Install branch connections to mains using mechanically formed tee fittings in main pipe, with the branch connected to the bottom of the main pipe. For up-feed risers, connect the branch to the top of the main pipe.

P. Install valves according to Section "General-Duty Valves for HVAC Piping."

Q. Install unions in piping, NPS 2 and smaller, adjacent to valves, at final connections of equipment, and elsewhere as indicated.

R. Install flanges in piping, NPS 2-1/2 and larger, at final connections of equipment and elsewhere as indicated.

S. Install strainers on inlet side of each control valve, pressure-reducing valve, solenoid valve, in-line pump, and elsewhere as indicated. Install NPS 3/4 nipple and ball valve in blowdown connection of strainers NPS 2 and larger. Match size of strainer blowoff connection for strainers smaller than NPS 2.

T. Install expansion loops, expansion joints, anchors, and pipe alignment guides as specified in Section "Expansion Fittings and Loops for HVAC Piping."

U. Identify piping as specified in Section "Identification for HVAC Piping and Equipment."

V. Install sleeves for piping penetrations of walls, ceilings, and floors. Comply with requirements for sleeves specified in Section "Sleeves and Sleeve Seals for HVAC Piping."

W. Install sleeve seals for piping penetrations of concrete walls and slabs. Comply with requirements for sleeve seals specified in Section "Sleeves and Sleeve Seals for HVAC Piping."

X. Install escutcheons for piping penetrations of walls, ceilings, and floors. Comply with requirements for escutcheons specified in Section "Escutcheons for HVAC Piping."

3.4 HANGERS AND SUPPORTS

A. Hanger, support, and anchor devices are specified in Section "Hangers and Supports for HVAC Piping and Equipment." Comply with the following requirements for maximum spacing of supports.

B. Seismic restraints are specified in Section "Vibration and Seismic Controls for HVAC Piping and Equipment."

C. Install the following pipe attachments:

1. Adjustable steel clevis hangers for individual horizontal piping less than 20 feet long.
2. Adjustable roller hangers and spring hangers for individual horizontal piping 20 feet or longer.
3. Pipe Roller: MSS SP-58, Type 44 for multiple horizontal piping 20 feet or longer, supported on a trapeze.

4. Spring hangers to support vertical runs.
5. Provide copper-clad hangers and supports for hangers and supports in direct contact with copper pipe.
6. On plastic pipe, install pads or cushions on bearing surfaces to prevent hanger from scratching pipe.

D. Install hangers for steel piping with the following maximum spacing and minimum rod sizes:

1. NPS 3/4: Maximum span, 7 feet; minimum rod size, 1/4 inch
2. NPS 1: Maximum span, 7 feet; minimum rod size, 1/4 inch.
3. NPS 1-1/2: Maximum span, 9 feet; minimum rod size, 3/8 inch.
4. NPS 2: Maximum span, 10 feet; minimum rod size, 3/8 inch.
5. NPS 2-1/2: Maximum span, 11 feet; minimum rod size, 3/8 inch.
6. NPS 3: Maximum span, 12 feet; minimum rod size, 3/8 inch.
7. NPS 4: Maximum span, 14 feet; minimum rod size, 1/2 inch.

E. Install hangers for drawn-temper copper piping with the following maximum spacing and minimum rod sizes:

1. NPS 3/4: Maximum span, 5 feet; minimum rod size, 1/4 inch.
2. NPS 1: Maximum span, 6 feet; minimum rod size, 1/4 inch.
3. NPS 1-1/2: Maximum span, 8 feet; minimum rod size, 3/8 inch.
4. NPS 2: Maximum span, 8 feet; minimum rod size, 3/8 inch.

F. Support vertical runs at roof, at each floor, and at 8-foot intervals between floors.

3.5 PIPE JOINT CONSTRUCTION

A. Ream ends of pipes and tubes and remove burrs. Bevel plain ends of steel pipe.

B. Remove scale, slag, dirt, and debris from inside and outside of pipe and fittings before assembly.

C. 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.

D. 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.

E. Threaded Joints: Thread pipe with tapered pipe threads according to ASME B1.20.1. Cut threads full and clean using sharp dies. Ream threaded pipe ends to remove burrs and restore full ID. Join pipe fittings and valves as follows:

1. 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.
3. PVC Sch. 80 pipe shall NOT be threaded.

F. Flanged Joints: Select appropriate gasket material, size, type, and thickness for service application. Install gasket concentrically positioned. Use suitable lubricants on bolt threads.

G. Grooved Joints: Assemble joints with coupling and gasket, lubricant, and bolts. Cut or roll grooves in ends of pipe based on pipe and coupling manufacturer's written instructions for pipe wall thickness. Use grooved-end fittings and rigid, grooved-end-pipe couplings.

H. Mechanically Formed, Copper-Tube-Outlet Joints: Use manufacturer-recommended tool and procedure, and brazed joints.

3.6 HYDRONIC SPECIALTIES INSTALLATION

A. Install manual air vents at high points in piping, at heat-transfer coils, and elsewhere as required for system air venting.

B. Install piping from boiler air outlet, air separator, or air purger to expansion tank with a 2 percent upward slope toward tank.

C. Install in-line air separators in pump suction. Install drain valve on air separators NPS 2 and larger.

D. Install bypass chemical feeders in each hydronic system where indicated, in upright position with top of funnel not more than 48 inches above the floor. Install feeder in minimum NPS 3/4 bypass line, from main with full-size, full-port, ball valve in the main between bypass connections. Install NPS 3/4 pipe from chemical feeder drain, to nearest equipment drain and include a full-size, full-port, ball valve.

E. Install expansion tanks on the floor below the air separator. Use manual vent for initial fill to establish proper water level in tank. Vent and purge air from hydronic system

1. Install tank fittings that are shipped loose.
2. Support tank from floor with sufficient strength to carry weight of tank, piping connections, fittings, plus tank full of water. Do not overload building components and structural members.

3.7 TERMINAL EQUIPMENT CONNECTIONS

A. Sizes for supply and return piping connections shall be the same as or larger than equipment connections.

B. Install control valves in accessible locations close to connected equipment.

C. Install bypass piping with globe valve around control valve. If parallel control valves are installed, only one bypass is required.

D. Install ports for pressure gages and thermometers at coil inlet and outlet connections according to Section "Meters and Gages for HVAC Piping."

3.8 CHEMICAL TREATMENT

A. Fill system with fresh water and add liquid alkaline compound with emulsifying agents and detergents to remove grease and petroleum products from piping. Circulate solution for a minimum of 24 hours, drain, clean strainer screens, and refill with fresh water. Refer to further notes in the drawings.

B. Add initial chemical treatment and maintain water quality in ranges noted above for the first year of operation.

C. Perform an analysis of makeup water to determine type and quantities of chemical treatment needed to keep system free of scale, corrosion, and fouling, and to sustain the following water characteristics:

1. pH: 8.5 to 10.0.
2. "P" Alkalinity: 100 to 500 ppm.
3. Boron: 100 to 200 ppm.
4. Chemical Oxygen Demand: Maximum 100 ppm. Modify this value if closed system contains glycol.
5. Corrosion Inhibitor:

    a. Sodium Nitrate: 1000 to 1500 ppm.
    b. Molybdate: 200 to 300 ppm.
    c. Chromate: 200 to 300 ppm.
    d. Sodium Nitrate Plus Molybdate: 100 to 200 ppm each.
    e. Chromate Plus Molybdate: 50 to 100 ppm each.

6. Soluble Copper: Maximum 0.20 ppm.
7. Tolyiriazole Copper and Yellow Metal Corrosion Inhibitor: Minimum 10 ppm.
8. Total Suspended Solids: Maximum 10 ppm.
9. Ammonia: Maximum 20 ppm.
10. Free Caustic Alkalinity: Maximum 20 ppm.
11. Microbiological Limits:

    a. Total Aerobic Plate Count: Maximum 1000 organisms/ml.
    b. Total Anaerobic Plate Count: Maximum 100 organisms/ml.
    c. Nitrate Reducers: 100 organisms/ml.
    d. Sulfate Reducers: Maximum 0 organisms/ml.
    e. Iron Bacteria: Maximum 0 organisms/ml.

3.9 FIELD QUALITY CONTROL

A. Prepare hydronic piping according to ASME B31.9 and as follows:

1. Leave joints, including welds, uninsulated and exposed for examination during test.
2. Provide temporary restraints for expansion joints that cannot sustain reactions due to test pressure. If temporary restraints are impractical, isolate expansion joints from testing.
3. Flush hydronic piping systems with clean water; then remove and clean or replace strainer screens.

4. Isolate equipment from piping. If a valve is used to isolate equipment, its closure shall be capable of sealing against test pressure without damage to valve. Install blinds in flanged joints to isolate equipment.
5. Install safety valve, set at a pressure no more than one-third higher than test pressure, to protect against damage by expanding liquid or other source of overpressure during test.

B. Perform the following tests on hydronic piping:

1. Use ambient temperature water as a testing medium unless there is risk of damage due to freezing. Another liquid that is safe for workers and compatible with piping may be used.
2. While filling system, use vents installed at high points of system to release air. Use drains installed at low points for complete draining of test liquid.
3. Isolate expansion tanks and determine that hydronic system is full of water.
4. Subject piping system to hydrostatic test pressure that is not less than 1.5 times the system's working pressure. Test pressure shall not exceed maximum pressure for any vessel, pump, valve, or other component in system under test. Verify that stress due to pressure at bottom of vertical runs does not exceed 90 percent of specified minimum yield strength or 1.7 times "SE" value in Appendix A in ASME B31.9, "Building Services Piping."
5. After hydrostatic test pressure has been applied for at least 10 minutes, examine piping, joints, and connections for leakage. Eliminate leaks by tightening, repairing, or replacing components, and repeat hydrostatic test until there are no leaks.
6. After completion of piping installation and prior to initial operation, conduct tests on piping system. Furnish materials and equipment required for tests. Correct defects disclosed by test. Perform test after installation and prior to acceptance in presence of the Engineer and subject to his approval.
7. Hydrostatically test in accordance with manufacturer’s written instructions and the requirements of ANSI B31.1 and B31.9. Test steel and copper piping system at 100 psig for minimum holding period of 24 hours during which time pressure shall not drop more than 4 psi. Before tests, remove or isolate gages, traps, and other apparatus in new system and existing piping system, which may be damaged. No leaking shall be allowed during the test period. Repair leaks by tightening, rewilding joints or renewing pipe or fittings. Do not caulk joints. Install a calibrated, test pressure gage in system to observe loss in pressure. After 30 minutes, all joints, welds, valves, etc shall be visually inspected for leaks. Correct defects disclosed by test.
8. Prepare written report of testing.

C. Perform the following before operating the system:

1. Open manual valves fully.
2. Inspect pumps for proper rotation.
3. Set makeup pressure-reducing valves for required system pressure.
4. Inspect air vents at high points of system and determine if all are installed and operating freely (automatic type), or bleed air completely (manual type).
5. Set temperature controls so all coils are calling for full flow.
6. Inspect and set operating temperatures of hydronic equipment, such as boilers, chillers, cooling towers, to specified values.
7. Verify lubrication of motors and bearings.

END OF SECTION 23 21 13

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SECTION 23 21 23 - HYDRONIC PUMPS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. Section Includes:

1. Flexible coupled, base-mounted, end-suction centrifugal pumps.

1.3 DEFINITIONS

A. Buna-N: Nitrile rubber.

B. EPT: Ethylene propylene terpolymer.

C. NPSH: Net positive suction head.

D. ODP: Open drip proof.

E. TEFC: Totally enclosed fan cooled.

1.4 ACTION SUBMITTALS

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

1. Include certified performance curves and rated capacities, operating characteristics, furnished specialties, electrical characteristics, and accessories for each type of product indicated.
2. Indicate pump's final impeller dimensions, and operating point on curves.

B. Shop Drawings: For each product indicated. For pump packages include plans, elevations, sections, details, and attachments to other work.

1. Show pump layout, component layout and connections.
2. Detail equipment assemblies and indicate dimensions, weights, loads, required clearances, method of field assembly, components, model numbers, and location and size of each field connection.
3. Wiring Diagrams: For power, signal, and control wiring.

1.5 INFORMATIONAL SUBMITTALS

A. Field Quality-Control Reports: Startup service reports.

B. Sample Warranty: For manufacturer's warranty.

1.6 CLOSEOUT SUBMITTALS

A. Operation and Maintenance Data: For pumps to include in emergency, operation, and maintenance manuals.

1. Exploded view diagrams with component parts list.
2. Instructions for installation, start-up, and operation.
3. Description of maintenance and care procedures.

1.7 WARRANTY

A. Each pump shall be factory hydrostatically tested per Hydraulic Institute Standards.

B. Manufacturer's Warranty: Manufacturer undertakes during the period of warranty to repair or to replace with new, in the shortest time possible, any parts found to present recognized defects in materials, construction or workmanship that render them unfit for the intended use. The warranty on the products has the following duration from the date of Substantial Completion:

1. Pumps: 5 years.

1.8 DELIVERY, STORAGE, AND HANDLING

A. Retain protective coatings and flange's protective covers during storage.

1.9 COORDINATION

A. Coordinate sizes and locations of concrete bases with actual equipment provided.

PART 2 - PRODUCTS

2.1 FLEXIBLE COUPLED, BASE/FRAMED-MOUNTED, END-SUCTION CENTRIFUGAL PUMPS

A. Manufacturers: Subject to compliance with requirements, provide product indicated on Drawings or comparable product by the following:

1. Patterson. Pump to match existing.

B. Description: Pumps shall be high efficiency end suction design; base mounted with OSHA approved coupling guard. The pumps shall be of the back pullout design, single stage, and capable of being serviced without disturbing piping connections. The flex coupling shall be rated for non-overloading conditions. The pump volute case shall be class 30 cast iron and shall have a volute mount rear support foot. The pumps shall have case wear rings and grease lubricated bearings. Pumps shall be designed for a maximum shaft deflection of 0.002" at the seal face. Impellers shall be precision-cast and dynamically balanced and shall be of the enclosed type, non-leaking brass and keyed to the shaft. The impellers shall have annular pressure reducing clearance with impeller balance holes to reduce axial thrust. The pumps shall have a replaceable bronze or stainless steel shaft sleeve and shall cover the liquid area under the seal. The pump shall have a mechanical seal type carbon vs. silicon carbide with seal water flush line. The pumps shall be rated for a minimum of 175 psi working pressure. Casing shall have tapped holes on the suction and discharge to accommodate gauges, fittings, and drain ports.

C. Pump Construction:

1. Casing: Radially split, cast iron, with replaceable bronze wear rings, threaded gage tappings at inlet and outlet, drain plug at bottom and air vent at top of volute, and threaded companion-flange or flanged connections. Provide integral mount on volute to support the casing, and provide attached piping to allow removal and replacement of impeller without disconnecting piping or requiring the realignment of pump and motor shaft.
2. Impeller: ASTM B 584, cast bronze; statically and dynamically balanced, keyed to shaft, and secured with a locking cap screw. For pumps not frequency-drive controlled, trim impeller to match specified performance.
3. Pump Shaft: Stainless steel.
4. Seal: Mechanical seal consisting of carbon rotating ring against a ceramic seat held by a stainless-steel spring, and Buna-N or EPT bellows and gasket.
5. Seal: Packing seal consisting of stuffing box with a minimum of four rings of graphite-impregnated braided yarn with bronze lantern ring between center two graphite rings, and bronze packing gland.
6. Pump Bearings: Grease-lubricated ball bearings in cast-iron housing with grease fittings.

D. Shaft Coupling: Molded-rubber insert and interlocking spider capable of absorbing vibration. Couplings shall be drop-out type to allow disassembly and removal without removing pump shaft or motor. EPDM coupling sleeve for variable-speed applications.

E. Coupling Guard: Dual rated; ANSI B15.1, Section 8; OSHA 1910.219 approved; steel; removable; attached to mounting frame.

F. Mounting Frame: Welded-steel frame and cross members, factory fabricated from ASTM A 36/A 36M channels and angles. Fabricate to mount pump casing, coupling guard, and motor.

G. Motor: Single speed, secured to mounting frame, with adjustable alignment.

1. 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. Comply with NEMA designation, temperature rating, service factor, and efficiency requirements for motors specified in Section "Common Motor Requirements for HVAC Equipment."

    a. Enclosure: Totally enclosed, fan cooled.
    b. Enclosure Materials: Cast iron, Cast aluminum, or Rolled steel.
    c. Motor Bearings: Permanently lubricated ball bearings.
    d. Efficiency: Premium efficient.

3. The motor shall be non-overloading throughout the entirety of the pump performance curve - premium efficiency.

H. Capacities and Characteristics: Refer to Construction Drawings.

2.2 PUMP SPECIALTY FITTINGS

A. Suction Diffuser:

1. Angle pattern.
2. 175-psig pressure rating, cast iron body and end cap, pump-inlet fitting.
3. Bronze startup and bronze or stainless-steel permanent strainers.
4. Bronze or stainless-steel straightening vanes.
5. Drain plug.
6. Factory-fabricated support.

B. Flexible Pump Connectors:

1. Flanged Connector with braided corrugated metal hose.
2. Stainless Steel hose and braid construction.
3. Carbon Steel flange construction.
4. Working pressures up to 315-psig pressure rating at 250°F.
5. Flexible connectors shall be provided at the line size of the system piping and shall not be reduced in size to match the pump connections. Provide stainless steel flexible connectors as manufactured by Mason Industries, Southeastern Hose SECF or engineer approved equal.

PART 3 - EXECUTION

3.1 PUMP INSTALLATION

A. Install pumps to provide access for periodic maintenance including removing motors, impellers, couplings, and accessories.

B. Independently support pumps and piping so weight of piping is not supported by pumps and weight of pumps is not supported by piping.

C. Equipment Mounting: Install base-mounted pumps on cast-in-place concrete equipment bases. Comply with requirements for equipment bases specified in the drawings.

1. Coordinate sizes and locations of concrete bases with actual equipment provided.
2. Construct bases to withstand, without damage to equipment, seismic force required by code.
3. Construct concrete bases 6 inches minimum high and extend base not less than 6 inches in all directions beyond the maximum dimensions of base-mounted pumps unless otherwise indicated or unless required for seismic-anchor support.
4. Minimum Compressive Strength: 3000 psi at 28 days.

D. Equipment Mounting: Install base-mounted pumps on cast-in-place concrete equipment base(s) using elastomeric pads, elastomeric mounts or restrained spring isolators.

1. Minimum Deflection: 1/4 inch.
2. Coordinate sizes and locations of concrete bases with actual equipment provided. Cast anchor-bolt inserts into bases.
3. Install dowel rods to connect concrete base to concrete floor. Unless otherwise indicated, install dowel rods on 18-inch centers around full perimeter of concrete base.
4. For supported equipment, install epoxy-coated anchor bolts that extend through concrete base and anchor into structural concrete floor.
5. Place and secure anchorage devices. Use setting drawings, templates, diagrams, instructions, and directions furnished with items to be embedded.
6. Install anchor bolts to elevations required for proper attachment to supported equipment.

E. Equipment Mounting: Install base-mounted pumps using elastomeric pads, elastomeric mounts or restrained spring isolators.

3.2 ALIGNMENT

A. Engage a factory-authorized service representative to perform alignment service.

B. Comply with requirements in Hydronics Institute standards for alignment of pump and motor shaft. Add shims to the motor feet and bolt motor to base frame. Do not use grout between motor feet and base frame.

C. Comply with pump and coupling manufacturers' written instructions.

D. After alignment is correct, tighten foundation bolts evenly but not too firmly. Completely fill baseplate with nonshrink, nonmetallic grout while metal blocks and shims or wedges are in place. After grout has cured, fully tighten foundation bolts.

3.3 CONNECTIONS

A. Where installing piping adjacent to pump, allow space for service and maintenance.

B. Connect piping to pumps. Piping shall not be load bearing on the pump. Pump inlet and discharge shall have zero loading from run-out piping. Install valves that are same size as piping connected to pumps.

C. Install suction and discharge pipe sizes equal to or greater than diameter of pump nozzles.

D. Install check, shutoff, and throttling valve with memory stop on discharge side of pumps.

E. Install suction diffuser along with shutoff valve on suction side of pumps. See drawing details.

F. Install flexible connectors on suction and discharge sides of base-mounted pumps between pump casing and valves.

G. Install pressure gages on pump suction and discharge or at integral pressure-gage tapping, or install single gage with multiple-input selector valve.

H. Install check valve and gate or ball valve on each condensate pump unit discharge.

I. Ground equipment according to Section "Grounding and Bonding for Electrical Systems."

J. Connect wiring according to Section "Low-Voltage Electrical Power Conductors and Cables."

END OF SECTION 23 21 23

SECTION 23 25 00 - HVAC WATER TREATMENT – CLOSED LOOP

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. This Section includes the following HVAC water-treatment systems:

1. HVAC water-treatment chemicals.

1.3 PERFORMANCE REQUIREMENTS

A. Water quality for HVAC systems shall minimize corrosion, scale buildup, and biological growth for optimum efficiency of HVAC equipment without creating a hazard to operating personnel or the environment.

B. Base HVAC water treatment on quality of water available at Project site, HVAC system equipment material characteristics and functional performance characteristics, operating personnel capabilities, and requirements and guidelines of authorities having jurisdiction.

C. Provide water treatment system for one year from date of Substantial Completion. Water treatment system shall include the entire volume of the connected chilled and hot water system that is connected to the new plant.

1.4 ACTION SUBMITTALS

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

1.5 INFORMATIONAL SUBMITTALS

A. Field quality-control test reports.

B. Other Informational Submittals:

1. Water-Treatment Program: Written sequence of operation on quarterly basis for the application equipment required to achieve water quality defined in the "Performance Requirements" Article above.
2. Water Analysis: Illustrate water quality available at Project site.

1.6 QUALITY ASSURANCE

A. HVAC Water-Treatment Service Provider Qualifications: An experienced HVAC water-treatment service provider capable of analyzing water qualities, installing water-treatment equipment, and applying water treatment as specified in this Section.

1.7 WARRANTY

A. Special Warranty: Manufacturer's standard form in which manufacturer agrees to maintain, repair, and replace components of chillers and boilers that fail in materials or workmanship within specified warranty period.

1. Warranty Period: One year from date of Substantial Completion. Warranty include, but are not limited to, the following:

a. Complete whole chemical unit including water treatment system assembly, maintenance, and chemicals.

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 the following:

1. J.L. Wingert.
2. Engineer Approved Equal.

2.2 MANUAL CHEMICAL-FEED EQUIPMENT

A. Bypass Feeders: Steel, with corrosion-resistant exterior coating, fill opening in the top, and NPS 3/4 side or bottom inlet and top side outlet. Quarter turn or threaded fill cap with gasket seal and diaphragm to lock the top on the feeder when exposed to system pressure in the vessel.

1. Capacity: See Construction Drawings.
2. Minimum Working Pressure: See Construction Drawings.

2.3 CHEMICALS

A. Chemicals shall be as recommended by water-treatment system manufacturer that are compatible with piping system components and connected equipment, and that can attain water quality specified in Part 1 "Performance Requirements" Article.

PART 3 - EXECUTION

3.1 WATER ANALYSIS

A. Perform an analysis of supply water to determine quality of water available at Project site.

3.2 INSTALLATION

A. Install chemical application equipment on concrete bases, level and plumb. Maintain manufacturer's recommended clearances. Arrange units so controls and devices that require servicing are accessible. Anchor chemical tanks and floor-mounting accessories to substrate.

B. Install water testing equipment on wall near water chemical application equipment.

C. Install interconnecting control wiring for chemical treatment controls and sensors.

D. Mount sensors and injectors in piping circuits.

E. Bypass Feeders: Install in closed hydronic systems, including hot-water heating, chilled water and equipped with the following:

1. Install bypass feeder in a bypass circuit around circulating pumps, unless otherwise indicated on Drawings.
2. Install water meter in makeup water supply.
3. Install a gate or full-port ball isolation valves on inlet, outlet, and drain below feeder inlet.
4. Install a swing check on inlet after the isolation valve.

3.3 CONNECTIONS

A. Piping installation requirements are specified in other Sections. Drawings indicate general arrangement of piping, fittings, and specialties.

B. Install piping adjacent to equipment to allow service and maintenance.

C. Make piping connections between HVAC water-treatment equipment and dissimilar-metal piping with dielectric fittings.

D. Install shutoff valves on HVAC water-treatment equipment inlet and outlet. Metal general-duty valves are specified in Section "General-Duty Valves for HVAC Piping."

E. Refer to Section "Domestic Water Piping Specialties" for backflow preventers required in makeup water connections to potable-water systems.

3.4 FIELD QUALITY CONTROL

A. Manufacturer's Field Service: Engage a factory-authorized service representative to inspect, test, and adjust components, assemblies, and equipment installations, including connections. Report results in writing.

B. Perform tests and inspections and prepare test reports.

1. Manufacturer's Field Service: Engage a factory-authorized service representative to inspect components, assemblies, and equipment installations, including connections, and to assist in testing.

C. Tests and Inspections:

1. Inspect field-assembled components and equipment installation, including piping and electrical connections.
2. Inspect piping and equipment to determine that systems and equipment have been cleaned, flushed, and filled with water, and are fully operational before introducing chemicals for water-treatment system.
3. Do not enclose, cover, or put piping into operation until it is tested and satisfactory test results are achieved.
4. Test for leaks and defects. If testing is performed in segments, submit separate report for each test, complete with diagram of portion of piping tested.
5. Leave uncovered and unconcealed new, altered, extended, and replaced water piping until it has been tested and approved. Expose work that has been covered or concealed before it has been tested and approved.
6. Cap and subject piping to static water pressure of 50 psig above operating pressure, without exceeding pressure rating of piping system materials. Isolate test source and allow test pressure to stand for four hours. Leaks and loss in test pressure constitute defects.
7. Repair leaks and defects with new materials and retest piping until no leaks exist.

D. Remove and replace malfunctioning units and retest as specified above.

E. Comply with ASTM D 3370 and with the following standards:

1. Silica: ASTM D 859.
2. Acidity and Alkalinity: ASTM D 1067.
3. Iron: ASTM D 1068.
4. Water Hardness: ASTM D 1126.

END OF SECTION 23 25 00

SECTION 23 31 13 - METAL DUCTS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. Section Includes:

1. Rectangular ducts and fittings.
2. Round ducts and fittings.
3. Sheet metal materials.
4. Sealants and gaskets.
5. Hangers and supports.

B. Related Sections:

1. Section "Testing, Adjusting, and Balancing for HVAC" for testing, adjusting, and balancing requirements for metal ducts.
2. Section "Air Duct Accessories" for dampers, sound-control devices, duct-mounting access doors and panels, turning vanes, and flexible ducts.

1.3 PERFORMANCE REQUIREMENTS

A. Delegated Duct Design: Duct construction, including sheet metal thicknesses, seam and joint construction, reinforcements, and hangers and supports, shall comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible" and performance requirements and design criteria indicated in "Duct Schedule" Article.

B. Structural Performance: Duct hangers and supports shall withstand the effects of gravity loads and stresses within limits and under conditions described in SMACNA's "HVAC Duct Construction Standards - Metal and Flexible".

C. Airstream Surfaces: Surfaces in contact with the airstream shall comply with requirements in ASHRAE 62.1.

1.4 ACTION SUBMITTALS

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

B. Shop Drawings:

1. Fabrication, assembly, and installation, including plans, elevations, sections, components, and attachments to other work.
2. Factory- and shop-fabricated ducts and fittings.
3. Duct layout indicating sizes, configuration, and static-pressure classes.
4. Elevation of top of ducts.
5. Dimensions of main duct runs from building grid lines.
6. Fittings.
7. Reinforcement and spacing.
8. Seam and joint construction.
9. Penetrations through fire-rated and other partitions.
10. Equipment installation based on equipment being used on Project.
11. Locations for duct accessories, including dampers, turning vanes, and access doors and panels.
12. Hangers and supports, including methods for duct and building attachment and vibration isolation.

1.5 INFORMATIONAL SUBMITTALS

A. Coordination Drawings: Plans, drawn to scale, on which the following items are shown and coordinated with each other, using input from installers of the items involved:

1. Duct installation in congested spaces, indicating coordination with general construction, building components, and other building services. Indicate proposed changes to duct layout.
2. Suspended ceiling components.
3. Structural members to which duct will be attached.
4. Size and location of initial access modules for acoustical tile.
5. Penetrations of smoke barriers and fire-rated construction.
6. Items penetrating finished ceiling including the following:

    a. Lighting fixtures.
    b. Air outlets and inlets.
    c. Speakers.
    d. Sprinklers.
    e. Access panels.

B. Welding certificates.

1.6 QUALITY ASSURANCE

A. Welding Qualifications: Qualify procedures and personnel according to the following:

1. AWS D1.1/D1.1M, "Structural Welding Code - Steel," for hangers and supports.
2. AWS D1.2/D1.2M, "Structural Welding Code - Aluminum," for aluminum supports.
3. AWS D9.1M/D9.1, "Sheet Metal Welding Code," for duct joint and seam welding.

B. ASHRAE Compliance: Applicable requirements in ASHRAE 62.1, Section 5 - "Systems and Equipment" and Section 7 - "Construction and System Start-up."

C. ASHRAE/IESNA Compliance: Applicable requirements in ASHRAE/IESNA 90.1, Section 6.4.4 - "HVAC System Construction and Insulation."

PART 2 - PRODUCTS

2.1 RECTANGULAR DUCTS AND FITTINGS

A. General Fabrication Requirements: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible" based on indicated static-pressure class unless otherwise indicated.

B. Transverse Joints: Select joint types and fabricate according to SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 2-1, "Rectangular Duct/Transverse Joints," for static-pressure class, applicable sealing requirements, materials involved, duct-support intervals, and other provisions in SMACNA's "HVAC Duct Construction Standards - Metal and Flexible."

C. Longitudinal Seams: Select seam types and fabricate according to SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 2-2, "Rectangular Duct/Longitudinal Seams," for static-pressure class, applicable sealing requirements, materials involved, duct-support intervals, and other provisions in SMACNA's "HVAC Duct Construction Standards - Metal and Flexible."

D. Elbows, Transitions, Offsets, Branch Connections, and Other Duct Construction: Select types and fabricate according to SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Chapter 4, "Fittings and Other Construction," for static-pressure class, applicable sealing requirements, materials involved, duct-support intervals, and other provisions in SMACNA's "HVAC Duct Construction Standards - Metal and Flexible."

2.2 ROUND DUCTS AND FITTINGS

A. General Fabrication Requirements: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Chapter 3, "Round, Oval, and Flexible Duct," based on indicated static-pressure class unless otherwise indicated.

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

    a. Lindab Inc.
    b. McGill AirFlow LLC.
    c. SEMCO Incorporated.
    d. Sheet Metal Connectors, Inc.
    e. Spiral Manufacturing Co., Inc.

B. Transverse Joints: Select joint types and fabricate according to SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 3-1, "Round Duct Transverse Joints," for static-pressure class, applicable sealing requirements, materials involved, duct-support intervals,

and other provisions in SMACNA's "HVAC Duct Construction Standards - Metal and Flexible."

1. Transverse Joints in Ducts Larger Than 60 Inches in Diameter: Flanged.

C. Longitudinal Seams: Select seam types and fabricate according to SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 3-2, "Round Duct Longitudinal Seams," for static-pressure class, applicable sealing requirements, materials involved, duct-support intervals, and other provisions in SMACNA's "HVAC Duct Construction Standards - Metal and Flexible."

1. Fabricate round ducts larger Than 90 inches in diameter with butt-welded longitudinal seams.

D. Tees and Laterals: Select types and fabricate according to SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 3-5, "90 Degree Tees and Laterals," and Figure 3-6, "Conical Tees," for static-pressure class, applicable sealing requirements, materials involved, duct-support intervals, and other provisions in SMACNA's "HVAC Duct Construction Standards - Metal and Flexible."

2.3 SHEET METAL MATERIALS

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

B. Galvanized Sheet Steel: Comply with ASTM A 653/A 653M.

1. Galvanized Coating Designation: G60.
2. Finishes for Surfaces Exposed to View: Mill phosphatized.

C. Carbon-Steel Sheets: Comply with ASTM A 1008/A 1008M, with oiled, matte finish for exposed ducts.

D. Stainless-Steel Sheets: Comply with ASTM A 480/A 480M, Type 304 or 316, as indicated in the "Duct Schedule" Article; cold rolled, annealed, sheet. Exposed surface finish shall be No. 2B, No. 2D, No. 3, or No. 4 as indicated in the "Duct Schedule" Article.

E. Aluminum Sheets: Comply with ASTM B 209 Alloy 3003, H14 temper; with mill finish for concealed ducts, and standard, one-side bright finish for duct surfaces exposed to view.

F. Reinforcement Shapes and Plates: ASTM A 36/A 36M, steel plates, shapes, and bars; black and galvanized.

1. Where black- and galvanized-steel shapes and plates are used to reinforce aluminum ducts, isolate the different metals with butyl rubber, neoprene, or EPDM gasket materials.

G. Tie Rods: Galvanized steel, 1/4-inch minimum diameter for lengths 36 inches or less; 3/8-inch minimum diameter for lengths longer than 36 inches.

2.4 SEALANT AND GASKETS

A. General Sealant and Gasket Requirements: Surface-burning characteristics for sealants and gaskets shall be a maximum flame-spread index of 25 and a maximum smoke-developed index of 50 when tested according to UL 723; certified by an NRTL.

B. Water-Based Joint and Seam Sealant:

1. Application Method: Brush on.
2. Solids Content: Minimum 65 percent.
3. Shore A Hardness: Minimum 20.
4. Water resistant.
5. Mold and mildew resistant.
6. VOC: Maximum 75 g/L (less water).
7. Maximum Static-Pressure Class: 10-inch wg, positive and negative.
8. Service: Indoor or outdoor.
9. Substrate: Compatible with galvanized sheet steel (both PVC coated and bare), stainless steel, or aluminum sheets.

C. Flanged Joint Sealant: Comply with ASTM C 920.

1. General: Single-component, acid-curing, silicone, elastomeric.
2. Type: S.
3. Grade: NS.
4. Class: 25.
5. Use: O.
6. For indoor applications, sealant shall have a VOC content of 250 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).
7. Sealant shall comply with the testing and product requirements of the California Department of Health Services' "Standard Practice for the Testing of Volatile Organic Emissions from Various Sources Using Small-Scale Environmental Chambers."

D. Flange Gaskets: Butyl rubber, neoprene, or EPDM polymer with polyisobutylene plasticizer.

E. Round Duct Joint O-Ring Seals:

1. Seal shall provide maximum leakage class of 3 cfm/100 sq. ft. at 1-inch wg and shall be rated for 10-inch wg static-pressure class, positive or negative.
2. EPDM O-ring to seal in concave bead in coupling or fitting spigot.
3. Double-lipped, EPDM O-ring seal, mechanically fastened to factory-fabricated couplings and fitting spigots.

2.5 HANGERS AND SUPPORTS

A. Hanger Rods for Noncorrosive Environments: Cadmium-plated steel rods and nuts.

B. Hanger Rods for Corrosive Environments: Electrogalvanized, all-thread rods or galvanized rods with threads painted with zinc-chromate primer after installation.

C. Strap and Rod Sizes: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Table 5-1, "Rectangular Duct Hangers Minimum Size," and Table 5-2, "Minimum Hanger Sizes for Round Duct."

D. Steel Cables for Galvanized-Steel Ducts: Galvanized steel complying with ASTM A 603.

E. Steel Cables for Stainless-Steel Ducts: Stainless steel complying with ASTM A 492.

F. Steel Cable End Connections: Cadmium-plated steel assemblies with brackets, swivel, and bolts designed for duct hanger service; with an automatic-locking and clamping device.

G. Duct Attachments: Sheet metal screws, blind rivets, or self-tapping metal screws; compatible with duct materials.

H. Trapeze and Riser Supports:

1. Supports for Galvanized-Steel Ducts: Galvanized-steel shapes and plates.
2. Supports for Stainless-Steel Ducts: Stainless-steel shapes and plates.
3. Supports for Aluminum Ducts: Aluminum or galvanized steel coated with zinc chromate.

PART 3 - EXECUTION

3.1 DUCT INSTALLATION

A. Drawing plans, schematics, and diagrams indicate general location and arrangement of duct system. Indicated duct locations, configurations, and arrangements were used to size ducts and calculate friction loss for air-handling equipment sizing and for other design considerations. Install duct systems as indicated unless deviations to layout are approved on Shop Drawings and Coordination Drawings.

B. Install ducts according to SMACNA's "HVAC Duct Construction Standards - Metal and Flexible" unless otherwise indicated.

C. Install round ducts in maximum practical lengths.

D. Install ducts with fewest possible joints.

E. Install factory- or shop-fabricated fittings for changes in direction, size, and shape and for branch connections.

F. Unless otherwise indicated, install ducts vertically and horizontally, and parallel and perpendicular to building lines.

G. Install ducts close to walls, overhead construction, columns, and other structural and permanent enclosure elements of building.

H. Install ducts with a clearance of 1 inch, plus allowance for insulation thickness.

I. Route ducts to avoid passing through transformer vaults and electrical equipment rooms and enclosures.

J. Where ducts pass through non-fire-rated interior partitions and exterior walls and are exposed to view, cover the opening between the partition and duct or duct insulation with sheet metal flanges of same metal thickness as the duct. Overlap openings on four sides by at least 1-1/2 inches.

K. Where ducts pass through fire-rated interior partitions and exterior walls, install fire dampers. Comply with requirements in Section "Air Duct Accessories" for fire and smoke dampers.

L. Protect duct interiors from moisture, construction debris and dust, and other foreign materials. Comply with SMACNA's "IAQ Guidelines for Occupied Buildings Under Construction," Appendix G, "Duct Cleanliness for New Construction Guidelines."

3.2 INSTALLATION OF EXPOSED DUCTWORK

A. Protect ducts exposed in finished spaces from being dented, scratched, or damaged.

B. Trim duct sealants flush with metal. Create a smooth and uniform exposed bead. Do not use two-part tape sealing system.

C. Grind welds to provide smooth surface free of burrs, sharp edges, and weld splatter. When welding stainless steel with a No. 3 or 4 finish, grind the welds flush, polish the exposed welds, and treat the welds to remove discoloration caused by welding.

D. Maintain consistency, symmetry, and uniformity in the arrangement and fabrication of fittings, hangers and supports, duct accessories, and air outlets.

E. Repair or replace damaged sections and finished work that does not comply with these requirements.

3.3 DUCT SEALING

A. Seal ducts for duct static-pressure, seal classes, and leakage classes specified in "Duct Schedule" Article according to SMACNA's "HVAC Duct Construction Standards - Metal and Flexible."

3.4 HANGER AND SUPPORT INSTALLATION

A. Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Chapter 5, "Hangers and Supports."

B. Building Attachments: Concrete inserts, powder-actuated fasteners, or structural-steel fasteners appropriate for construction materials to which hangers are being attached.

1. Where practical, install concrete inserts before placing concrete.
2. Install powder-actuated concrete fasteners after concrete is placed and completely cured.

3. Use powder-actuated concrete fasteners for standard-weight aggregate concretes or for slabs more than 4 inches thick.
4. Do not use powder-actuated concrete fasteners for lightweight-aggregate concretes or for slabs less than 4 inches thick.
5. Do not use powder-actuated concrete fasteners for seismic restraints.

C. Hanger Spacing: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Table 5-1, "Rectangular Duct Hangers Minimum Size," and Table 5-2, "Minimum Hanger Sizes for Round Duct," for maximum hanger spacing; install hangers and supports within 24 inches of each elbow and within 48 inches of each branch intersection.

D. Hangers Exposed to View: Threaded rod and angle or channel supports.

E. Support vertical ducts with steel angles or channel secured to the sides of the duct with welds, bolts, sheet metal screws, or blind rivets; support at each floor and at a maximum intervals of 16 feet.

F. Install upper attachments to structures. Select and size upper attachments with pull-out, tension, and shear capacities appropriate for supported loads and building materials where used.

3.5 CONNECTIONS

A. Make connections to equipment with flexible connectors complying with Section "Air Duct Accessories."

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

3.6 START UP

A. Air Balance: Comply with requirements in Section "Testing, Adjusting, and Balancing for HVAC."

3.7 DUCT SCHEDULE

A. Supply Ducts:

1. Round or Rectangular Ducts Connected to Fan Coil Units, Furnaces, Heat Pumps, Constant-Volume Air-Handling Units, and downstream from Air Terminal Units:

    a. Pressure Class: Positive 2-inch wg.
    b. Minimum SMACNA Seal Class: A.

2. Round or Flat Oval Ducts Connected to Variable-Air-Volume Air-Handling Units and upstream from Air Terminal Units:

    a. Pressure Class: Positive 4-inch wg or as required for design pressure.
    b. Minimum SMACNA Seal Class: A.

B. Return Ducts:

1. Ducts Connected to Air Handling Units, Fan Coil Units, Furnaces, and Heat Pumps:

   a. Pressure Class: Positive 2-inch wg.
   b. Minimum SMACNA Seal Class: A.

C. Exhaust Ducts:

1. Ducts Connected to Fans Exhausting (ASHRAE 62.1, Class 1 and 2) Air:

   a. Pressure Class: Negative 2-inch wg.
   b. Minimum SMACNA Seal Class: A if negative pressure, and A if positive pressure.

2. Ducts Connected to Commercial Kitchen Hoods: Comply with NFPA 96.

   a. Exposed to View: Type 304, stainless-steel sheet, No. 4 finish.
   b. Concealed: Type 304, stainless-steel sheet, No. 2D finish.
   c. Welded seams and joints.
   d. Pressure Class: Positive or negative 2-inch wg.
   e. Minimum SMACNA Seal Class: Welded seams, joints, and penetrations.

3. Ducts Connected to Dishwasher Hoods:

   a. Type 304, stainless-steel sheet.
   b. Exposed to View: No. 4 finish.
   c. Concealed: No. 2D finish.
   d. Welded seams and flanged joints with watertight EPDM gaskets.
   e. Pressure Class: Positive or negative 2-inch wg.
   f. Minimum SMACNA Seal Class: Welded seams, joints, and penetrations.

D. Outdoor-Air (Not Filtered, Heated, or Cooled) Ducts:

1. Ducts Connected to Fan Coil Units, Furnaces, Heat Pumps, and Air Handling Units.

   a. Pressure Class: Positive 2-inch wg.
   b. Minimum SMACNA Seal Class: A.

E. Intermediate Reinforcement:

1. Galvanized-Steel Ducts: Galvanized steel or carbon steel coated with zinc-chromate primer.

2. Stainless-Steel Ducts:

   a. Exposed to Airstream: Match duct material.
   b. Not Exposed to Airstream: Match duct material.

3. Aluminum Ducts: Aluminum.

F. Elbow Configuration:

1. Rectangular Duct: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 4-2, "Rectangular Elbows."

    a. Velocity 1000 fpm or Lower:

        1) Radius Type RE 1 with minimum 0.5 radius-to-diameter ratio.
        2) Mitered Type RE 4 without vanes.

    b. Velocity 1000 to 1500 fpm:

        1) Radius Type RE 1 with minimum 1.0 radius-to-diameter ratio.
        2) Radius Type RE 3 with minimum 0.5 radius-to-diameter ratio and two vanes.
        3) Mitered Type RE 2 with vanes complying with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 4-3, "Vanes and Vane Runners," and Figure 4-4, "Vane Support in Elbows."

    c. Velocity 1500 fpm or Higher:

        1) Radius Type RE 1 with minimum 1.5 radius-to-diameter ratio.
        2) Radius Type RE 3 with minimum 1.0 radius-to-diameter ratio and two vanes.
        3) Mitered Type RE 2 with vanes complying with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 4-3, "Vanes and Vane Runners," and Figure 4-4, "Vane Support in Elbows."

2. Rectangular Duct: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 4-2, "Rectangular Elbows."

    a. Radius Type RE 1 with minimum 1.5 radius-to-diameter ratio.
    b. Radius Type RE 3 with minimum 1.0 radius-to-diameter ratio and two vanes.
    c. Mitered Type RE 2 with vanes complying with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 4-3, "Vanes and Vane Runners," and Figure 4-4, "Vane Support in Elbows."

3. Round Duct: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 3-4, "Round Duct Elbows."

    a. Minimum Radius-to-Diameter Ratio and Elbow Segments: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Table 3-1, "Mitered Elbows." Elbows with less than 90-degree change of direction have proportionately fewer segments.

        1) Velocity 1000 fpm or Lower: 0.5 radius-to-diameter ratio and three segments for 90-degree elbow.
        2) Velocity 1000 to 1500 fpm: 1.0 radius-to-diameter ratio and four segments for 90-degree elbow.
        3) Velocity 1500 fpm or Higher: 1.5 radius-to-diameter ratio and five segments for 90-degree elbow.
        4) Radius-to Diameter Ratio: 1.5.

b. Round Elbows, 12 Inches and Smaller in Diameter: Stamped or pleated.
c. Round Elbows, 14 Inches and Larger in Diameter: Standing seam.

G. Branch Configuration:

1. Rectangular Duct: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 4-6, "Branch Connection."

a. Rectangular Main to Rectangular Branch: 45-degree entry.
b. Rectangular Main to Round Branch: Spin in.

2. Round: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 3-5, "90 Degree Tees and Laterals," and Figure 3-6, "Conical Tees." Saddle taps are permitted in existing duct.

a. Velocity 1000 fpm or Lower: 90-degree tap.
b. Velocity 1000 to 1500 fpm: Conical tap.
c. Velocity 1500 fpm or Higher: 45-degree lateral.

3.8 FIELD QUALITY CONTROL

A. Perform tests and inspections.

B. Leakage Tests:

1. Comply with SMACNA's "HVAC Air Duct Leakage Test Manual." Submit a test report for each test.

2. Provide leakage test for all installed ductwork trunk and branch lines.

3. Conduct tests, in presence of Engineer, at static pressures equal to maximum design pressure of system or section being tested. If pressure classifications are not indicated, test entire system at maximum system design pressure. Do not pressurize systems above maximum design operating pressure. Give seven days advance notice for testing.

4. Assemble and install ductwork in accordance with recognized industry practices which will achieve air-tight (5% leakage for systems rated 3" and under; 1% for systems rated over 3") and noiseless (no objectionable noise) systems, capable of performing each indicated service. Install each run with minimum number of joints. Align ductwork accurately at connections. Support ducts rigidly with suitable ties, braces, hangers and anchors of type which will hold ducts true-to-shape and to prevent buckling. Support vertical ducts at every floor.

5. Remake leaking joints and retest until leakage is less than maximum allowable.

6. Leakage Test: After each duct system is completed, test for duct leakage in accordance with Sections 3 and 5 of the SMACNA HVAC Air Duct Leakage Test Manual. Test pressure shall be equal to pressure class of duct. Repair leaks and repeat tests until total leakage is less than 5% of system design air flow for low pressure systems and less than 1% for systems rated over 3"

C. Duct system will be considered defective if it does not pass tests and inspections.

D. Prepare test and inspection reports.

END OF SECTION 23 31 13

SECTION 23 33 00 - AIR DUCT ACCESSORIES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. Section Includes:

1. Backdraft and pressure relief dampers.
2. Manual volume dampers.
3. Control dampers.
4. Fire dampers.
5. Smoke dampers.
6. Flange connectors.
7. Turning vanes.
8. Duct-mounted access doors.
9. Flexible connectors.
10. Flexible ducts.
11. Duct accessory hardware.

B. Related Requirements:

1. Section "HVAC Gravity Ventilators" for roof-mounted ventilator caps.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product.

B. Shop Drawings: For duct accessories. Include plans, elevations, sections, details and attachments to other work.

1. Coordination Drawings: Reflected ceiling plans, drawn to scale, on which ceiling-mounted access panels and access doors required for access to duct accessories are shown and coordinated with each other, using input from Installers of the items involved.

2. Detail duct accessories fabrication and installation in ducts and other construction. Include dimensions, weights, loads, and required clearances; and method of field assembly into duct systems and other construction. Include the following:

a. Special fittings.
b. Manual volume damper installations.
c. Control-damper installations.

d. Fire-damper and smoke-damper installations, including sleeves; and duct-mounted access doors.
e. Wiring Diagrams: For power, signal, and control wiring.

1.4 CLOSEOUT SUBMITTALS

A. Operation and maintenance data. For air duct accessories to include in operation and maintenance manuals

PART 2 - PRODUCTS

2.1 ASSEMBLY DESCRIPTION

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

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

2.2 MATERIALS

A. Galvanized Sheet Steel: Comply with ASTM A 653/A 653M.

1. Galvanized Coating Designation: G60.
2. Exposed-Surface Finish: Mill phosphatized.

B. Stainless-Steel Sheets: Comply with ASTM A 480/A 480M, Type 304, and having a No. 2 finish for concealed ducts and No. 4 finish for exposed ducts.

C. Aluminum Sheets: Comply with ASTM B 209, Alloy 3003, Temper H14; with mill finish for concealed ducts and standard, 1-side bright finish for exposed ducts.

D. Extruded Aluminum: Comply with ASTM B 221, Alloy 6063, Temper T6.

E. Reinforcement Shapes and Plates: Galvanized-steel reinforcement where installed on galvanized sheet metal ducts; compatible materials for aluminum and stainless-steel ducts.

F. Tie Rods: Galvanized steel, 1/4-inch minimum diameter for lengths 36 inches or less; 3/8-inch minimum diameter for lengths longer than 36 inches.

2.3 BACKDRAFT AND PRESSURE RELIEF DAMPERS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Greenheck Fan Corporation.
2. Nailor Industries Inc.
3. Pottorff.
4. Ruskin Company.

B. Description: Gravity balanced.

C. Maximum Air Velocity: 1000 fpm.

D. Maximum System Pressure: 1-inch wg.

E. Frame: Hat-shaped, 0.094-inch thick, galvanized sheet steel, with welded corners or mechanically attached and mounting flange.

F. Blades: Multiple single-piece blades, center pivoted, maximum 6-inch width, 0.025-inch thick, roll-formed aluminum with sealed edges.

G. Blade Action: Parallel.

H. Blade Seals: Neoprene, mechanically locked.

I. Blade Axles:

1. Material: Aluminum.
2. Diameter: 0.20 inch.

J. Tie Bars and Brackets: Aluminum.

K. Return Spring: Adjustable tension.

L. Bearings: Synthetic pivot bushings.

M. Accessories:

1. Adjustment device to permit setting for varying differential static pressure.
2. Counterweights and spring-assist kits for vertical airflow installations.
3. Electric actuators.
4. Chain pulls.
5. Screen Mounting: Front mounted in sleeve.
    a. Sleeve Thickness: 20 gage minimum.
    b. Sleeve Length: 6 inches minimum.
6. Screen Mounting: Rear mounted.
7. Screen Material: Aluminum.
8. Screen Type: Bird.
9. 90-degree stops.

2.4 MANUAL VOLUME DAMPERS

A. Standard, Steel, Manual Volume Dampers:

B. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

a. Flexmaster U.S.A., Inc.
b. Greenheck Fan Corporation.
c. Nailor Industries Inc.
d. Pottorff.
e. Ruskin Company.

2. Standard leakage rating with linkage outside airstream.
3. Suitable for horizontal or vertical applications.
4. Frames:

a. Frame: Hat-shaped, 0.094-inch- thick, galvanized sheet steel.
b. Mitered and welded corners.
c. Flanges for attaching to walls and flangeless frames for installing in ducts.

5. Blades:

a. Multiple or single blade.
b. Parallel- or opposed-blade design.
c. Stiffen damper blades for stability.
d. Galvanized steel, 0.064 inch thick.

6. Blade Axles: Galvanized steel.
7. Bearings:

a. Molded synthetic.
b. Dampers in ducts with pressure classes of 3-inch wg (750 Pa) or less shall have axles full length of damper blades and bearings at both ends of operating shaft.

8. Tie Bars and Brackets: Galvanized steel.

C. Jackshaft:

1. Size: 1-inch diameter.
2. Material: Galvanized-steel pipe rotating within pipe-bearing assembly mounted on supports at each mullion and at each end of multiple-damper assemblies.
3. Length and Number of Mountings: As required to connect linkage of each damper in multiple-damper assembly.

D. Damper Hardware:

1. Zinc-plated, die-cast core with dial and handle made of 3/32-inch- thick zinc-plated steel, and a 3/4-inch hexagon locking nut.
2. Include center hole to suit damper operating-rod size.
3. Include elevated platform for insulated duct mounting.

2.5 CONTROL DAMPERS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. T.A. Morrison (TAMCO)
2. Greenheck Fan Corporation.
3. Nailor Industries Inc.
4. Pottorff.
5. Ruskin Company.

B. Description: (Base Option for Return Air Application)

1. Extruded aluminum (6063-T5) damper frame shall not be less than 0.080” in thickness. Damper frame shall be 4” deep x 1", with duct mounting flanges on both sides of frame. Damper frame shall have a 2" mounting flange on the rear of the damper, when installed as Extended Rear Flange install type. Frame to be assembled using zinc-plated steel mounting fasteners. Welded frames shall not be acceptable.
2. Blades shall be maximum 6.4" deep extruded aluminum (6063-T5) air-foil profiles with a minimum wall thickness of 0.06”. All blades shall be symmetrically pivoted.
3. Blade seals shall be extruded EPDM, secured in an integral slot within the aluminum blade extrusions and shall be mechanically fastened to prevent shrinkage and movement over the life of the damper. Adhesive or clip-on type blade seals will not be approved.
4. Frame seals shall be extruded silicone, secured in an integral slot within the aluminum frame extrusions and shall be mechanically fastened to prevent shrinkage and movement over the life of the damper. Metallic compression type jamb seals will not be approved.
5. Bearings shall be a dual bearing system composed of a Celcon inner bearing (fixed around a 7/16" aluminum hexagon blade pivot pin), rotating within a polycarbonate outer bearing inserted in the frame. Single axle bearing, rotating in an extruded or punched hole shall not be acceptable. Bearings are to be maintenance-free, requiring no lubrication.
6. Hexagonal control shaft shall be $^{7}/_{16}$" . It shall have an adjustable length and shall be an integral part of the blade axle. A field-applied control shaft shall not be acceptable. All parts shall be zinc-plated steel.
7. Linkage hardware shall be aluminum and corrosion-resistant zinc-plated steel, installed in the frame side, out of the airstream, and accessible after installation. Linkage hardware shall be complete with cup-point trunnion screws to prevent linkage slippage and a Celcon bearing between moving parts to reduce wear and increase longevity. Linkage that consists of metal rubbing metal will not be approved.
8. Dampers shall be designed for operation in temperatures ranging from -40°F to 212°F.
9. Dampers shall be AMCA rated for Leakage Class 1A at 1 in. w.g. static pressure differential. Standard air leakage data to be certified under the AMCA Certified Ratings Program.
10. Dampers shall be custom made to required size, with blade stops not exceeding 1¼” in height. The blade stop shall be a continuous and integral part of the head/sill. Welded and caulked blade stops shall not be acceptable.
11. Installation of dampers must be in accordance with manufacturer’s current installation guidelines, provided with each damper shipment.
12. Field-supplied intermediate structural support is required to resist applied pressure loads for dampers that consist of two or more sections in both height and width. (Refer to manufacturer Aluminum Damper Installation Guidelines.)

C. Description: (Salt Water Resistance Option for Outside Air Application)

1. Extruded aluminum (6063-T5) damper frame shall not be less than 0.080” in thickness. Damper frame shall be 4” deep x 1", with duct mounting flanges on both sides of frame. Damper frame shall have a 2" mounting flange on the rear of the damper when installed as Extended Rear Flange install type. Aluminum frame shall be clear anodized to a minimum thickness of 0.7 mil (18 microns) deep. Frame shall be assembled using stainless steel screws. Welded frames shall not be acceptable.
2. Blades shall be maximum 6.4" deep extruded aluminum (6063-T5) air-foil profiles with a minimum wall thickness of 0.06”, clear anodized to a minimum thickness of 0.7 mil (18 microns) deep. All blades shall be symmetrically pivoted.
3. Blade seals shall be extruded silicone, secured in an integral slot within the aluminum blade extrusions and shall be mechanically fastened to prevent shrinkage and movement over the life of the damper. Adhesive or clip-on type blade seals will not be approved.
4. Frame seals shall be extruded silicone, secured in an integral slot within the aluminum frame extrusions and shall be mechanically fastened to prevent shrinkage and movement over the life of the damper. Metallic compression type jamb seals will not be approved.
5. Bearings shall be a dual bearing system composed of a Celcon inner bearing (fixed around a 7/16" aluminum hexagon blade pivot pin), rotating within a polycarbonate outer bearing inserted in the frame. Single axle bearing, rotating in an extruded or punched hole shall not be acceptable. Bearings are to be maintenance-free, requiring no lubrication.
6. Hexagonal control shaft shall be $^{7}/_{16}$". It shall have an adjustable length and shall be an integral part of the blade axle. A field-applied control shaft shall not be acceptable. All parts shall be stainless steel.
7. Linkage hardware shall be aluminum and stainless steel, installed in the frame side, out of the airstream, and accessible after installation. Linkage hardware shall be complete with stainless steel cup-point trunnion screws to prevent linkage slippage and a Celcon bearing between moving parts to reduce wear and increase longevity. Linkage that consists of metal rubbing metal will not be approved.
8. Dampers shall be designed for operation in temperatures ranging from -40°F to 212°F.
9. Dampers shall be AMCA rated for Leakage Class 1A at 1 in. w.g. static pressure differential. Standard air leakage data to be certified under the AMCA Certified Ratings Program.
10. Dampers shall be custom made to required size, with blade stops not exceeding 1¼” in height. The blade stop shall be a continuous and integral part of the head/sill. Welded and caulked blade stops shall not be acceptable.
11. Installation of dampers must be in accordance with manufacturer’s current installation guidelines, provided with each damper shipment.
12. Field-supplied intermediate structural support is required to resist applied pressure loads for dampers that consist of two or more sections in both height and width. (Refer to manufacturer Aluminum Damper Installation Guidelines.)

2.6 FIRE DAMPERS

A. Manufacturers: Subject to compliance with requirements, products by one of the following:

1. Greenheck Fan Corporation.
2. Nailor Industries Inc.
3. Pottorff.
4. Ruskin Company.

B. Type: Static and dynamic; rated and labeled according to UL 555 by an NRTL.

C. Closing rating in ducts up to 4-inch wg static pressure class and minimum 2000-fpm velocity.

D. Fire Rating: 1-1/2 and 3 hours.

E. Frame: Curtain type with blades outside airstream; Curtain type with blades outside airstream except when located behind grille where blades may be inside airstream]; fabricated with roll-formed, 0.034-inch- thick galvanized steel; with mitered and interlocking corners.

F. Mounting Sleeve: Factory- or field-installed, galvanized sheet steel.

1. Minimum Thickness: 0.05- inch- thick, as indicated, and of length to suit application.
2. Exception: Omit sleeve where damper-frame width permits direct attachment of perimeter mounting angles on each side of wall or floor; thickness of damper frame must comply with sleeve requirements.

G. Mounting Orientation: Vertical or horizontal as indicated.

H. Blades: Roll-formed, interlocking, 0.024-inch- thick, galvanized sheet steel. In place of interlocking blades, use full-length, 0.034-inch- thick, galvanized-steel blade connectors.

I. Horizontal Dampers: Include blade lock and stainless-steel closure spring.

J. Heat-Responsive Device: Replaceable, 165 deg F rated, fusible links.

2.7 SMOKE DAMPERS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Greenheck Fan Corporation.
2. Nailor Industries Inc.
3. Pottorff.
4. Ruskin Company.

B. General Requirements: Label according to UL 555S by an NRTL.

C. Smoke Detector: Integral, factory wired for single-point connection.

D. Frame: Hat-shaped, 0.094-inch- thick, galvanized sheet steel, with welded or mechanically attached corners and mounting flange.

E. Blades: Roll-formed, horizontal, interlocking, 0.034-inch- thick, galvanized sheet steel.

F. Leakage: Class I.

G. Rated pressure and velocity to exceed design airflow conditions.

H. Mounting Sleeve: Factory-installed, 0.039-inch- thick, galvanized sheet steel; length to suit wall or floor application.

I. Damper Motors: Two-position action.

J. Comply with NEMA designation, temperature rating, service factor, enclosure type, and efficiency requirements for motors specified in Section "Common Motor Requirements for HVAC Equipment."

1. Motor Sizes: Minimum size as indicated. If not indicated, large enough so driven load will not require motor to operate in service factor range above 1.0.
2. Permanent-Split-Capacitor or Shaded-Pole Motors: With oil-immersed and sealed gear trains.
3. Spring-Return Motors: Equip with an integral spiral-spring mechanism where indicated. Enclose entire spring mechanism in a removable housing designed for service or adjustments. Size for running torque rating of 150 in. x lbf and breakaway torque rating of 150 in. x lbf.
4. Outdoor Motors and Motors in Outdoor-Air Intakes: Equip with O-ring gaskets designed to make motors weatherproof. Equip motors with internal heaters to permit normal operation at minus 40 deg F.
5. Nonspring-Return Motors: For dampers larger than 25 sq. ft., size motor for running torque rating of 150 in. x lbf and breakaway torque rating of 300 in. x lbf.
6. Electrical Connection: 115 V, single phase, 60 Hz.

K. Accessories:

1. Auxiliary switches for signaling, fan control or position indication.
2. Test and reset switches, damper mounted.

2.8 FLANGE CONNECTORS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Ductmate Industries, Inc.
2. Nexus PDQ; Division of Shilco Holdings Inc.
3. Ward Industries, Inc.; a division of Hart & Cooley, Inc.

B. Description: Add-on or roll-formed, factory-fabricated, slide-on transverse flange connectors, gaskets, and components.

C. Material: Galvanized steel.

D. Gage and Shape: Match connecting ductwork.

2.9 TURNING VANES

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Ductmate Industries, Inc.
2. Duro Dyne Inc.

3. METALAIRE, Inc.
4. Ward Industries, Inc.; a division of Hart & Cooley, Inc.

B. Manufactured Turning Vanes for Metal Ducts: Curved blades of galvanized sheet steel; support with bars perpendicular to blades set; set into vane runners suitable for duct mounting.

1. Acoustic Turning Vanes: Fabricate airfoil-shaped aluminum extrusions with perforated faces and fibrous-glass fill.

C. General Requirements: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible"; Figures 4-3, "Vanes and Vane Runners," and 4-4, "Vane Support in Elbows."

D. Vane Construction: Single wall for ducts up to 48 inches wide and double wall for larger dimensions.

2.10 DUCT-MOUNTED ACCESS DOORS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Flexmaster U.S.A., Inc.
2. Greenheck Fan Corporation.
3. Nailor Industries Inc.
4. Pottorff.

B. Duct-Mounted Access Doors: Fabricate access panels according to SMACNA's "HVAC Duct Construction Standards - Metal and Flexible"; Figures 7-2 (7-2M), "Duct Access Doors and Panels," and 7-3, "Access Doors - Round Duct."

1. Door:

a. Double wall, rectangular.
b. Galvanized sheet metal with insulation fill and thickness as indicated for duct pressure class.
c. Vision panel.
d. Hinges and Latches: 1-by-1-inch butt or piano hinge and cam latches.
e. Fabricate doors airtight and suitable for duct pressure class.

2. Frame: Galvanized sheet steel, with bend-over tabs and foam gaskets.
3. Number of Hinges and Locks:

a. Access Doors Less Than 12 Inches Square: No hinges and two sash locks.
b. Access Doors up to 18 Inches Square: Two hinges and two sash locks.
c. Access Doors up to 24 by 48 Inches: Continuous and two compression latches with outside and inside handles.
d. Access Doors Larger Than 24 by 48 Inches: Continuous and two compression latches with outside and inside handles.

C. Pressure Relief Access Door:

1. Door and Frame Material: Galvanized sheet steel.
2. Door: Single wall with metal thickness applicable for duct pressure class.
3. Operation: Open outward for positive-pressure ducts and inward for negative-pressure ducts.
4. Factory set at 3.0- to 8.0-inch wg
5. Doors close when pressures are within set-point range.
6. Hinge: Continuous piano.
7. Latches: Cam.
8. Seal: Neoprene or foam rubber.
9. Insulation Fill: 1-inch- thick, fibrous-glass or polystyrene-foam board.

2.11 DUCT ACCESS PANEL ASSEMBLIES

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Ductmate Industries, Inc.
2. Flame Gard, Inc.
3. 3M.

B. Labeled according to UL 1978 by an NRTL.

C. Panel and Frame: Minimum thickness 0.0428-inch stainless steel.

D. Fasteners: Stainless steel. Panel fasteners shall not penetrate duct wall.

E. Gasket: Comply with NFPA 96; grease-tight, high-temperature ceramic fiber, rated for minimum 2000 deg F.

F. Minimum Pressure Rating: 10-inch wg, positive or negative.

2.12 FLEXIBLE CONNECTORS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Ductmate Industries, Inc.
2. Duro Dyne Inc.
3. Elgen Manufacturing.
4. Ward Industries, Inc.; a division of Hart & Cooley, Inc.

B. Materials: Flame-retardant or noncombustible fabrics.

C. Coatings and Adhesives: Comply with UL 181, Class 1.

D. Metal-Edged Connectors: Factory fabricated with a fabric strip 3-1/2 inches wide attached to two strips of 2-3/4-inch- wide, 0.028-inch- thick, galvanized sheet steel or 0.032-inch- thick aluminum sheets. Provide metal compatible with connected ducts.

E. Indoor System, 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 deg F.

F. Outdoor System, Flexible Connector Fabric: Glass fabric double coated with weatherproof, synthetic rubber resistant to UV rays and ozone.

1. Minimum Weight: 24 oz./sq. yd.
2. Tensile Strength: 530 lbf/inch in the warp and 440 lbf/inch in the filling.
3. Service Temperature: Minus 50 to plus 250 deg F.

G. High-Temperature System, Flexible Connectors: Glass fabric coated with silicone rubber.

1. Minimum Weight: 16 oz./sq. yd.
2. Tensile Strength: 285 lbf/inch in the warp and 185 lbf/inch in the filling.
3. Service Temperature: Minus 67 to plus 500 deg F.

H. High-Corrosive-Environment System, Flexible Connectors: Glass fabric with chemical-resistant coating.

1. Minimum Weight: 14 oz./sq. yd..
2. Tensile Strength: 450 lbf/inch in the warp and 340 lbf/inch in the filling.
3. Service Temperature: Minus 67 to plus 500 deg F.

I. Thrust Limits: Combination coil spring and elastomeric insert with spring and insert in compression, and with a load stop. Include rod and angle-iron brackets for attaching to fan discharge and duct.

1. Frame: Steel, fabricated for connection to threaded rods and to allow for a maximum of 30 degrees of angular rod misalignment without binding or reducing isolation efficiency.
2. Outdoor Spring Diameter: Not less than 80 percent of the compressed height of the spring at rated load.
3. Minimum Additional Travel: 50 percent of the required deflection at rated load.
4. Lateral Stiffness: More than 80 percent of rated vertical stiffness.
5. Overload Capacity: Support 200 percent of rated load, fully compressed, without deformation or failure.
6. Elastomeric Element: Molded, oil-resistant rubber or neoprene.
7. Coil Spring: Factory set and field adjustable for a maximum of 1/4-inch movement at start and stop.

2.13 FLEXIBLE DUCTS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Flexmaster U.S.A., Inc.
2. McGill AirFlow LLC.
3. Ward Industries, Inc.; a division of Hart & Cooley, Inc.

B. Insulated, Flexible Duct: 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.
3. Temperature Range: Minus 10 to plus 160 deg F.
4. Insulation R-value: R-6.

C. Flexible Duct Connectors:

1. Clamps: Stainless-steel band with cadmium-plated hex screw to tighten band with a worm-gear action in sizes 3 through 18 inches, to suit duct size.

2.14 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 INSTALLATION

A. Install duct accessories according to applicable details in SMACNA's "HVAC Duct Construction Standards - Metal and Flexible" for metal ducts.

B. Install duct accessories of materials suited to duct materials; use galvanized-steel accessories in galvanized-steel ducts, stainless-steel accessories in stainless-steel ducts, and aluminum accessories in aluminum ducts.

C. Install backdraft dampers at inlet of exhaust fans or exhaust ducts as close as possible to exhaust fan unless otherwise indicated.

D. Install volume dampers at points on supply, return, and exhaust systems where branches extend from larger ducts. Where dampers are installed in ducts having duct liner, install dampers with hat channels of same depth as liner, and terminate liner with nosing at hat channel.

1. Install steel volume dampers in steel ducts.
2. Install aluminum volume dampers in aluminum ducts.

E. Set dampers to fully open position before testing, adjusting, and balancing.

F. Install test holes at fan inlets and outlets and elsewhere as indicated.

G. Install fire and smoke dampers according to UL listing.

H. Install duct access doors on sides of ducts to allow for inspecting, adjusting, and maintaining accessories and equipment at the following locations:

1. On both sides of duct coils.
2. Upstream from duct filters.
3. At outdoor-air intakes and mixed-air plenums.
4. At drain pans and seals.
5. Downstream from manual volume dampers, control dampers, backdraft dampers, and equipment.
6. Adjacent to and close enough to fire or smoke dampers, to reset or reinstall fusible links. Access doors for access to fire or smoke dampers having fusible links shall be pressure relief access doors and shall be outward operation for access doors installed upstream from dampers and inward operation for access doors installed downstream from dampers.
7. At each change in direction and at maximum 50-foot spacing.
8. Upstream from turning vanes.
9. Upstream or downstream from duct silencers.
10. Control devices requiring inspection.
11. Elsewhere as indicated.

I. Install access doors with swing against duct static pressure.

J. Access Door Sizes:

1. One-Hand or Inspection Access: 8 by 8 inches.
2. Two-Hand Access: 12 by 6 inches.
3. Head and Hand Access: 18 by 10 inches.
4. Head and Shoulders Access: 21 by 14 inches.
5. Body Access: 25 by 14 inches.
6. Body plus Ladder Access: 25 by 17 inches.

K. Label access doors according to Section "Identification for HVAC Piping and Equipment" to indicate the purpose of access door.

L. Install flexible connectors to connect ducts to equipment.

M. Connect flexible ducts to metal ducts with adhesive plus sheet metal screws.

N. Install duct test holes where required for testing and balancing purposes.

3.2 FIELD QUALITY CONTROL

A. Tests and Inspections:

1. Operate dampers to verify full range of movement.
2. Inspect locations of access doors and verify that purpose of access door can be performed.
3. Operate fire and smoke dampers to verify full range of movement and verify that proper heat-response device is installed.
4. Inspect turning vanes for proper and secure installation.

END OF SECTION 23 33 00

SECTION 23 36 00 - AIR TERMINAL UNITS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. Section Includes:

1. Shutoff, single-duct air terminal units.

1.3 PERFORMANCE REQUIREMENTS

A. Structural Performance: Hangers and supports shall withstand the effects of gravity loads and stresses within limits and under conditions described in SMACNA's "HVAC Duct Construction Standards - Metal and Flexible"

1.4 SUBMITTALS

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

B. Shop Drawings: For air terminal units. Include plans, elevations, sections, details, and attachments to other work.

C. Field quality-control reports.

D. Operation and maintenance data.

1.5 QUALITY ASSURANCE

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

B. ASHRAE Compliance: Applicable requirements in ASHRAE 62.1, Section 5 - "Systems and Equipment" and Section 7 - "Construction and System Start-Up."

PART 2 - PRODUCTS

2.1 SHUTOFF, SINGLE-DUCT AIR TERMINAL UNITS

A. Manufacturers: Subject to compliance with requirements, provide products by the following:

1. Metalaire. VAV box to match existing.

B. Configuration: Volume-damper assembly inside unit casing with control components inside a protective metal shroud.

C. Casing: 22 gauge galvanized steel.

1. Casing Lining: 1-inch- thick double wall insulation, coated, fibrous-glass duct liner complying with ASTM C 1071, The interior surface of the unit casing is acoustically and thermally lined with a 1", 1.0 lb composite density glass fiber with high density facing. The minimum insulation R-value is 3.8 and having a maximum flame-spread index of 25 and a maximum smoke-developed index of 50, for both insulation and adhesive, when tested according to ASTM E 84.

a. Insulation shall be covered by an interior liner made of 26-ga galvanized steel.
b. Cover liner with nonporous foil and perforated metal.

2. Casing Lining: Adhesive attached, 1-inch- thick, polyurethane foam insulation complying with UL 181 erosion requirements, and having a maximum flame-spread index of 25 and a maximum smoke-developed index of 50, for both insulation and adhesive, when tested according to ASTM E 84.
3. Air Inlet: Round stub connection or S-slip and drive connections for duct attachment.
4. Air Outlet: S-slip and drive connections, size matching inlet size.
5. Access: Removable panels for access to parts requiring service, adjustment, or maintenance; with airtight gasket.
6. Airstream Surfaces: Surfaces in contact with the airstream shall comply with requirements in ASHRAE 62.1.

D. Volume Damper: Galvanized steel with peripheral gasket and self-lubricating bearings.

1. Maximum Damper Leakage: ARI 880 rated, 2 percent of nominal airflow at 4-inch wg inlet static pressure.
2. Damper Position: Normally open.

E. Hydronic Coils: Copper tube, with mechanically bonded aluminum fins spaced no closer than 0.1 inch or 120 fpf (fins per foot), and rated for a minimum working pressure of 200 psig and a maximum entering-water temperature of 220 deg F. Include manual air vent and drain valve.

F. Electric-Resistance Heating Coils: Nickel-chromium heating wire, free of expansion noise and hum, mounted in ceramic inserts in a galvanized-steel housing; with primary automatic, and secondary manual, reset thermal cutouts. Terminate elements in stainless-steel, machine-staked terminals secured with stainless-steel hardware.

1. Access door interlocked disconnect switch.

2. Downstream air temperature sensor with local connection to override discharge-air temperature to not exceed a maximum temperature set point (adjustable.)
3. Nickel chrome 80/20 heating elements.
4. Airflow switch for proof of airflow.
5. Fan interlock contacts.
6. Fuses in terminal box for overcurrent protection (for coils more than 48 A).
7. Mercury contactors.
8. Magnetic contactor for each step of control (for three-phase coils).

G. Direct Digital Controls: Microprocessor-based controller and room sensor. Control devices shall be compatible with temperature controls specified in Section 23 09 00 "Instrumentation and Control for HVAC" and shall have the following features:

1. Damper Actuator: 24 V,
2. Terminal Unit Controller: Pressure-independent, variable-air-volume controller with electronic airflow transducer with multipoint velocity sensor at air inlet, factory calibrated to minimum and maximum air volumes, and having the following features:

   a. Occupied and unoccupied operating mode.
   b. Remote reset of airflow or temperature set points.
   c. Adjusting and monitoring with portable terminal.
   d. Communication with temperature-control system specified in Section 230900 "Instrumentation and Control for HVAC."

3. Room Sensor: Wall mounted, with temperature set-point adjustment and access for connection of portable operator terminal.

2.2 HANGERS AND SUPPORTS

A. Hanger Rods for Noncorrosive Environments: Cadmium-plated steel rods and nuts.

B. Hanger Rods for Corrosive Environments: Electrogalvanized, all-thread rods or galvanized rods with threads painted with zinc-chromate primer after installation.

C. Steel Cables: Galvanized steel complying with ASTM A 603.

D. Steel Cable End Connections: Cadmium-plated steel assemblies with brackets, swivel, and bolts designed for duct hanger service; with an automatic-locking and clamping device.

E. Air Terminal Unit Attachments: Sheet metal screws, blind rivets, or self-tapping metal screws; compatible with duct materials.

F. Trapeze and Riser Supports: Steel shapes and plates for units with steel casings; aluminum for units with aluminum casings.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Install air terminal units according to NFPA 90A, "Standard for the Installation of Air Conditioning and Ventilating Systems."

B. Install air terminal units level and plumb. Maintain sufficient clearance for normal service and maintenance.

C. Install wall-mounted thermostats.

3.2 HANGER AND SUPPORT INSTALLATION

A. Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Chapter 5, "Hangers and Supports."

B. Building Attachments: Concrete inserts, powder-actuated fasteners, or structural-steel fasteners appropriate for construction materials to which hangers are being attached.

1. Where practical, install concrete inserts before placing concrete.
2. Install powder-actuated concrete fasteners after concrete is placed and completely cured.
3. Use powder-actuated concrete fasteners for standard-weight aggregate concretes and for slabs more than 4 inches thick.
4. Do not use powder-actuated concrete fasteners for lightweight-aggregate concretes and for slabs less than 4 inches thick.

C. Hangers Exposed to View: Threaded rod and angle or channel supports.

D. Install upper attachments to structures. Select and size upper attachments with pull-out, tension, and shear capacities appropriate for supported loads and building materials where used.

3.3 CONNECTIONS

A. Install piping adjacent to air terminal unit to allow service and maintenance.

B. Hot-Water Piping: In addition to requirements in Section "Hydronic Piping," connect heating coils to supply with shutoff valve, strainer, control valve, and union or flange; and to return with balancing valve and union or flange.

C. Connect ducts to air terminal units according to Section "Metal Ducts."

3.4 IDENTIFICATION

A. Comply with requirements in Section "Identification for HVAC Piping and Equipment" for equipment labels and warning signs and labels.

B. Label the ceiling tile below the air terminal unit to indicate equipment label.

3.5 FIELD QUALITY CONTROL

A. Perform tests and inspections.

1. Manufacturer's Field Service: Engage a factory-authorized service representative to inspect components, assemblies, and equipment installations, including connections, and to assist in testing.

B. Tests and Inspections:

1. After installing air terminal units and after electrical circuitry has been energized, test for compliance with requirements.
2. Leak Test: After installation, fill water coils and test for leaks. Repair leaks and retest until no leaks exist.
3. Operational Test: After electrical circuitry has been energized, start units to confirm proper motor rotation and unit operation.
4. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment.

C. Air terminal unit will be considered defective if it does not pass tests and inspections.

D. Prepare test and inspection reports.

3.6 STARTUP SERVICE

A. Perform startup service.

1. Complete installation and startup checks according to manufacturer's written instructions.
2. Verify that inlet duct connections are as recommended by air terminal unit manufacturer to achieve proper performance.
3. Verify that controls and control enclosure are accessible.
4. Verify that control connections are complete.
5. Verify that nameplate and identification tag are visible.
6. Verify that controls respond to inputs as specified.

3.7 DEMONSTRATION

A. Train Owner's maintenance personnel to adjust, operate, and maintain air terminal units.

END OF SECTION 23 36 00

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SECTION 23 37 13 - DIFFUSERS, REGISTERS, AND GRILLES

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Rectangular and square ceiling diffusers.
2. Linear slot diffusers.
3. Fixed face registers and grilles.

B. Related Sections:

1. Section "Air Duct Accessories" for fire and smoke dampers and volume-control dampers not integral to diffusers, registers, and grilles.

1.2 ACTION SUBMITTALS

A. Product Data: For each type of 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. Diffuser, Register, and Grille Schedule: Indicate drawing designation, room location, quantity, model number, size, and accessories furnished.

B. Samples: For each exposed product and for each color and texture specified.

PART 2 - PRODUCTS

2.1 CEILING DIFFUSERS

A. Rectangular and Square Ceiling Diffusers <CD>:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

a. Price Industries.
b. Titus.
c. METALAIRE, Inc.
d. Nailor Industries Inc.

2. Devices shall be specifically designed for variable-air-volume flows.
3. Material: Aluminum.
4. Finish: Baked enamel, white or color selected by Architect if specified in drawings.
5. Face Size: 24 by 24 inches.

6. Face Style: Plaque.
7. Mounting: Surface or T-bar.
8. Pattern: Fixed.
9. Dampers: Manual volume damper at branch duct runout.
10. Accessories:

    a. Equalizing grid.
    b. Plaster ring.
    c. Safety chain.
    d. Wire guard.
    e. Sectorizing baffles.
    f. Operating rod extension.

2.2 LINEAR SLOT OUTLETS

A. Linear Slot Diffuser <LD-HT or LD-JT>:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

    a. Price Industries.
    b. Titus.
    c. METALAIRE, Inc.
    d. Nailor Industries Inc.

2. Devices shall be specifically designed for variable-air-volume flows.
3. Material - Shell: Aluminum, insulated
4. Material - Pattern Controller and Tees: Aluminum.
5. Finish - Face and Shell: Baked enamel, black.
6. Finish - Pattern Controller: Baked enamel, black.
7. Finish - Tees: Baked enamel, color selected by Architect.
8. Slot Width: See Construction Drawings.
9. Number of Slots: See Construction Drawings.
10. Length: See Construction Drawings.
11. Accessories: As required to satisfy layout per Construction Drawings.

2.3 REGISTERS AND GRILLES

A. Fixed Face Register <SAR, RAR, EAR> or Grille <SAG, RAG, EAG, TAG>:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

    a. Price Industries.
    b. Titus.
    c. METALAIRE, Inc.
    d. Nailor Industries Inc.

2. Material: Aluminum.

3. Finish: Baked enamel, color selected by Architect.
4. Face Arrangement: 1/2-by-1/2-by-1/2-inch grid core.
5. Frame: 1-1/4 inches or 1 inch wide.

2.4 SOURCE QUALITY CONTROL

A. Verification of Performance: Rate diffusers, registers, and grilles according to ASHRAE 70, "Method of Testing for Rating the Performance of Air Outlets and Inlets."

PART 3 - EXECUTION

3.1 INSTALLATION

A. Install diffusers, registers, and grilles level and plumb.

B. Ceiling-Mounted Outlets and Inlets: Drawings indicate general arrangement of ducts, fittings, and accessories. Air outlet and inlet locations have been indicated to achieve design requirements for air volume, noise criteria, airflow pattern, throw, and pressure drop. Make final locations where indicated, as much as practical. For units installed in lay-in ceiling panels, locate units in the center of panel. Where architectural features or other items conflict with installation, notify Architect for a determination of final location.

C. Install diffusers, registers, and grilles with airtight connections to ducts and to allow service and maintenance of dampers, air extractors, and fire dampers.

3.2 ADJUSTING

A. After installation, adjust diffusers, registers, and grilles to air patterns indicated, or as directed, before starting air balancing.

END OF SECTION 23 37 13

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SECTION 23 52 16 - CONDENSING HYDRONIC BOILERS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. Section Includes:

1. Packaged, factory-fabricated and -assembled, gas-fired, firetube duplex alloy stainless steel high efficiency condensing boilers, trim and accessories for generating hot water.

1.3 REFERENCES

A. ASME Section IV

B. CAN-1.3.1-77, Industrial and Commercial Gas Fired Packaged Boilers

C. CSD-1, Controls and Safety Devices

D. XL GAPS

E. NEC, National Electric Code

F. UL-795 7th Edition

G. AHRI, BTS-2000

H. ASHRAE 90.1

1.4 SUBMITTALS

A. Product Data: Include performance data, operating characteristics, technical product data, rated capacities of selected model, weights (shipping, installed and operating), installation and start-up instructions, and furnished accessory information.

B. Shop Drawings: For boiler, standard boiler trim and accessories.

1. End Assembly Drawing: Detail overall dimensions, connection sizes, connection locations, and clearance requirements.

2. Wiring Diagrams: Detail electrical requirements for the boiler including ladder type wiring diagrams for power, interlock and control wiring. Clearly differentiate between portions of wiring that are factory installed and portions to be field installed.

C. Certificate of Product Rating: Submit AHRI Certificate indicating Thermal Efficiency, Combustion Efficiency, Materials of Construction, Input, and Gross Output conform to the design basis.

D. Thermal efficiency curves: Submit thermal efficiency curves between and including minimum and maximum rated capacities, for return water temperatures ranging from 80°F to 180°F.

E. Water side pressure drop curve.

F. Flue gas temperature curves: Submit flue gas temperature curves for minimum and maximum boiler capacity, for return water temperatures ranging from 80°F to 160°F.

1. If submitted flue gas temperatures, minimum or maximum inputs are different from that of the basis of design manufacturer and model, the manufacturer shall be responsible for draft calculations and reselection of the flue gas exhaust system.

G. Source quality-control test reports.

H. Field quality-control test reports: Start-up by a factory authorized service company.

I. Operation and Maintenance Data: Data to be included in Installation and Operation Manual.

J. Warranty: Standard warranty specified in this Section.

1.5 QUALITY ASSURANCE

A. Aftermarket Support and Service: The manufacturer shall have a factory authorized service training program, where boiler technicians can attend a training class and obtain certification to perform start-up, maintenance and basic troubleshooting specific to the product line.

B. Electrical Components, Devices and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.

C. ASME Compliance: Fabricate and label boilers to comply with ASME Boiler and Pressure Vessel Code, Section IV “Heating Boilers”, for a maximum allowable working pressure of 160 PSIG.

D. CSD-1 Compliance: The boiler shall comply with ASME Controls and Safety Devices for Automatically Fired Boilers (CSD-1).

E. ASHRAE/IESNA 90.1 Compliance: Boilers shall have minimum efficiency according to “Gas and Oil Fired Boilers - Minimum Efficiency Requirements.”

F. UL Compliance: Boilers must be tested for compliance with UL 795, “Commercial-Industrial Gas Heating Equipment.” Boilers shall be listed and labeled by ETL.

G. AHRI Compliance: Boilers shall be tested and rated according to the BTS-2000 test standard and verified by AHRI.

H. NOx Emissions Compliance: Boiler shall be tested for compliance with SCAQMD and TCEQ.

I. The equipment shall be of the type, design, and size that the manufacturer currently offers for sale and appears in the manufacturer's current catalog.

J. The equipment shall fit within the allocated space, leaving ample allowance for maintenance and inspection.

K. The equipment shall be new and fabricated from new materials. The equipment shall be free from defects in materials and workmanship.

L. All units of the same classification shall be identical to the extent necessary to ensure interchangeability of parts, assemblies, accessories, and spare parts wherever possible.

M. In order to provide unit responsibility for the specified capacities, efficiencies, and performance, the boiler manufacturer shall certify in writing that the equipment being submitted shall perform as specified.

1.6 COORDINATION

A. Mechanical contractor shall coordinate the size and location of concrete bases. Cast anchor-bolt inserts into bases. Concrete reinforcement and formwork requirements are specified in Division 03.

1.7 WARRANTY

A. Standard Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace components of boilers that fails in materials or workmanship within specified warranty period from the factory provided the boiler is installed, controlled, operated and maintained in accordance with the Installation, Operation and Maintenance Manual.

1. Warranty Period for the Pressure Vessel and Heat Exchanger: The boiler manufacturer shall warranty against failure due to thermal shock, flue gas condensate corrosion, and/or defective material or workmanship for a period of 10 years, non-prorated, from the date of shipment from the factory provided the boiler is installed, controlled, operated and maintained in accordance with the Installation, Operation and Maintenance Manual.
2. Warranty Period for the Burner Head: The boiler manufacturer shall warranty the burner head against defective material or workmanship for a period of 5 years, non-prorated.
3. Warranty Period for all other components: The boiler manufacturer will repair or replace any part of the boiler that is found to be defective in workmanship or material within eighteen (18) months of shipment from the factory or twelve (12) months from start-up, whichever comes first.
4. Warranties are only valid provided the boiler is installed, controlled, operated and maintained in accordance with the Installation, Operation and Maintenance Manual.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Basis-of-Design Product: Subject to compliance with requirements, provide high mass firetube condensing boiler manufactured by the following:

1. Fulton Endura EDR. Boiler to match phase 'A' equipment.

2.2 CONSTRUCTION

A. Description: Factory-fabricated, -assembled, and -pressure tested, stainless steel firetube condensing boiler with heat exchanger sealed pressure tight, built on a steel base; including flue gas vent; combustion air intake connections, water supply, water return, condensate drain, and controls. The boiler, burner and controls shall be completely factory assembled as a self-contained unit. Each boiler shall be neatly finished, thoroughly tested, and properly packaged for shipping. Closed-loop water heating service only.

B. Heat Exchanger: The heat exchanger is defined as the surfaces of the pressure vessel where flue gases transfer sensible and latent heat to the hydronic fluid.

1. The boiler shall be a firetube design, such that all combustion chamber components are within water-backed areas. Watertube boilers shall not be accepted.
2. The heat exchanger shall be fully welded construction utilizing stainless steel for the fire-tubes, tube sheets, combustion chamber, flue collector and pressure vessel shell.
3. Heat exchange capability shall be maximized within the heat exchanger.
4. Material: The heat exchanger shall have the following material characteristics and properties:
    a. Nonferrous, corrosion-resistant combustion chamber.
    b. Stainless steel fire tube unit designed for pressure firing and shall be constructed and tested for 160 PSI water working pressure and 200°F maximum allowable operating temperature, in accordance with the A.S.M.E. Section IV Rules for the Construction of Heating Boilers.
    c. Boilers with heat exchangers constructed of cast aluminum, mild steel, cast iron or copper finned tube materials are unacceptable.
5. Flue gas test port must be included as a standard part of the heat exchanger flue collector or part of flue exhaust duct.

C. Pressure Vessel: Design and construction shall be in accordance with Section IV of the ASME Code for heating boilers.

1. The water side of the pressure vessel shall be a counter-flow design with internal water-baffling plates.
2. The water connections shall not be designed to support an external structural load from the piping system.

D. Burner: Standard natural gas, forced draft.

1. The combustion chamber shall be of the sealed combustion type

2. The burner must be capable of firing both a complete blue flame with maximum gas and air input as well as firing infrared when gas and air are reduced. The burner must be capable of firing at 100% of rated input when supplied with 4.0" WC of inlet gas pressure, so as to maintain service under heavy demand conditions; no exceptions.
3. The burner shall use a fully sealed, non-sparking combustion air blower to precisely mix and control the flow of fuel/air mixture for maximum efficiency throughout the entire range of modulation. The combustion air blower shall operate for a pre-purge period before burner ignition and a post-purge period after burner operation to clear the combustion chamber.

E. Main Fuel Train:

1. The boiler shall have a pre-mix combustion system, capable of operating at a minimum 4" W.C. incoming natural gas pressure while simultaneously achieving emissions performance, full modulation, and full rated input capacity. Maximum natural gas pressure allowed to the inlet of the fuel train shall be no less than 28" W.C. or as allowed by the boiler manufacturer.
2. A factory mounted main fuel train shall be supplied. The fuel train shall be fully assembled complete with high and low gas pressure switches, wired, and installed on the boiler and shall comply with CSD-1 code. The fuel train components shall be enclosed within the boiler cabinet.
3. A lock up regulator upstream of the fuel train shall be furnished by the boiler manufacturer as a standard component integral to the boiler cabinet. Factory test fire of the boiler with the provided lock up regulator is required.
4. The boiler shall have a firing/leak test valve and pressure test valve as required by CSD-1.
5. The boiler shall have dual-seated main gas valve.
6. Gas control trains shall have a redundant safety shut-off feature, main gas regulation, shut-off cock and plugged pressure tapping to meet the requirements of ANSI Z21.13/CSA 4.9.
7. A gas sediment trap with flanged connection shall be included as a standard on the gas line connection point to the boiler

F. Ignition: The boiler shall be equipped with a 100% safety shutdown.

G. Boiler Enclosure:

1. Sealed Cabinet: Jacketed steel enclosure with left hinged full height front access door, fully removable latching access panels, gasketed seams to maintain sealed combustion, mounted on a steel skid with steel plate decking.
2. Control Enclosure: NEMA 250, Type 1.
3. Finish: Internally and externally primed and painted finish.
4. Combustion Air: Drawn from the inside of the sealed cabinet, preheating the combustion air.

H. Rigging and Placement: The boiler shall come with lifting eyes and fork hole accessibility for rigging.

I. Characteristics and Capacities:

1. Design Water Pressure Rating: 160 psig.

2. Safety Relief Valve Setting: 60 psig.
3. Minimum Return Water Temperature: No minimum temperature required.
4. Maximum Allowable Water Temperature: 210°F.
5. Minimum Water Flow Rate: Flow rate equivalent to turndown ratio required to protect the heat exchanger.
6. Maximum Water Flow Rate: Flow rate equivalent to turndown ratio required to protect the heat exchanger.
7. Minimum Delta-T: No minimum delta-T required.
8. Maximum Delta-T: 100°F
9. Minimum Side Clearance: Shall not exceed 6" between any number of boilers.
10. Maximum Allowable Operating Setpoint: 180°F
11. Jacket Losses: External convection and radiation heat losses to the boiler room from the boiler shall comply with IAW ASHRAE 103-2007, and shall not exceed 0.2% of the rated boiler input at maximum capacity.

J. Dedicated circulator pumps, or primary-secondary arrangements shall not be required to protect the boiler from thermal shock. Boilers requiring the use of primary-secondary piping arrangements are unacceptable.

2.3 TRIM

A. Safety Relief Valve: ASME Rated.

B. Pressure and Temperature Gauge: Minimum 3-1/2" diameter, combination pressure and -temperature gauge. Gauges shall have operating-pressure and -temperature ranges so normal operating range is about 50 percent of full range.
1. Mounted in the field in the boiler supply water piping prior to the first isolation valve by the boiler installer.

C. Combustion Air Inlet Filter: MERV 8

D. Flue Gas Condensate Drain Trap: A flue gas condensate drain trap shall be provided to prevent positive pressure exhaust gases from entering the boiler room.

E. The boiler will feature a condensate drain with float switch, which will shut down the boiler if the condensate drain is blocked.

2.4 CONTROLS

A. The boiler electrical controls shall include the following devices and features:
1. Control display factory mounted on the front cabinet panel door.
   a. The control display shall serve as a user interface for programming parameters, boiler control and monitoring.
2. Integrated controls transformer.
3. Control relay for 120 VAC motorized isolation valve control.
4. Flame safeguard, temperature, and lead/lag control.
5. All controls are to be cabinet, vessel or panel mounted and so located on the boiler as to provide ease of servicing the boiler without disturbing the controls. All controls shall be mounted and wired according to UL requirements.

B. Burner Operating Controls: To maintain safe operating conditions, factory mounted and wired burner safety controls limit burner operation:

1. High Limit: A manual reset mechanical Aquastat device shall stop the burner if operating conditions rise above maximum boiler design temperature.
2. Low-Water Cut Off: Electronic probe type mounted in the pressure vessel shall prevent burner operation on low water alarm.
3. Air Safety Switch: Prevent operation unless sufficient combustion air is proven.
4. High Condensate Probe: Prevent operation in the event of a blocked condensate drain.
5. Blocked Exhaust: Prevent operation in the event of a blocked flue gas exhaust stack.

C. Boiler Operating Controls and Features:

1. Inlet Water Temperature Monitoring.
2. Combustion Air Temperature Monitoring.
3. Flue Gas Exhaust Temperature Monitoring: Sensor probe shall be stainless steel.
4. Operating temperature limit for automatic start and stop.
5. Flue gas exhausts temperature monitoring.
6. Return water temperature monitoring.
7. Time of day display.
8. Customizable boiler name display.
9. Alarm history for 15 most recent alarms including equipment status at time of lockout.

D. Building Automation System Interface: Hardware and software to enable building automation system (BAS) to monitor, control, and display boiler status and alarms.

1. Hardwired Contacts:
   a. Monitoring: Boiler Status, Burner Demand, General Alarm, Firing Rate.
   b. Control with Factory Installed Jumper: Safety Interlock for External Device, Remote Boiler Enable, Remote Lead/Lag Enable, Emergency Stop (E-Stop)
   c. Remote Setpoint Signal: 4-20 mA.
2. Communication Protocol: A communication interface with BAS shall enable BAS operator to remotely enable and monitor the boiler plant from an operator workstation.
   a. The boilers will communicate with each other and the Building Automation System via a daisy chain addressed Modbus network. Field wiring between nodes shall be twisted pair low voltage with shielded ground.
   b. A BACnet MSTP and IP protocol communication gateway shall be provided. The BACnet gateway is field installed on the MASTER boiler. Lag boilers (for future installation if applicable) shall not require a dedicated BACnet gateway for the BAS to monitor status. The BAS shall only be required to communicate through the MASTER boiler. A communication point mapping list shall be provided.

2.5 ELECTRICAL POWER

A. Single-Point Field Power Connection: Factory-installed and factory-wired switches, transformers, control and safety devices and other devices shall provide a single-point field power connection to the boiler.

B. Electrical Characteristics:
1. Voltage: 120 V.

2. Phase: Single.
3. Frequency: 60 Hz.

2.6 VENTING

A. Combustion Air Intake: It shall be acceptable to either direct vent the boiler using sealed combustion by drawing combustion air in from the outdoors or by drawing air from the mechanical space itself.
   1. Sealed Combustion: Schedule 40 PVC pipe or smooth-walled galvanized steel, vent termination with 1/2” x 1/2” mesh bird screen.
   2. Mechanical Space: Adequate combustion air and ventilation shall be supplied to the boiler room in accordance with local codes.

B. Flue Gas Exhaust: The flue gas exhaust stack shall be AL 29-4C stainless steel, listed and labeled to UL-1738 / C-UL S636 for use with Category II/IV appliances, guaranteed appropriate for the application by the manufacturer and supplier of the venting.

C. Condensate drain piping shall be galvanized, stainless steel, or Schedule 40 CPVC. Flexible hose, Copper, carbon steel, or PVC pipe materials shall not be accepted.

2.7 SOURCE QUALITY CONTROL

A. Test and inspect factory-assembled boilers, before shipping, according to ASME Boiler and Pressure Vessel Code.

B. Each boiler shall be installed and operated in a functioning hydronic system, inclusive of venting, as part of the manufacturing process. A factory test fire report corresponding to the boiler configuration shall be included with each boiler.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Before boiler installation, examine roughing-in for concrete equipment bases, anchor-bolt sizes and locations, and piping and electrical connections to verify actual locations, sizes, and other conditions affecting boiler performance, maintenance, and operations.

   1. Final boiler locations indicated on Drawings are approximate. Determine exact locations before roughing-in for piping and electrical connections.

B. Examine mechanical spaces for suitable conditions where boilers will be installed.

C. Proceed with installation only after satisfactory conditions have been verified.

3.2 BOILER INSTALLATION

A. Install boilers level on concrete base, minimum 4 inches high. Concrete materials and installation requirements are specified in Division 03.

B. Install gas-fired boilers according to NFPA 54. Equipment and materials shall be installed in an approved manner and in accordance with the boiler manufacturer's installation requirements.

C. Assemble and install boiler trim.

D. Install electrical devices furnished with the boiler but not specified to be factory mounted.

E. Install control wiring to field-mounted electrical devices.

3.3 START-UP

A. Shall be performed by Boiler manufacturer's factory-trained personnel.

B. Test during operation and adjust if necessary:

1. Safeties
2. Operating controls
3. Static and full load gas supply pressure
4. Gas manifold and blower suction pressure
5. Amp draw of blower
6. Combustion analysis

C. Submit copy of start-up report to Architect and Engineer.

3.4 CONNECTIONS

A. Piping installation requirements are specified in other Division 15 Sections. Drawings indicate general arrangement of piping, fittings, and specialties.

B. Install piping adjacent to boiler to allow service and maintenance.

C. Install piping from equipment drain connection to nearest floor drain. Piping shall be at least full size of connection. Provide all fittings and transition as required.

D. Connect gas piping to boiler gas train inlet with isolation valve and union. Piping shall be at least full size of gas train connection. Provide a reducer if required.

E. Connect hot water supply and return water connections with shutoff valve and union or flange at each connection.

F. Install piping from safety relief valves to the nearest floor drain.

G. Install piping from flue gas condensate drain connection to the condensate drain trap and to the nearest floor drain.

H. Boiler Venting:
   1. Install flue venting and combustion air-intake.
   2. Connect to boiler connections, flue size and type as recommended by the manufacturer.

I. Ground equipment according to Section “Grounding and Bonding for Electrical Systems.”

J. Connect wiring according to Section “Low-Voltage Electrical Power Conductors and Cables.”

3.5 FIELD QUALITY CONTROL

A. Perform tests and inspections and prepare test reports.

   1. Manufacturer's Field Service: Engage a factory-authorized service representative to inspect components, assemblies, and equipment installations, including connections, and to assist in testing.

B. Tests and inspections:

   1. Perform installation and startup checks according to manufacturer's written instructions.
   2. Leak Test: Hydrostatic test. Repair leaks and retest until no leaks exist.
   3. Operational Test: Start units to confirm proper motor rotation and unit operation. Adjust air-fuel ratio and combustion.
   4. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment.

      a. Check and adjust initial operating set points and high- and low-limit safety set points of fuel supply, water level, and water temperature.
      b. Set field-adjustable switches and circuit-breaker trip ranges as indicated.

C. Remove and replace malfunctioning units and retest as specified above.

3.6 DEMONSTRATION

A. Engage a factory-authorized service representative to train Owner's maintenance personnel to adjust, operate, and maintain boilers.

END OF SECTION 23 52 16

SECTION 23 64 23 - SCROLL WATER CHILLERS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. Section Includes: Packaged, air-cooled, electric-motor-driven, scroll water chillers.

1.3 ACTION SUBMITTALS

A. Product Data: Include refrigerant, rated capacities, operating characteristics, furnished specialties, and accessories.

B. Submit dimensional plan and elevation view drawings, weights and loadings, required clearances, location and size of all field connections, electrical requirements and wiring diagrams.

C. Submit product data indicating rated capacities, accessories and any special data.

D. Submit manufacturer's installation instructions.

1.4 INFORMATIONAL SUBMITTALS

A. Certificates: For certification required in "Quality Assurance" Article.

B. Seismic Qualification Certificates: For water chillers, accessories, and components from manufacturers.

C. Startup service reports.

D. Warranty.

1.5 CLOSEOUT SUBMITTALS

A. Operation and maintenance data.

1.6 QUALITY ASSURANCE

A. ARI Certification: Certify chiller according to ARI 590 certification program.

B. ARI Rating: Rate water chiller performance according to requirements in ARI 550/590, "Water Chilling Packages Using the Vapor Compression Cycle."

C. ASHRAE Compliance: ASHRAE 15 for safety code for mechanical refrigeration.

D. ASHRAE/IESNA 90.1 Compliance: Applicable requirements in ASHRAE/IESNA 90.1, Section 6 - "Heating, Ventilating, and Air-Conditioning."

E. ASME Compliance: Fabricate and stamp water chiller heat exchangers to comply with ASME Boiler and Pressure Vessel Code.

F. Comply with NFPA 70.

G. Comply with requirements of UL and UL Canada and include label by a qualified testing agency showing compliance.

H. Factory Tested: Packaged chiller shall be pressure tested, evacuated, and fully charged with refrigerant and oil, and be functionally run-tested at the factory.

I. Chiller must be manufactured in an ISO certified facility.

J. Factory trained and authorized service personnel shall perform pre-startup checks and startup procedures.

1.7 DELIVERY AND HANDLING

A. Chillers shall be delivered to the job site completely assembled and charged with refrigerant and oil by the manufacturer.

B. Comply with the manufacturer’s instructions for rigging and handling.

C. If unit is to be stored, comply with manufacturer instructions for storage.

1.8 WARRANTY

A. Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace components of water chillers that fail in materials or workmanship within specified period.

1. Five years TOTAL. Extended warranties include, but are not limited to, the following:

    a. Complete whole chiller unit including refrigerant and oil charge.
    b. Complete compressor and drive assembly including refrigerant and oil charge.
    c. Refrigerant and oil charge.
    d. Parts and labor.
    e. Loss of refrigerant charge for any reason.

2. Compressor Warranty Period: **Five** years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 PACKAGED AIR-COOLED WATER CHILLERS

A. Manufacturers: Subject to compliance with requirements, provide comparable product by the following:

1. Daikin AGZ. Chiller to match phase ‘A’ equipment.

B. Description: Provide and install as shown on the plans factory-assembled, factory-charged air-cooled scroll compressor packaged chillers in the quantity specified. Each chiller shall consist of hermetic tandem scroll compressor sets (total four compressors), brazed plate evaporator, air-cooled condenser section, microprocessor-based control system and all components necessary for controlled unit operation.

1. Chiller shall be functionally tested at the factory to ensure trouble free field operation

C. Compressor:

1. The compressors shall be sealed hermetic, scroll type with crankcase oil heater and suction strainer. The compressor motor shall be refrigerant gas cooled, high torque, hermetic induction type, two-pole, with inherent thermal protection on all three phases and shall be mounted on RIS vibration isolator pads. The compressors shall be equipped with an internal module providing compressor protection and communication capability.

D. Evaporator

1. The evaporator shall be a compact, high efficiency, dual circuit, brazed plate-to-plate type heat exchanger consisting of parallel stainless steel plates. The water-side working pressure shall be a minimum of 653 psig (4502 kPa). Vent and drain connections shall be provided in the inlet and outlet chilled water piping by the installing contractor. Evaporators shall be designed and constructed according to, and listed by, Underwriters Laboratories (UL).
2. The evaporator shall be protected with an external, electric resistance heater plate and insulated with 3/4" (19mm) thick closed-cell polyurethane insulation. This combination shall provide freeze protection down to -20°F (-29°C) ambient air temperature.
3. The water-side maximum design pressure shall be rated at a minimum of 653 psig (4502 kPa). Evaporators shall be designed and constructed according to, and listed by Underwriters Laboratories (UL).

E. Condenser:

1. Condenser fans shall be propeller type arranged for vertical air discharge and individually driven by direct-drive fan motors. The fans shall be equipped with a heavy-gauge vinyl-coated fan guard. Fan motors shall be TEAO type with permanently lubricated ball bearings, inherent overload protection, three-phase, direct-drive, 1140 rpm. Each fan section shall be partitioned to avoid cross circulation.
2. Coil shall be microchannel design and shall have a series of flat tubes containing multiple, parallel flow microchannels layered between the refrigerant manifolds. Tubes shall be 9153 aluminum alloy. Tubes made of 3102 alloy or other alloys of lower

corrosion resistance shall not be accepted. Coils shall consist of a two-pass arrangement. Each condenser coil shall be factory leak tested with high-pressure air under water. Condenser coils shall include baked epoxy coating providing 6000+ hour salt spray resistance (ASTM B117-90) applied to both the coil and the coil frames.

F. Refrigerant Circuit:

1. Each of the two refrigerant circuits shall include a replaceable-core refrigerant filter-drier, sight glass with moisture indicator, liquid line solenoid valve (no exceptions), expansion valve, and insulated suction line.

G. Construction:

1. Unit casing and all structural members and rails shall be fabricated of pre-painted or galvanized steel. Painted parts shall be able to meet ASTM B117, 1000-hour salt spray test.
2. Upper and lower section of unit shall have protective and decorative louvers covering the coils and unit end and have painted steel wraps enclosing the coil end sections and piping.

H. Control System:

1. A centrally located weatherproof control panel shall contain the field power connection points, control interlock terminals, and control system. Box shall be designed in accordance with NEMA 3R rating. Power and starting components shall include factory circuit breaker for fan motors and control circuit, individual contactors for each fan motor, solid-state compressor three-phase motor overload protection, inherent fan motor overload protection and two power blocks (one per circuit) for connection to remote, contractor supplied disconnect switches. Hinged access doors shall be lockable. Barrier panels or separate enclosures are required to protect against accidental contact with line voltage when accessing the control system.
2. Shall include optional single-point connection to a non-fused disconnect switch with through-the-door handle and compressor circuit breakers.

I. Unit Controller:

1. An advanced DDC microprocessor unit controller with a 5-line by 22-character liquid crystal display provides the operating and protection functions. The controller shall take preemptive limiting action in case of high discharge pressure or low evaporator pressure. The controller shall contain the following features as a minimum:
2. The unit shall be protected in two ways: (1) by alarms that shut the unit down and require manual reset to restore unit operation and (2) by limit alarms that reduce unit operation in response to some out-of-limit condition. Shut down alarms shall activate an alarm signal.
3. Shutdown Alarms
    a. No evaporator water flow (auto-restart)
    b. Sensor failures
    c. Low evaporator pressure
    d. Evaporator freeze protection
    e. High condenser pressure
    f. Outside ambient temperature (auto-restart)
    g. Motor protection system

h. Phase voltage protection

4. Limit Alarms
   a. Condenser pressure stage down, unloads unit at high discharge pressures.
   b. Low ambient lockout, shuts off unit at low ambient temperatures.
   c. Low evaporator pressure hold, holds stage #1 until pressure rises.
   d. Low evaporator pressure unload, shuts off one compressor.

5. Unit Enable Section
   a. Enables unit operation from either local keypad, digital input, or BAS

6. Unit Mode Selection
   a. Selects standard cooling, ice, glycol, or test operation mode

7. Analog Inputs:
   a. Reset of leaving water temperature, 4-20 mA
   b. Current Limit

8. Digital Inputs
   a. Unit off switch
   b. Remote start/stop
   c. Flow switch
   d. Motor protection

9. Digital Outputs:
   a. Shutdown alarm; field wired, activates on an alarm condition, off when alarm is cleared.
   b. Evaporator pump; field wired, starts pump when unit is set to start

10. Condenser fan control - The unit controller shall provide control of condenser fans based on compressor discharge pressure.

11. Building Automation System (BAS) Interface

    a. Factory mounted DDC controller(s) shall support operation on a BACnet®, network via one of the data link / physical layers listed below as specified by the successful Building Automation System (BAS) supplier.
    b. BACnet MS/TP master (Clause 9)
    c. BACnet IP, (Annex J)
    d. BACnet ISO 8802-3, (Ethernet)
    e. The information communicated between the BAS and the factory mounted unit controllers shall include the reading and writing of data to allow unit monitoring, control and alarm notification as specified in the unit sequence of operation and the unit points list.
    f. All communication from the chiller unit controller as specified in the points list shall be via standard BACnet objects. Proprietary BACnet objects shall not be allowed. BACnet communications shall conform to the BACnet protocol (ANSI/ASHRAE135-2001). A BACnet Protocol Implementation Conformance Statement (PICS) shall be provided along with the unit submittal.

J. Accessories:

1. Factory-furnished, chilled-water thermal dispersion flow switches for field installation.
2. Individual compressor suction and discharge pressure gages with shutoff valves for each refrigeration circuit.
3. Factory-furnished **neoprene, elastomeric, rubber-in-shear** isolators for field installation.
4. Factory-furnished full architectural louvers panels.
5. Provide acoustical treatment for compressor.

K. Capacities and Characteristics:

1. Capacity: See Chiller Schedule on the drawings.

2.2 SOURCE QUALITY CONTROL

A. For water chillers located outdoors, rate sound power level according to ARI 370 procedure.

PART 3 - EXECUTION

3.1 WATER CHILLER INSTALLATION

A. Install chillers on support structure indicated.

B. Install in accordance with manufacturer's requirements. Level the chiller using the base rail as a reference. The chiller must be level within 1/2" in over the entire length and width. Use shims as necessary to level the chiller.

C. Equipment Mounting: Install chiller on concrete bases using elastomeric pads.

1. Install dowel rods to connect concrete base to concrete floor. Unless otherwise indicated, install dowel rods on 18-inch centers around the full perimeter of concrete base.
2. For supported equipment, install epoxy-coated anchor bolts that extend through concrete base and anchor into structural concrete floor.
3. Place and secure anchorage devices. Use 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.

D. Maintain manufacturer's recommended clearances for service and maintenance.

E. Charge chiller with refrigerant and fill with oil if not factory installed.

F. Install separate devices furnished by manufacturer and not factory installed.

3.2 CONNECTIONS

A. Comply with requirements in Section "Hydronic Piping." Drawings indicate general arrangement of piping, fittings, and specialties.

B. Install piping adjacent to chiller to allow service and maintenance.

C. Evaporator Fluid Connections: See Chiller Details on the drawings. Install a field-supplied or manufacturer-supplied strainer in the chilled water return line at the evaporator inlet that meets manufacturer perforation size specifications.

D. Connect each drain connection with a union and drain pipe and extend pipe, full size of connection, to floor drain. Provide a shutoff valve at each connection if required.

3.3 STARTUP SERVICE

A. Engage a factory-authorized service representative to perform chiller startup service.

B. Inspect field-assembled components, equipment installation, and piping and electrical connections for proper assembly, installation, and connection.

C. Prepare test and inspection startup reports.

D. Provide all labor and materials to perform startup. Startup shall be performed by a factory-trained technician from the original equipment manufacturer (OEM). Technician shall confirm that equipment has been correctly installed and passes specification checklist prior to equipment becoming operational and covered under OEM warranty. This shall be done in strict accordance with manufacturer's specifications and requirements. Third-party service agencies are not permitted.

E. A start-up log shall be furnished by the factory approved start-up technician to document the chiller's start-up date and shall be signed by the owner or his authorized representative prior to commissioning the chillers.

F. Provide local service agent with direct access to factory support on equipment.

G. Provide instruction to the owner on operation and maintenance.

3.4 DEMONSTRATION

A. Engage a factory-authorized service representative to train Owner's maintenance personnel to adjust, operate, and maintain chillers.

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SECTION 237413 - PACKAGED, OUTDOOR, CENTRAL-STATION AIR-HANDLING UNITS

PART 1 - GENERAL

1.1 SUMMARY

A. This Section includes packaged, outdoor, central-station air-handling units and energy recovery unit (outdoor rooftop type) with the following components and accessories:

1. Outdoor Air Handling Units

B. Unit shall be UL and C-UL Listed.

C. Supply fans within the scope of AHRI Standard 430 shall be certified in accordance with AHRI Standard 430.

D. Unit sound performance data shall be provided using AHRI Standard 260 test methods and reported as sound power. Trane, in providing this program and data, does not certify or warrant NC levels. These levels are affected by factors specific to each application and/or installation and therefore unable to be predicted or certified by Trane. Refer to product data for specific fan footnote references.

E. Manufacturer provided VFDs shall be certified to AHRI Standard 1210 "Performance Rating of Variable Frequency Drives" to ensure documented and reliable VFD efficiency.

1.2 DEFINITIONS

A. RTU: Rooftop unit. As used in this Section, this abbreviation means packaged, outdoor, central-station air-handling units. This abbreviation is used regardless of whether the unit is mounted on the roof or on a concrete base on ground. This includes RTU and Packaged Outdoor Rooftop Energy Recovery Ventilator (ERV) unit as scheduled on the Construction Documents.

B. Supply-Air Fan: The fan providing supply-air to conditioned space. "Supply air" is defined as the air entering a space from air-conditioning, heating, or ventilating apparatus.

C. VAV: Variable Air Volume.

D. VFD: Variable Frequency Drive.

1.3 PERFORMANCE REQUIREMENTS

A. Delegated Design: Design RTU supports to comply with wind performance requirements, including comprehensive engineering analysis by a qualified professional engineer, using performance requirements and design criteria indicated.

B. Wind-Restraint Performance:

1. Basic Wind Speed: 160 mph.
2. Building Classification Category: II.
3. Minimum 10 lb/sq. ft (48.8 kg/sq. m) multiplied by the maximum area of the mechanical component projected on a vertical plane that is normal to the wind direction, and 45 degrees either side of normal.

1.4 ACTION SUBMITTALS

A. Product Data:

1. Provide manufacturer's technical data for each RTU that indicates dimensions, weights, rated capacities, ratings, fan performance, finishes of materials, electrical characteristics, required clearances, furnished specialties, accessories, and connection requirements.
2. Provide data of filter media, filter performance data, filter assembly, and filter frames.
3. Provide manufacturer's installation instructions.

B. Shop Drawings: Detail equipment assemblies and indicate unit dimensions, weight loading, required clearances, construction details, field connection details, electrical characteristics and connection requirements. Computer generated fan curves for each air handling unit shall be submitted with specific design operating point noted. A computer generated psychometric chart shall be submitted for each cooling coil with design points and final operating point clearly noted. Sound data for discharge, radiated and return positions shall be submitted by octave band for each unit. Calculations for required baserail heights to satisfy condensate trapping requirements of cooling coil shall be included.

1. Wiring Diagrams: Power, signal, and control wiring.

C. Delegated-Design Submittal: For RTU supports indicated to comply with performance requirements and design criteria, including analysis data signed and sealed by the qualified professional engineer responsible for their preparation.

1. Detail mounting, securing, and flashing of roof curb to roof structure. Indicate coordinating requirements with roof membrane system.
2. Wind Restraint Details: Detail fabrication and attachment of wind and restraints. Show anchorage details and indicate quantity, diameter, and depth of penetration of anchors.

1.5 INFORMATIONAL SUBMITTALS

A. Field quality-control test reports.

B. Warranty.

C. Coordination Drawings: Plans and other details, drawn to scale, on which the following items are shown and coordinated with each other, using input from installers of the items involved:

1. Structural members to which RTUs and ERV will be attached.
2. Roof openings
3. Roof curbs and flashing.

D. Manufacturer Wind Loading Qualification Certification: Submit certification that specified equipment will withstand wind forces specified.

1. Basis for Certification: Indicate whether withstand certification is based on actual test of assembled components or on calculations.
2. Dimensioned Outline Drawings of Equipment Unit: Identify center of wind force and locate and describe mounting and anchorage provisions.
3. Detailed description of equipment anchorage devices on which the certification is based and their installation requirements.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Deliver, store, protect and handle products to site.

B. Accept products on site on factory-furnished shipping skids. Inspect for damage.

C. Store in clean dry place and protect from construction traffic. Handle carefully to avoid damage to components, enclosures, and finish.

1.7 CLOSEOUT SUBMITTALS

A. Operation and maintenance data.

1.8 QUALITY ASSURANCE

A. ARI Compliance:

1. Comply with ARI 210/240 and ARI 340/360 for testing and rating energy efficiencies for RTUs.
2. Comply with ARI 270 for testing and rating sound performance for RTUs.
3. Air handler furnished with double width, double inlet (DWDI) fans and/or plenum fans where applicable, shall be certified in accordance with the central station air handling units certification program, which is based on AHRI Standard 430.
4. Air handling unit water heating & cooling coils shall be certified in accordance with the forced circulation air cooling and air heating coils certification program, which is based on AHRI Standard 410.

B. ASHRAE Compliance:

1. Comply with ASHRAE 33 for methods of testing cooling and heating coils.
2. Comply with applicable requirements in ASHRAE 62.1, Section 5 - "Systems and Equipment" and Section 7 - "Construction and Startup."

C. ASHRAE/IESNA 90.1 Compliance: Applicable requirements in ASHRAE/IESNA 90.1, Section 6 - "Heating, Ventilating, and Air-Conditioning."

D. NFPA Compliance: Comply with NFPA 90A and NFPA 90B.

E. UL Compliance: Comply with UL 1995.

F. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Manufacturers: Subject to compliance with requirements, provide products by the following:

1. Daikin. Rooftop unit to match phase 'A' equipment.

2.2 UNIT CONSTRUCTION

A. General Fabrication Requirements for Casings: Fabricate unit with heavy gauge channel posts and panels secured with mechanical fasteners. All panels, access doors, and ship sections shall be sealed with permanently applied bulb-type gasket. Shipped loose gasketing is not allowed.

B. Panels and access doors shall be constructed as a 2-inch nominal thick; thermal broke double wall assembly, injected with foam insulation with an R-value of not less than R-13.
1. The inner liner shall be constructed of solid stainless steel.
2. Exterior surfaces shall be constructed of painted galvanized steel, for aesthetics and long-term durability. Paint finish will include a base primer with a high-quality polyester resin topcoat. Finished, unabraded panel surfaces shall be exposed to an ASTM B117 salt spray environment and exhibit no visible red rust at a minimum of 3,000 hours exposure. Finished, abraded surfaces shall be tested per ASTM D1654, having a mean scribe creepage not exceeding 1/16" at 1,000 hours minimum exposure to an ASTM B117 salt spray environment. Measurements of results shall be quantified using ASTM D1654 in conjunction with ASTM D610 and ASTM D714 to evaluate blister and rust ratings.
3. The floor plate shall be constructed as specified for the inner liner.
4. Unit will be furnished with solid inner liners.

C. Panel deflection shall not exceed L/240 ratio at 125% of design static pressure, maximum 5 inches of positive or 6 inches of negative static pressure. Deflection shall be measured at the panel midpoint.

D. The casing leakage rate shall not exceed 0.50 cfm per square foot of casing surface area at design static pressure up to a maximum of +5" w.c. in positive pressure sections and -6" w.c. in negative pressure sections.

E. Module to module field assembly shall be accomplished with an overlapping, full perimeter internal splice joint that is sealed with bulb type gasketing on both mating modules to minimize on-site labor and meet indoor air quality standards.

F. Access doors shall be flush mounted to cabinetry, with minimum of two six inch long stainless steel piano-type hinges, latch and full size handle assembly. Access doors shall swing outward

for unit sections under negative pressure. Access doors on positive pressure sections, shall have a secondary latch to relieve pressure and prevent injury upon access.

G. Provide cross broke roofcap system to divert water from the top surface of the air handler. The rain shed roofcap shall have 2”standing seams covered with splice cap channels to seal top seam. Splice cap shall break down over sides of standing seam to protect the ends of the seam.

H. Cooling coil piping vestibule 30” deep shall be factory installed of standard cabinet construction on the coil connection side of the unit. Roofcap over vestibule shall be a continuous single piece covering both the coil section and the vestibule. Roofcap seams between coil section and vestibule are not allowed.

I. The unit shall have a 6-inch curb ready base for structural rigidity and condensate trapping. The curb-ready base shall be designed with sloped drip pans located under all unit sections except duct openings and shall be supported by frame member.

J. Roof curb kit of 16-inch height shall provide support for the air handler on the building roof and provide a weather protected area for terminating and securing the roof membrane. The roof curb kit shall be manufactured by the air handler unit manufacturer.

K. An insulated, double-walled piping vestibule, 30" deep, shall be factory installed of standard cabinet construction on the coil connection side of the unit. Roofcap over vestibule shall be a continuous single piece covering both the coil section and the vestibule. Roofcap seams between coil section and vestibule are not allowed.

L. Construct drain pans from stainless steel with cross break and double sloping pitch to drain connection. Provide drain pans under cooling coil section. Drain connection centerline shall be a minimum of 3’’ above the base rail to aid in proper condensate trapping. Drain connections that protrude from the base rail are not acceptable. There must be a full 2’’ thickness of insulation under drain pan.

M. Factory leakage test available for units selected with high pressure, low leakage construction. The unit manufacturer shall provide a witnessed factory leak test on selected units. The cabinet shall be tested at the unit’s positive and negative maximum design operating static pressure, up to 8” of differential static pressure across the cabinet exterior walls for the entire unit. Cabinet leakage shall not exceed Class 6 leakage per ASHRAE Standard 111. All supply and return opening shall be sealed. Air pressure and flow shall be measured by a third party calibrated and certified apparatus. The testing shall be performed at the factory. Owner’s representative shall select on unit to be tested at the time of order. A written test report shall be prepared by the manufacturer and issued to the owner’s representative.

N. Factory panel deflection testing available for units selected with high pressure, low leakage construction. The unit manufacturer shall provide a factory deflection test on one unit at the unit’s positive and negative maximum design operating static pressure, up to 8” of differential static pressure across the cabinet exterior walls for the entire unit. A deflection limit of L/240 will be demonstrated at this time. “L” is defined as the height of a panel on the side of the unit. Measurement shall be at the mid-point of “L” along the largest panel on one side.

O.

2.3 FAN ASSEMBLIES

A. Acceptable fan assembly shall be a single width, single inlet, class II, direct-drive type plenum fan dynamically balanced as an assembly, as shown in schedule. Maximum fan RPM shall be below first critical fan speed. Fan assemblies shall be dynamically balanced by the manufacturer on all three planes. Provide access to motor and fan assembly through hinged access door.

B. Fan and motor shall be mounted internally on a steel base. Factory mount motor on slide base that can be slid out the side of the unit if removal is required. Provide access to motor, drive, and bearings through hinged access door. Fan and motor assembly shall be mounted on rubber-in-shear vibration type isolators inside cabinetry.

C. Multiple VFDs, on a common panel, shall be provided for each fan array to provide redundancy in case of loss of function of one of the VFDs or fan motors. Individual VFDs shall be sized based on motor FLA to reduce overall panel input current. In the event of a VFD failure, the remaining VFDs must be capable of compensating and maintaining normal fan array operation. VFD panel shall have a common disconnect that is accessible from the outside of the unit. Disconnect shall open input power to all VFDs simultaneously. Disconnect shall be lockable in the off position. Disconnect shall utilize circuit breaker to provide overcurrent and short circuit protection. VFD panel shall be provided with a single point of field connection for field input power. Each VFD shall be supplied with independent input fusing, as required. VFDs shall be capable of onboard diagnostics to monitor individual fan motor performance. Externally mounted VFDs shall be provided with independent keypad. VFD panel shall be provided with a common point connection for speed input signal, start/stop signal, and fault status. Field safety interlock relay shall be field wired and provided

D. Transmitter per Fan (High Performance Flow Meter): The fan shall have an airflow measurement system to measure fan airflow directly or to measure differential pressure that can be used to calculate fan airflow. The system shall predict airflow within +/- 5 percent total accuracy (device & transmitter) when operating within the stable operating region of the fan curve. On units supplied with multiple direct drive fans, one transmitter is supplied for each fan in the array. The submitted fan airflow performance and noise levels shall not be affected by the installation of the device.

1. The supply fan's Starter/VFD shall be mounted internal of unit casing in the controls section. The internal enclosure shall be an integral part of the unit casing to allow for thermal venting to casing interior, but shall be accessible from unit exterior through access door. Internally mounted starters shall have doors with the same construction as other doors on unit. An external disconnect shall be mounted through the door to the starter/VFD to disconnect full power from starter/VFD.

E. Motor Wiring Conduit: The fan motor wiring shall be factory-wired to the unit-mounted starter/disconnect, variable frequency drive, or external motor junction box within flexible metal conduit of adequate length so that the fan vibration isolation, if applicable, will not be restricted.

F. Each fan in the multiple-fan array shall be provided with integral back flow prevention: a backdraft damper that prohibits recirculation of air in the event a fan or multiple fans become disabled. Dampers are tested and rated based on AMCA Standard 500. Dampers to be heavy duty type capable of a maximum back pressure that exceeds the design total static pressure with

minimal leakage. The dampers should have a minimal total effect on airflow performance-both pressure drop when open and system effect on the fan. The damper blades and frame shall be extruded aluminum with blade edge seals locked into the blade edge. Adhesive type seals are unacceptable. AHU manufacturer responsible for providing proper spacing upstream of dampers to ensure full, uniform airflow through upstream components. For units where the damper(s) are supplied at the jobsite, the installing contractor shall contract a certified TAB contractor to verify uniform airflow thru upstream components.

2.4 BEARINGS, SHAFTS, AND DRIVES

A. Bearings: Basic load rating computed in accordance with AFBMA - ANSI Standards. The bearings shall be provided on the motor with the fan wheel mounted directly on the motor shaft, AMCA arrangement 4.

B. Shafts shall be solid, hot rolled steel, ground and polished, keyed to shaft, and protectively coated with lubricating oil. Hollow shafts are not acceptable.

C. The fan wheel shall be direct coupled to the motor shaft. The wheel width shall be determined by motor speed and fan performance characteristics.

2.5 ELECTRICAL

A. Fan motors shall be manufacturer provided and installed, Open Drip Proof, premium efficiency (meets or exceeds EPAct requirements), 3500 RPM, single speed, 460V / 60HZ / 3P. Complete electrical characteristics for each fan motor shall be as shown in schedule.

B. The air handler(s) shall be ETL and ETL-Canada listed by Intertek Testing Services, Inc. Units shall conform to bi-national standard ANSI/UL Standard 1995/CSA Standard C22.2 No. 236.

C. Wiring Termination: Provide terminal lugs to match branch circuit conductor quantities, sizes, and materials indicated. Enclosed terminal lugs in terminal box sized to NFPA 70.

D. Manufacturer shall provide ASHRAE 90.1 Energy Efficiency equation details for individual equipment to assist Building Engineer for calculating system compliance.

E. Installing contractor shall provide GFI receptacle within 25 feet of unit to satisfy National Electrical Code requirements.

F. Air handler manufacturer shall provide and mount conduit and wiring from each fan motor terminated at an external junction box.

G. Air handler manufacturer shall provide, mount and wire ABB variable speed drive with electrical characteristics such as indicated on project schedule and shown on manufacturer's data sheets.

2.6 COOLING AND HEATING COILS

A. Certification: Acceptable water cooling, water heating, steam, and refrigerant coils shall be certified in accordance with AHRI Standard 410 and bear the AHRI label. Coils exceeding the scope of the manufacturer's certification and/or the range of AHRI's standard rating conditions will be considered provided the manufacturer is a current member of the AHRI Forced Circulation Air-Cooling and Air-Heating Coils certification programs and that the coils have been rated in accordance with AHRI Standard 410. Manufacturer must be ISO 9002 certified.

B. Water cooling coil shall be provided. Provide access to coil(s) for service and cleaning. Enclose coil headers and return bends fully within unit casing. Unit shall be provided with coil connections that extend a minimum of 5" beyond unit casing for ease of installation. Drain and vent connections shall be provided exterior to unit casing. Coil connections must be factory sealed with grommets on interior and exterior panel liners to minimize air leakage and condensation inside panel assembly. If not factory packaged, Contractor must supply all coil connection grommets and sleeves. Coils shall be removable through side and/or top panels of unit without the need to remove and disassemble the entire section from the unit.
   1. Headers shall consist of seamless copper tubing to assure compatibility with primary surface. Headers to have intruded tube holes to provide maximum brazing surface for tube to header joint, strength, and inherent flexibility. Header diameter should vary with fluid flow requirements.
   2. Fins shall have a minimum thickness of 0.0095 inch aluminum plate construction. Fins shall have full drawn collars to provide a continuous surface cover over the entire tube for maximum heat transfer. Tubes shall be mechanically expanded into the fins to provide a continuous primary to secondary compression bond over the entire finned length for maximum heat transfer rates. Bare copper tubes shall not be visible between fins.
   3. Coil tubes shall be 5/8 inch OD seamless copper, 0.035 inch nominal tube wall thickness, expanded into fins, brazed at joints.
   4. Coil connections shall be carbon steel, NPT threaded connection. Connection size to be determined by manufacturer based upon the most efficient coil circuiting. Vent and drain fittings shall be furnished on the connections, exterior to the air handler. Vent connections provided at the highest point to assure proper venting. Drain connections shall be provided at the lowest point to insure complete drainage and prevent freeze-up.
   5. Coil casing shall be a formed channel frame of galvanized steel.

2.7 FILTERS

A. Furnish flat panel filter section with 2-inch pleated MERV 8 filter. Provide side loading and removal of filters.

B. Furnish flat panel filter section with 4-inch filter. Provide side loading and removal of filters.

C. Filter media shall be UL 900 listed, Class I or Class II.

2.8 MARINE LIGHT

A. Factory-mounted, weather resistant (enclosed and gasketed to prevent water and dust intrusion), light emitting diode (LED) fixture shall be provided in sections of the unit as specified for maintenance and service visibility. Fixture shall be complete with aluminum die cast housing, polycarbonate lens designed for maximum light output, and LEDs wired to a single switch within a factory provided service module. LED lighting shall provide instant-on "white" light and have a minimum 25,000 hour life. Fixtures shall be designed for flexible positioning during maintenance and service activities for optimal location. All lights within the unit shall be wired to a single switch within the factory provided service module. The service module shall include a GFCI receptacle separate from the load side of the equipment. Electrical contractor shall be required to provide a 120V supply to the factory-mounted service module for the marine light circuit and for the GFCI receptacle circuit per NEC. Service module shall be provided on the fan section.

2.9 ULTRAVIOLET (UVC) LIGHTS

A. UV-C light fixtures and lamps shall be provided by the air handler manufacturer. The UV-C fixtures shall be factory-assembled and tested in the air handler. Lamp life shall be 9,000 hours minimum with no more than a 15% loss of output after one year of continuous use. The UV-C fixtures and lamps shall be accessible via downstream door for maintenance of the bulbs. Fixtures shall meet the UL drip-proof design criteria. Fixtures shall be constructed of UV resistant polymer to resist corrosion. Fixtures shall have been tested and recognized by UL/C-UL under Category Code ABQK (Accessories, Air Duct Mounted), UL Standards 153, 1598 & 1995.

B. All polymeric materials that come into direct or indirect (reflected) contact with UV-C light shall be UVC resistant or shielded from the UV-C light using a certified UV-C tolerant material such as metal.

C. Access doors shall be provided at the location of each UV-C light as indicated on the plans and schedule. A window or viewport shall be provided to allow viewing of the UV-C light array to confirm operation. The AHU windows shall be treated to assure the UV-C energy emitted through it is below the threshold limits specified by NIOSH and ACGIH.

D. All sections of the handler with access doors where the UV-C lights may pose a risk for direct exposure shall have a mechanical interlock switch that disconnects power to the lights when the door is opened. Each UV section shall also be equipped with an externally mounted on-off/disconnect/shut off switch that disconnects power to the UV-C lights. The switch shall be equipped with a lock-out/tagout to prevent unwanted operation of the UV-C lights.

2.10 CONTROLS

A. Control equipment and sequence of operation are specified in Section “Direct Digital Control Systems."

B. Refer to construction drawings for motorized dampers/actuators and outside airflow measuring station requirements and sequence of operations.

2.11 ROOF CURBS

A. Materials: Galvanized steel with corrosion-protection coating, watertight gaskets, and factory-installed wood nailer; complying with NRCA standards.

1. Curb Insulation and Adhesive: Comply with NFPA 90A or NFPA 90B.

a. Materials: ASTM C 1071, Type I or II.
b. Thickness: 2 inch min.

2. Application: Factory applied with adhesive and mechanical fasteners to the internal surface of curb.

a. Liner Adhesive: Comply with ASTM C 916, Type I.
b. Mechanical Fasteners: Galvanized steel, suitable for adhesive attachment, mechanical attachment, or welding attachment to duct without damaging liner when applied as recommended by manufacturer and without causing leakage in cabinet.
c. Liner materials applied in this location shall have air-stream surface coated with a temperature-resistant coating or faced with a plain or coated fibrous mat or fabric depending on service air velocity.
d. Liner Adhesive: Comply with ASTM C 916, Type I.

B. Curb Height: max. 16 inches

C. Wind Restraints: Metal brackets compatible with the curb and casing, painted to match RTU, used to anchor unit to the curb, and designed for loads at Project site. Comply with requirements in Section “Action Submittals” above

D. Outdoor AHU shall be provided with a factory-supplied roof curb. Curb shall be shipped to jobsite disassembled. Contractor shall be responsible for assembly and mounting to roof structure per the Roof Curb Manual. Units with factory-supplied external piping cabinet, the factory-supplied curb shall include a curb section for the pipe cabinet.

2.12 CAPACITIES AND CHARACTERISTICS

A. See construction drawings.

2.13 ADDITIONAL SECTIONS

A. Plenum section shall be provided and properly sized for inlet and/or discharge air flow (between 600 and 1500 feet per minute). The plenum shall provide single or multiple openings as shown on drawings and project schedule.

B. Access section shall be provided for access between components.

C. APPLICABLE FOR ERV-1. The ERV core shall transfer both sensible and latent energy between the incoming fresh air stream and the exhaust stale air stream. The ERV core shall be in either a cross-flow or counter cross-flow orientation and have no moving parts. The ERV

core shall be certified by AHRI under its Standard 1060 for Energy Recovery Ventilators. Products not currently AHRI certified will not be accepted. The ERV core shall achieve the minimum effectiveness value as indicated in the schedule. The fresh air stream must have complete separation from the stale air stream to prevent cross contamination. The ERV core shall have Exhaust Air Transport Ratio of less than 0.5% as tested to AHRI 1060 (EATR) to prevent cross-over of gases, contaminants or odors. The ERV core's Outdoor Air Correction Factor (OACF) shall not exceed 1.0 as tested to AHRI 1060 (OACF) Standard. The ERV core shall not be degraded or promote the growth of mold and bacteria with a rating of zero in testing according to ISO846 A and C. The ERV core must be able to tolerate freezing temperatures of -30C (-22F) and not have an increase in EATR or decrease in performance after being frozen. The ERV core must be able to tolerate high temperatures of +60C (140F) and not have an increase in EATR or decrease in performance at these elevated temperatures. The ERV core must be freeze tolerant tested to 40 freeze thaw cycles from -20C (-4F) to +20C (68F) while maintaining the energy recovery effectiveness and EATR rating of less than 0.5%. The ERV core must be water washable to remove dust and contaminants. The ERV core must be flame proof and comply with UL 723 with a flame spread index that shall not be over 25 and a smoke index that shall not be over 50. The ERV cores should have particulate filters positioned before the incoming air streams.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of RTUs.

B. Examine roughing-in for RTUs to verify actual locations of piping and duct connections before equipment installation.

C. Examine roofs for suitable conditions where RTUs will be installed.

D. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

A. Roof Curb: Install on roof structure, level and secure. Install RTUs on curbs and coordinate roof penetrations and flashing with roof construction specified in Architectural and Structural drawings and Section "Roof Accessories." Secure RTUs to upper curb rail, and secure curb base to roof framing or concrete base with anchor bolts.

B. Unit Support: Install unit level on structural curbs. Coordinate wall penetrations and flashing with wall construction. Secure RTUs to structural support with anchor bolts.

C. Install wind restraints according to manufacturer's written instructions.

D. Install condensate drain, minimum connection size, with trap and indirect connection to nearest roof drain or area drain.

E. Install piping adjacent to RTUs inside pipe chase to allow service and maintenance.

F. Duct installation requirements are specified in other HVAC Sections. Drawings indicate the general arrangement of ducts. The following are specific connection requirements:

1. Install ducts to termination at top of roof curb.
2. Remove roof decking only as required for passage of ducts. Do not cut out decking under entire roof curb.
3. Connect supply and return ducts to RTUs with flexible duct connectors specified in Section "Air Duct Accessories."
4. Install supply and return-air duct continuously through roof structure.

G. Lifting instructions:

1. The air handling units must be rigged, lifted, and installed in strict accordance with the manufacturer's Installation, Operation, and Maintenance manual. The units are also to be installed in strict accordance with the specifications. Units may be shipped fully assembled or disassembled to the minimum functional section size in accordance with shipping and job site requirements.
2. Outdoor units shall be shipped on 6" integral base frame for the purpose of mounting units on a roof curb or field-supplied pier support system.
3. All units will be shipped with an integral base frame designed with the necessary number of lift points for safe installation. All lifting lugs are to be utilized during lift. The lift points will be designed to accept standard rigging devices and be removable after installation. Units shipped in sections will have a minimum of four points of lift.

3.3 FIELD QUALITY CONTROL

A. Manufacturer's Field Service: Engage a factory-authorized service representative to inspect, test, and adjust components, assemblies, and equipment installations, including connections. Report results in writing.

B. Do not operate units for any purpose, temporary or permanent, until ductwork is clean, filters are in place, bearings lubricated, and fan has been test run under observation.

C. Perform tests and inspections and prepare test reports.

1. Manufacturer's Field Service: Engage a factory-authorized service representative to inspect components, assemblies, and equipment installations, including connections, and to assist in testing. Report results in writing.

D. Tests and Inspections:

1. After installing RTUs and after electrical circuitry has been energized, test units for compliance with requirements.
2. Inspect for and remove shipping bolts, blocks, and tie-down straps.
3. Operational Test: After electrical circuitry has been energized, start units to confirm proper motor rotation and unit operation.
4. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment.

E. Remove and replace malfunctioning units and retest as specified above.

3.4 STARTUP SERVICE

A. Engage a factory-authorized service representative to perform startup service.

B. Complete installation and startup checks according to manufacturer's written instructions and do the following:

1. Inspect for visible damage to unit casing.
2. Inspect internal insulation.
3. Verify that labels are clearly visible.
4. Verify that clearances have been provided for servicing.
5. Verify that controls are connected and operable.
6. Verify that filters are installed.
7. Clean coils and inspect for construction debris.
8. Remove packing from vibration isolators.
9. Verify lubrication on fan and motor bearings.
10. Inspect fan-wheel rotation for movement in correct direction without vibration and binding.
11. Adjust fan belts to proper alignment and tension.
12. Start unit according to manufacturer's written instructions.
    a. Complete unit and each VFD startup sheets and include in closeout documents.
13. Inspect and record performance of interlocks and protective devices; verify sequences.
14. Operate unit for an initial period as recommended or required by manufacturer.
15. Inspect outdoor-air damper for proper stroke and interlock with return-air damper.
16. Inspect controls for correct sequencing of cooling and heating mode.

3.5 CLEANING AND ADJUSTING

A. After completing system installation and testing, adjusting, and balancing RTU and air-distribution systems, clean filter housings and install new filters.

3.6 DEMONSTRATION

A. Engage a factory-authorized service representative to startup equipment and train Owner's maintenance personnel to adjust, operate, and maintain the equipment.

END OF SECTION 23 74 13

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SECTION 23 82 19 - FAN COIL UNITS

PART 1 - GENERAL

1.1 SUMMARY

A. This Section includes fan-coil units and accessories.

1.2 ACTION SUBMITTALS

A. Product Data: Include rated capacities, operating characteristics, furnished specialties, and accessories.

B. Shop Drawings: Detail equipment assemblies and indicate dimensions, weights, loads, required clearances, method of field assembly, components, and location and size of each field connection.

1. Wiring Diagrams: Power, signal, and control wiring.

1.3 INFORMATIONAL SUBMITTALS

A. Field quality-control test reports.

1.4 CLOSEOUT SUBMITTALS

A. Operation and maintenance data.

1.5 QUALITY ASSURANCE

A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.

B. ASHRAE Compliance: Applicable requirements in ASHRAE 62.1, Section 5 - "Systems and Equipment" and Section 7 - "Construction and Startup."

C. ASHRAE/IESNA 90.1 Compliance: Applicable requirements in ASHRAE/IESNA 90.1, Section 6 - "Heating, Ventilating, and Air-Conditioning."

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Manufacturers: Subject to compliance with requirements, provide products by the following:

1. Daikin. Refer to project allowance.

2.2 DUCTED FAN-COIL UNITS

A. Description: Factory-packaged and -tested units rated according to ARI 440, ASHRAE 33, and UL 1995.

B. Drain Pans: **Stainless steel**. Fabricate pans and drain connections to comply with ASHRAE 62.1.

C. Chassis: Galvanized steel where exposed to moisture, with baked-enamel finish and removable access panels.

D. Cabinets: Steel with baked-enamel finish in manufacturer's standard paint color.

1. Unit will be supplied with 1-inch, double-wall panels. The cabinet is to be thermally isolated through injected foam insulation inside each cabinet. Single wall cabinets with fiberglass insulation exposed in the airstream are not acceptable. Frame channels which allow heat conductance between the inside and outside of the cabinet are not acceptable. Base rails used for unit mounting/hanging are acceptable. Panel shall have a minimum thermal insulation of R6. Foam injected insulation conforms to:

a. ASTM C1071 (including C665)
b. b. UL 181 for erosion
c. 25/50 rating for flame spread/smoke developed per ASTM E-84, UL 723 and NFPA 90A

E. Filters: Minimum arrestance according to ASHRAE 52.1, and a minimum efficiency reporting value (MERV) according to ASHRAE 52.2.

1. MERV 8 Pleated filter

F. Hydronic Coils: Copper tube, with mechanically bonded aluminum fins spaced no closer than 0.1 inch, rated for a minimum working pressure of 200 psig and a maximum entering-water temperature of 220 deg F. Include manual air vent and drain.

G. Direct-Driven Fans: Double width, forward curved, centrifugal; with permanently lubricated, multispeed motor resiliently mounted in the fan inlet. Aluminum or painted-steel wheels, and painted-steel or galvanized-steel fan scrolls.

H. Electrical Connection: Factory wire motors and controls for a single electrical connection.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Install fan-coil units to comply with NFPA 90A.

B. Verify locations of thermostats and other exposed control sensors with Drawings and room details before installation. Install devices 48 inches above finished floor.

C. Install new filters in each fan-coil unit within two weeks after Substantial Completion.

D. Piping installation requirements are specified in other Sections. Drawings indicate general arrangement of piping, fittings, and specialties. Specific connection requirements are as follows:

1. Install piping adjacent to machine to allow service and maintenance.
2. Connect piping to fan-coil-unit factory hydronic piping package. Install piping package if shipped loose.
3. Connect condensate drain to indirect waste.

    a. Install condensate trap of adequate depth to seal against the pressure of fan. Install cleanouts in piping at changes of direction.

E. Connect supply and return ducts to fan-coil units with flexible duct connectors specified in Section "Air Duct Accessories." Comply with safety requirements in UL 1995 for duct connections.

3.2 FIELD QUALITY CONTROL

A. Perform the following field tests and inspections and prepare test reports:

1. Operational Test: After electrical circuitry has been energized, start units to confirm proper motor rotation and unit operation.
2. Operate electric heating elements through each stage to verify proper operation and electrical connections.
3. Test and adjust controls and safety devices. Replace damaged and malfunctioning controls and equipment.

B. Remove and replace malfunctioning units and retest as specified above.

END OF SECTION 23 82 19

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SECTION 260500 - ELECTRICAL GENERAL REQUIREMENTS

PART 1 - GENERAL

1.1 SUMMARY

The Electrical General Requirements are supplementing and applicable to Division 16 Sections and shall apply to all phases of work specified herein, shown on the Drawings, or required to provide a complete installation of electrical systems. Section 16 is sub-divided for convenience only.

A. This Section includes the following:

1. Job Conditions
2. Regulatory Requirements
3. Electrical equipment coordination and installation.
4. Submittals, Operating and Maintenance instructions and As-built drawings.
5. Common electrical installation requirements.
6. Warranty of work.

1.2 JOB CONDITIONS:

A. Site Inspections: Before submitting proposals, each bidder should visit the site and fully familiarize himself with all job conditions and shall be fully informed as to the extent of his work. No consideration will be given after bid opening date for alleged misunderstanding as to the requirements of work involved in connecting to the utilities or as to requirements of materials to be furnished. The contractor shall contact the utility prior to bid and make appropriate provisions in such bid as required by the utility for the utility's routing and connection.

B. Scheduled Interruptions: Planned interruptions of utilities service, to any facility affected by this contract, shall be carefully planned and approved by Architect at least ten (10) days in advance of the requested interruption. The Contractor shall not interrupt services until the Architect has granted specific approval. The request shall indicate services to be affected, date and time of interruption and duration of outage. Request for interruption of service will not be approved until all equipment and materials required for the completion of that particular phase of work are on the job site. The work may have to be scheduled after normal working hours.

C. Accidental Interruptions: All excavation and/or remodeling work required shall be performed with care so as not to interrupt other existing services (water, gas, electrical, sewer, sprinklers, etc.). If accidental utility interruption resulting from work performed by the Contractor occurs, service shall be immediately restored to its original condition without delay, by and at the expense of the Contractor, using skilled workmen of the trade required.

1.3 REGULATORY REQUIREMENTS:FIND

A. Permits, Fees, and Inspections: This Contractor shall secure and pay for all permits, and inspections required on work performed under this section of the Specifications. He shall assume full responsibility for all assessments and taxes necessary for the completion and acceptance of the work. The Owner will arrange for utility power including any impact fees.

B. Applicable Standards and Codes: The electrical installation shall comply with all applicable building codes; local, state, and federal ordinances. In case of a discrepancy among these applicable regulatory codes and ordinances, the most stringent requirement shall govern. The Contractor shall notify the Architect in writing of any such discrepancy. Should the Contractor perform any work that does not comply with the applicable regulatory codes and ordinances he shall bear all cost arising in correcting the deficiencies. Application standards and codes shall include all local ordinances, all state laws, and the applicable requirements of the following:

1. American National Standards Institute - ANSI
2. National Electrical Manufacturer's Association - NEMA
3. National Fire Protection Association – NFPA (latest editions)
4. The National Electric Code – NEC – NFPA 70, 2014 Edition
5. The Life Safety Code – NFPA 101, 2015 Florida Edition
6. The National Fire Alarm Code – NFPA 72, 2016 Florida Edition
7. Florida Building Code, 2017 Edition
8. Underwriters' Laboratories, Inc. – UL

C. Drawings and Specifications: The drawings and these specifications are complementary each to the other. What is called for by one shall be as binding as if called for by both. Omissions from the drawings and specifications of details of work which are evidently necessary to carry out the intent of the drawings and specifications, or which are customarily performed, shall not relieve the Contractor from performing such work. In any case of discrepancy in the figures or catalog numbers, the matter shall be submitted to the Architect, who shall promptly make a determination in writing. Any adjustment by the Contractor shall be at the Contractor's own risk and expense. Electrical drawings are diagrammatic only. Do not scale these drawings. All equipment shall be installed in accordance with manufacturer's recommendations and any conflicting data shall be verified before bidding.

D. The Contractor shall after completion of the work, furnish the Architect a certificate of final inspection and approval from the applicable local inspection department. The Contractor shall also make necessary changes to plans and specifications to meet code standards at no additional cost to the Owner.

1.4 CONNECTION TO EXISTING UTILITIES:

A. All utility work shall be coordinated with and approved by the local providing utility. Permission for all utility outages shall be requested a minimum of (14) days in advance, unless an emergency arises. Explicit detail shall be shown for all connections to existing utilities. The applicable utility company must approve both the location and the method of the proposed connection.

B. The contractor coordinate procedure to and shall pay for all electric energy consumption during construction as part of the project.

C. The contractor shall include the electric utility connection fee in the bid unless specifically directed by Owner not to do so. If, prior to bid, the electric utility connection fee is unknown, the Contractor shall include $25,000 as a line item in the bid for each service. Once the utility connection fee is known, if the utility connection fee is less than $25,000, the balance shall be removed from the Contractor's total contract price.

1.5 COOPERATION:

A. Interfacing with Other Crafts: It shall be the responsibility of the Contractor to cooperate and coordinate with all other crafts working on this project. This Contractor shall do all cutting, trenching, backfill and structural removals to permit entry of the electrical system components. The General Contractor shall do all patching and finishing.

B. Equipment Furnished Under Other Sections: This Contractor shall furnish and install, complete electrical roughing-in and connections to all equipment furnished under other sections and indicate on drawings. This includes all outlets as shown on mechanical and electrical drawings. All such equipment shall be set in place as work of other sections.

C. Heating and Air Conditioning:

1. The Contractor shall furnish all branch circuit wiring to motors and control panels or centers including disconnects, receptacles, switches, and appurtenances to which the system at the units may be connected, to provide a complete system of wiring for power. Control equipment and control circuit wiring is specified in the Mechanical Section.

2. Control devices to be included in the branch circuit, except those furnished integrals with the equipment, will be delivered by the Heating and Air Conditioning Contractor and installed by the Electrical Contractor.

1.6 WORKMANSHIP:

All work shall be executed in a neat and substantial manner by skilled workman, well qualified, and regularly engaged in the type of work required. Substandard work shall be removed and replaced by the Contractor at no cost to the Owner.

1.7 APPROVAL OF MATERIALS AND EQUIPMENT:

Prior-Submittals: The Contractor shall base his proposal on the materials specified herein and on the drawings. Reference to a particular product by manufacturer, trade name, or catalog number establishes the quality standards of material and equipment required for this installation and is not intended to exclude products equal in quality and similar design. The Specifying Engineer reserves the sole right to decide the equality of materials proposed for use in lieu of these specified. It shall be the Contractor's responsibility to furnish the information and data sufficient to establish the quality and utility of the items in question, including furnishing of samples if required. If other equipment manufacturers determine that their equipment will fit in the space and meet the recommended clearances, suit all job conditions, equal or exceed the quality of the specified items, then a request may be made in writing to the Specifying Engineer at least ten (10) business days prior to bid date for permission to be included in the approved equipment list. All data required for evaluation shall accompany the above letter. The Specifying Engineer offers two submittal reviews, if these are unacceptable, only an “as-specified” submittal will be accepted. In addition, all value engineering alternates should only be submitted when directly requested by the owner and must be noted specifically as “VE” alternates to the items specified in the construction documents. A letter from the owner directing the VE effort is strongly encouraged as an accompaniment to any VE submittal.

A. Submittals:

1. Submittals: The Contractor shall submit a list of equipment proposed for installation. Catalog data and shop drawings on all proposed systems and their components shall be submitted. Where substitutions alter the design or space requirements, the Contractor shall defray all items of cost for the revised design and construction including costs to all allied trades

involved. Provide six (6) copies of submittals and shop drawings as a minimum unless the General Conditions requires a greater number of copies. In lieu of paper copies, the Contractor may submit the submittals in PDF format.

a. Submittals Schedule: Submittals shall be submitted within thirty (30) days after the contract is awarded. It is not the responsibility of the Engineer to expedite the review of submittals if the contractor has not adequately prepared the submittals in a time efficient manner. The contractor bears all the responsibility for the added time requirements of resubmittals.

b. Identification: Place a permanent label or title block on each submittal for identification. Each major section of submittals such as power equipment, lighting equipment, fire alarm, etc., shall be secured together in a booklet or stapled with a covering index. The different parts of the submittal shall describe which Specification Section it is referenced. The covering index shall list the following information:
   1) Project name and date
   2) Name, address, and phone number of General contractor and project manager.
   3) Name, address, and phone number of Sub-contractor and project manager.
   4) Supplier of equipment with phone number and person responsible for this project.
   5) Index of each item covered in submittal and model number.
   6) Any deviation from contract documents shall be specifically noted on submittal cover index and specifically identified with highlighting, encircling, or boldly on specific submittal sheet.

c. The submittal shall not be in individual parts per each Specification Section but be combined as a part of a major section such as power equipment, lighting equipment, fire alarm, methods, etc.

d. Resubmittals: The Specifying Engineer will participate in two resubmittal reviews. After the second resubmittal review, the Engineer shall not review the submittal until the Contractor provides $1,000 to the Engineer to perform each additional required resubmittal review. Make resubmittals in same form and number of copies as initial submittal.
   1) Include previous submittal review comments.
   2) For each item being resubmitted, include previous review comment and explain how resubmitted item meets the criteria of the previous review comment.

2. Electrical and Mechanical/Plumbing/Fire Protection Equipment Coordination:

The electrical power equipment submittals shall be accompanied by a letter verifying coordination of electrical services for all mechanical, plumbing, and fire protection equipment requiring power. The letter shall follow the format listed below.

To: _____
(General Contractor)

Re: _____
(Project name and location)

We the undersigned subcontractors certify that we have coordinated the electrical requirements for mechanical, plumbing, and fire protection sprinkler equipment as evidenced by the coordination chart listed herein.

	Load	1 Phase	Number of	Maximum	Minimum	Breaker	Circuit

Item	Full Load Amps	or 3 Phase	Electrical Connections	Overcurrent Protection	Overcurrent Protection	Proposed	Proposed

The above list details all required electrical connections for mechanical equipment.

Signed: _____

For: _____
Mechanical Subcontractor

The above list details all required electrical connections for plumbing equipment.

Signed: _____

For: _____
Plumbing Subcontractor

The above list details all required electrical and fire alarm connections for fire protection equipment.

Signed: _____

For: _____
Fire Protection Sprinkler Subcontractor

The above list of equipment has been reviewed and the required connections are being provided. (Any exceptions or request for direction shall be listed here)

Signed: _____

For: _____
Electrical Subcontractor

1.8 PRODUCT DELIVERY, STORAGE AND HANDLING

A. Protection: Take necessary precautions to protect all material, equipment, apparatus and work from damage. Failure to do so to the satisfaction of the Architect will be sufficient cause for the rejection of the material, equipment or work in question. Contractor is responsible for the safety and good condition of the materials installed until final acceptance by the owner.

B. Cleaning: Conduit openings shall be capped or plugged during installation. Fixtures and equipment shall be tightly covered and protected against dirt, moisture, chemical and mechanical injury. At the completion of the work the fixtures, material and equipment shall be thoroughly cleaned and delivered in condition satisfactory to the Architect.

1.9 TESTING AND BALANCING:

Make tests that may be required by the Owner or the Architect in connection with the operation of the electrical system in the buildings. Balance all single-phase loads connected to all panelboards in the buildings to insure approximate equal divisions of these loads on the main secondary power supply serving the buildings. All tests shall be made in accordance with the latest standards of the IEEE and the NEC. The installation shall be tested as defined in the 16 specifications. Contractor shall perform circuit continuity and operational tests on all equipment furnished or connected by Contractor. The tests shall be made in the presence of the Architect or his representative. The Contractor shall notify the Architect at least twenty-four (24) hours in advance of tests. The Contractor shall provide all testing equipment and all costs shall be borne by him. Written reports shall be made of all tests and shall be made available at the Pre-Final Inspection**.** All faults shall be corrected immediately.

A. A letter shall be written giving the following:

1. Measured amps on each phase of each panel.
2. Resistance to ground of each new grounding electrode.
3. Measured voltage phase to phase and phase to neutral at each panel.
4. Ground continuity and polarity instrument used.

1.10 OPERATING AND MAINTENANCE INSTRUCTIONS/AS BUILT DRAWINGS:

A. Four (4) complete sets of instructions containing the manufacturer's Operating and Maintenance (O&M) instructions for each piece of equipment shall be furnished to the Owner. Each set shall be permanently bound and shall have a hard cover. One complete set shall be furnished at the time that the test procedure is submitted, and remaining sets shall be furnished before the Contract is completed. Flysheets shall be placed before instructions covering each subject. The instruction sheets shall be approximately 8-1/2" by 11" with large sheets of Drawings folded in. The instructions shall include information for major pieces of equipment and systems. In addition, a CD shall be provided to the Owner with the O&M Manuals and Drawings contained therein.

B. Upon completion of the work and at the time designated, the services of one project engineer shall be provided by the Contractor to instruct the representative of the Owner in the operation and maintenance of the systems.

C. This Contractor shall provide as-built Drawings at the completion of the job. Drawings shall show all significant changes in equipment, wiring, routing, location, etc. All underground conduit routing shall be accurately indicated with locations dimensioned. As-built drawings shall be submitted for review as red-lined on a field hard copy. After review by the Architect, the Contractor will be given digital AutoCAD files and shall make revisions and resubmit final on disk.

D. All signals, communications, data, control, dimming systems, etc. shall be included in the As-Built drawings. Where electrical drawings contain a large number of items that prevent easy discernment of the As-Built system, enlarged details or other graphic methods shall be used to clarify the identification required for As-Builts usage.

E. As-Built drawings shall include the following information:

1. Stub-out locations dimensioned from permanent building lines.

2. Routing of all main feeders and identified as under slab, in slab, above ceiling, etc. also for lighting and power branch circuits the number of conductors shall be included, and for feeders and motor branch circuits the number, size, and insulation of conductors shall be included.
3. Corrected panel board and equipment schedules.
4. Corrected circuit numbers as they appear on the panel board directories.
5. Corrected motor horsepower and full load amperes.
6. Location of major distribution open junction boxes with 2" conduit and over.
7. Location of all underground raceways or duct banks dimensioned from easily identified points with depth indicated from BFG (below finished grade) and by elevation in feet.

7.11 GUARANTEE AND SERVICE:

A. Upon completion of all tests and acceptance, the Contractor shall furnish the Owner a written guarantee covering the electrical work done for a period of one (1) year from date of acceptance. Guarantee includes equipment capacity and performance ratings specified without excessive noise levels. Upon notice from the Architect or the Owner, the Contractor shall, during the guarantee period, rectify and replace any defective material or workmanship and repair any damage caused thereby without additional cost.

PART 2 – PRODUCTS (Not Used)

PART 3 - EXECUTION

3.1 COMMON REQUIREMENTS FOR ELECTRICAL INSTALLATION

A. Comply with NECA 1-2015.

B. Measure indicated mounting heights to bottom of unit for suspended items and to center of unit for wall-mounting items.

C. Headroom Maintenance: If mounting heights or other location criteria are not indicated, arrange and install components and equipment to provide maximum possible headroom consistent with these requirements.

D. Equipment: Install to facilitate service, maintenance, and repair or replacement of components of both electrical equipment and other nearby installations. Connect in such a way as to facilitate future disconnecting with minimum interference with other items in the vicinity.

E. Right of Way: Give to raceways and piping systems installed at a required slope.

END OF SECTION 260500

SECTION 260519 - LOW-VOLTAGE ELECTRICAL POWER CONDUCTORS AND CABLES

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Copper building wire rated 600 V or less.
2. Aluminum building wire rated 600 V or less.
3. Metal-clad cable, Type MC, rated 600 V or less.
4. Connectors, splices, and terminations rated 600 V and less.

1.2 ACTION SUBMITTALS

A. Product Data: For each type of product.

B. Product Schedule: Indicate type, use, location, and termination locations.

1.3 INFORMATIONAL SUBMITTALS

A. Field quality-control reports.

PART 2 - PRODUCTS

2.1 COPPER BUILDING WIRE

A. Description: Flexible, insulated and uninsulated, drawn copper current-carrying conductor with an overall insulation layer or jacket, or both, rated 600 V or less.

B. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Alpha Wire Company.
2. General Cable Technologies Corporation.
3. Okonite Company (The).
4. Southwire Company.

C. Standards:

1. Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and use.
2. RoHS compliant.
3. Conductor and Cable Marking: Comply with wire and cable marking according to UL's "Wire and Cable Marking and Application Guide."

D. Conductors: Copper, complying with ASTM B3 for bare annealed copper and with ASTM B8 for stranded conductors.

E. \Conductor Insulation – All types may not be indicated below, coordinate with Drawings and intended uses:

1. Type NM: Comply with UL 83 and UL 719.
2. Type RHH and Type RHW-2: Comply with UL 44.
3. Type USE-2 and Type SE: Comply with UL 854.
4. Type THHN and Type THWN-2: Comply with UL 83.
5. Type THW and Type THW-2: Comply with NEMA WC-70/ICEA S-95-658 and UL 83.
6. Type XHHW-2: Comply with UL 44.

2.2 ALUMINUM BUILDING WIRE

A. Description: Flexible, insulated and uninsulated, drawn aluminum current-carrying conductor with an overall insulation layer or jacket, or both, rated 600 V or less.

B. Allowed Use Locations: Aluminum conductors may only be used on feeder or distribution circuits larger than 100A. The Drawings typically indicate all conductor sizes in copper. The contractor shall provide a cross reference table for engineer approval prior to any conductor to be substituted with an aluminum conductor.

C. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Alpha Wire Company.
2. General Cable Technologies Corporation.
3. Okonite Company (The).
4. Southwire Company.

D. Standards:

1. Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and use.
2. RoHS compliant.
3. Conductor and Cable Marking: Comply with wire and cable marking according to UL's "Wire and Cable Marking and Application Guide."

E. Conductors: Aluminum, complying with ASTM B800 and ASTM B801.

F. Conductor Insulation – All types may not be indicated below, coordinate with Drawings and intended uses:

1. Type NM: Comply with UL 83 and UL 719.
2. Type RHH and Type RHW-2: Comply with UL 44.
3. Type USE-2 and Type SE: Comply with UL 854.
4. Type THHN and Type THWN-2: Comply with UL 83.
5. Type THW and Type THW-2: Comply with NEMA WC-70/ICEA S-95-658 and UL 83.
6. Type XHHW-2: Comply with UL 44.

2.3 METAL-CLAD CABLE, TYPE MC

A. Description: A factory assembly of one or more current-carrying insulated conductors in an overall metallic sheath.

B. Allowed Use Locations: Metal-clad cable, Type MC shall only be used in walls from end of circuit devices (receptacles or switches) up to junction box above ceiling for homerun circuit or light fixture. Homerun circuit shall not be in Type MC cable. Wiring between devices within walls are allowed to be in Type MC cable.

C. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. General Cable Technologies Corporation.
2. Okonite Company (The).
3. Southwire Company.

D. Standards:

1. Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and use.
2. Comply with UL 1569.
3. RoHS compliant.
4. Conductor and Cable Marking: Comply with wire and cable marking according to UL's "Wire and Cable Marking and Application Guide."

E. Circuits:

1. Single circuit.

F. Conductors: Copper, complying with ASTM B3 for bare annealed copper and with ASTM B8 for stranded conductors.

G. Ground Conductor: Insulated.

H. Conductor Insulation:

1. Type TFN/THHN/THWN-2: Comply with UL 83.
2. Type XHHW-2: Comply with UL 44.

I. Armor: Steel, interlocked.

J. Jacket: PVC applied over armor.

2.4 CONNECTORS AND SPLICES

A. Description: Factory-fabricated connectors, splices, and lugs of size, ampacity rating, material, type, and class for application and service indicated; listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and use.

B. Jacketed Cable Connectors: For steel and aluminum jacketed cables, zinc die-cast with set screws, designed to connect conductors specified in this Section.

PART 3 - EXECUTION

3.1 CONDUCTOR MATERIAL APPLICATIONS

A. Feeders: Copper for feeders smaller than No. 3 AWG; copper or aluminum for feeders No. 3 AWG and larger. Conductors shall be 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.

3.2 CONDUCTOR INSULATION AND MULTICONDUCTOR CABLE APPLICATIONS AND WIRING METHODS

A. Exposed Feeders: Type THHN/THWN-2, single conductors in raceway.

B. Feeders Concealed in Ceilings and Crawlspaces: Type THHN/THWN-2, single conductors in raceway.

C. Feeders Concealed in Walls and Partitions: Type THHN/THWN-2, single conductors in raceway.

D. Feeders Concealed in Concrete, below Slabs-on-Grade, and Underground: Type XHHW-2, single conductors in raceway.

E. Feeders in Cable Tray: Type THHN/THWN-2, single conductors in raceway or Type RHW-2/USE-2 if exterior located.

F. Exposed Branch Circuits, Including in Crawlspaces: Type XHHW-2, single conductors in raceway.

G. Branch Circuits Concealed in Ceilings, Walls, and Partitions: Type THHN/THWN-2, single conductors in raceway or Metal-clad cable, Type MC.

H. Branch Circuits Concealed in Concrete, below Slabs-on-Grade, and Underground: Type XHHW-2, single conductors in raceway.

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 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 as required by other Specification sections."

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.

1. Use oxide inhibitor in each splice, termination, and tap for aluminum conductors.

C. Wiring at Outlets: Install conductor at each outlet, with at least 12 inches of slack.

D. Prior to conduit/conductor routing to outlets, contractor shall request final verification of locations. Outlets shall be allowed to be moved 10 feet prior to installation with no cost change.

E. Comply with requirements in accompanying Section on Fire Alarm Systems for connecting, terminating, and identifying wires and cables.

3.5 IDENTIFICATION

A. Identify and color-code conductors and cables according to requirements in accompanying Sections in this book of Specifications.

B. Identify each spare conductor at each end with identity number and location of other end of conductor, and identify as spare conductor.

3.6 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 accompanying Sections in this book of Specifications.

3.7 FIRESTOPPING

A. Apply firestopping to electrical penetrations of fire-rated floor and wall assemblies to restore original fire-resistance rating of assembly according to requirements in accompanying Sections in this book of Specifications.

END OF SECTION 260519

SECTION 260523 - CONTROL-VOLTAGE ELECTRICAL POWER CABLES

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Balanced twisted pair cabling hardware.
2. Low-voltage control cabling.
3. Control-circuit conductors.

1.2 DEFINITIONS

A. Low Voltage: As defined in NFPA 70 for circuits and equipment operating at less than 50 V or for remote-control and signaling power-limited circuits.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product.

1.4 QUALITY ASSURANCE

A. Testing Agency Qualifications: Accredited by NETA.

1. Testing Agency's Field Supervisor: Currently certified by BICSI as an RCDD.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

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. 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.

C. Flame Travel and Smoke Density for Riser Cables in Non-Plenum Building Spaces: As determined by testing identical products according to UL 1666.

D. 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.

E. RoHS compliant.

2.2 BALANCED TWISTED PAIR CABLE HARDWARE

A. Description: Hardware designed to connect, splice, and terminate balanced twisted pair copper communications cable.

B. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. AMP NETCONNECT; a TE Connectivity Ltd. company.
2. Belden CDT Networking Division/NORDX.
3. General Cable; General Cable Corporation.
4. Hubbell Premise Wiring.
5. Siemon Co. (The).
6. Superior Essex Inc.

C. General Requirements for Balanced Twisted Pair Cable Hardware:

1. Comply with the performance requirements of Category 5e and/or Category 6 as applicable to product used.
2. Comply with TIA-568-C.2, IDC type, with modules designed for punch-down caps or tools.
3. Cables shall be terminated with connecting hardware of same category or higher.

D. Connecting Blocks: 110-style IDC for Category 5e or Category 6 as applicable Provide blocks for the number of cables terminated on the block, plus 20 percent spare, integral with connector bodies, including plugs and jacks where indicated.

E. Patch Panel: Modular panels housing numbered jack units with IDC-type connectors at each jack location for permanent termination of pair groups of installed cables.

1. Features:

a. Universal T568A and T568B wiring labels.
b. Labeling areas adjacent to conductors.
c. Replaceable connectors.
d. 12, 24 or 48 ports.

2. Construction: 16-gauge steel and mountable on 19-inch equipment racks or on wall-mountable independent of an equipment rack.

F. Patch Cords: Factory-made, four-pair cables in lengths necessary to connect equipment or as indicated on the Drawings; terminated with an eight-position modular plug at each end.

1. Patch cords shall have bend-relief-compliant and color-coded boots to ensure performance. Patch cords shall have latch guards to protect against snagging.

G. Plugs and Plug Assemblies:

1. Male; eight position; color-coded modular telecommunications connector designed for termination of a single four-pair 100-ohm unshielded or shielded balanced twisted pair cable.
2. Comply with IEC 60603-7-1, IEC 60603-7-2, IEC 60603-7-3, IEC 60603-7-4, and IEC 60603-7.5.
3. Marked to indicate transmission performance.

H. Jacks and Jack Assemblies:

1. Female; eight position; modular; fixed telecommunications connector designed for termination of a single four-pair 100-ohm unshielded or shielded balanced twisted pair cable.
2. Designed to snap-in to a patch panel or faceplate.
3. Standards.

    a. Category 5e, unshielded balanced twisted pair cable shall comply with IEC 60603-7-2.
    b. Category 5e, shielded balanced twisted pair cable shall comply with IEC 60603-7-3.
    c. Category 6, unshielded balanced twisted pair cable shall comply with IEC 60603-7-4.
    d. Category 6, shielded balanced twisted pair cable shall comply with IEC 60603-7.5.

4. Marked to indicate transmission performance.

I. Faceplate:

1. Port quantity as indicated on the Drawings; vertical single gang faceplates designed to mount to single gang wall boxes.
2. Plastic Faceplate: High-impact plastic. Coordinate color with Drawings and Architect
3. Metal Faceplate: Stainless steel, complying with requirements in "Wiring Devices."
4. For use with snap-in jacks accommodating any combination of balanced twisted pair, optical fiber, and coaxial work area cords.

    a. Flush mounting jacks, positioning the cord at a 45-degree angle.

J. Legend:

1. Machine printed, in the field, using adhesive-tape label.
2. Snap-in, clear-label covers and machine-printed paper inserts.

2.3 LOW-VOLTAGE CONTROL CABLE

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

1. Multi-pair, twisted, No. 18 AWG, stranded (19x30) tinned-copper conductors.
2. PVC insulation.
3. Unshielded.

4. PVC jacket.
5. Flame Resistance: Comply with NFPA 262.

2.4 CONTROL-CIRCUIT CONDUCTORS

A. Class 1 Control Circuits: Stranded copper, Type THHN/THWN-2, complying with UL 83 in raceway.

B. Class 2 Control Circuits: Stranded copper, Type THHN/THWN-2, complying with UL 83 in raceway.

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

D. Class 2 Control Circuits and Class 3 Remote-Control and Signal Circuits That Supply Critical Circuits: Circuit Integrity (CI) cable.

1. Smoke control signaling and control circuits.

2.5 SOURCE QUALITY CONTROL

A. Factory test balanced twisted pair cables according to TIA-568-C.2.

B. Cable will be considered defective if it does not pass tests and inspections.

C. Prepare test and inspection reports.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Test balanced twisted pair cables on receipt at Project site.

1. Test each pair of twisted pair cable for open and short circuits.

3.2 INSTALLATION OF RACEWAYS AND BOXES

A. Comply with requirements in "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 4 inches (102 mm) square by 2-1/8 inches (53 mm) deep.
2. Flexible metal conduit shall not be used.

B. Comply with TIA-569-D 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. Secure conduits to backboard if entering the room from overhead.
4. Extend conduits 4 inches above finished floor.
5. 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.

B. General Requirements for Cabling:

1. Comply with TIA-568-C Series of standards.
2. Comply with BICSI ITSIMM, Ch. 5, "Copper Structured Cabling Systems."
3. Terminate all conductors; no cable shall contain unterminated elements. Make terminations only at indicated outlets, terminals, and cross-connect and patch panels.
4. Cables may not be spliced and shall be continuous from terminal to terminal. Do not splice cable between termination, tap, or junction points.
5. Cables serving a common system may be grouped in a common raceway. Install network cabling and control wiring and cable in separate raceway from power wiring. Do not group conductors from different systems or different voltages.
6. 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.
7. 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." Install lacing bars and distribution spools.
8. Do not install bruised, kinked, scored, deformed, or abraded cable. Remove and discard cable if damaged during installation and replace it with new cable.
9. Cold-Weather Installation: Bring cable to room temperature before dereeling. Do not use heat lamps for heating.
10. Pulling Cable: Comply with BICSI ITSIMM, Ch. 5, "Copper Structured Cabling Systems." Monitor cable pull tensions.
11. Support: Do not allow cables to lay on removable ceiling tiles.
12. Secure: Fasten securely in place with hardware specifically designed and installed so as to not damage cables.
13. Provide strain relief.
14. Keep runs short. Allow extra length for connecting to terminals. Do not bend cables in a radius less than 10 times the cable OD. Use sleeves or grommets to protect cables from vibration at points where they pass around sharp corners and through penetrations.
15. Ground wire shall be copper, and grounding methods shall comply with IEEE C2. Demonstrate ground resistance.

C. Balanced Twisted Pair Cable Installation:

1. Comply with TIA-568-C.2.
2. Install termination hardware as specified in "Communications Copper Horizontal Cabling" unless otherwise indicated.
3. Do not untwist UTP cables more than 1/2 inch at the point of termination to maintain cable geometry.

D. Installation of Control-Circuit Conductors:

1. Install wiring in raceways. Comply with requirements specified in "Raceways and Boxes for Electrical Systems."

E. Open-Cable Installation:

1. Install cabling with horizontal and vertical cable guides in telecommunications spaces with terminating hardware and interconnection equipment.
2. Suspend copper cable not in a wireway or pathway a minimum of 8 inches above ceilings by cable supports not more than 30 inches apart.
3. Cable shall not be run through or on structural members or in contact with pipes, ducts, or other potentially damaging items. Do not run cables between structural members and corrugated panels.

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 with a tag for future use.

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 TIA-569-D, Annex A, "Firestopping."

B. Comply with BICSI TDMM, "Firestopping" Chapter.

3.7 GROUNDING

A. For data communication wiring, comply with TIA-607-B and with BICSI TDMM, "Bonding and Grounding (Earthing)" Chapter.

B. For low-voltage control wiring and cabling, comply with requirements "Grounding and Bonding for Electrical Systems."

3.8 IDENTIFICATION

A. Comply with requirements for identification specified in "Identification for Electrical Systems."

B. Identify data and communications system components, wiring, and cabling according to TIA-606-B; label printers shall use label stocks, laminating adhesives, and inks complying with UL 969.

C. Identify each wire on each end and at each terminal with a number-coded identification tag. Each wire shall have a unique tag.

3.9 FIELD QUALITY CONTROL

A. Tests and Inspections:

1. Visually inspect cable jacket materials for UL or third-party certification markings. Inspect cabling terminations to confirm color-coding for pin assignments and inspect cabling connections to confirm compliance with TIA-568-C.1.
2. Visually inspect cable placement, cable termination, grounding and bonding, equipment and patch cords, and labeling of all components.

B. End-to-end cabling will be considered defective if it does not pass tests and inspections.

C. Prepare test and inspection reports.

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.

1.3 INFORMATIONAL SUBMITTALS

A. Field quality-control reports.

1.4 CLOSEOUT SUBMITTALS

A. Operation and maintenance data.

1. Plans showing as-built, dimensioned locations of system described in "Field Quality Control" Article, including the following:
   a. Ground rods.
   b. Grounding arrangements and connections for separately derived systems.

1.5 QUALITY ASSURANCE

A. Testing Agency Qualifications: Certified by NETA.

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.

B. Comply with UL 467 for grounding and bonding materials and equipment.

2.2 MANUFACTURERS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Burndy; Part of Hubbell Electrical Systems.
2. ERICO; a brand of nVent.
3. Galvan Industries, Inc.; Electrical Products Division, LLC.
4. O-Z/Gedney; a brand of Emerson Industrial Automation.
5. Thomas & Betts Corporation; A Member of the ABB Group.

2.3 CONDUCTORS

B. Insulated Conductors: Copper or tinned-copper wire or cable insulated for 600 V unless otherwise required by applicable Code or authorities having jurisdiction.

C. 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.

D. Grounding Bus: Predrilled rectangular bars of annealed copper, 1/4 by 4 inches in cross section, with 9/32-inch holes spaced 1-1/8 inches apart. Stand-off insulators for mounting shall comply with UL 891 for use in switchboards, 600 V and shall be Lexan or PVC, impulse tested at 5000 V.

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. Welded Connectors: Exothermic-welding kits of types recommended by kit manufacturer for materials being joined and installation conditions.

C. Bus-Bar Connectors: Compression type, copper or copper alloy, with two wire terminals.

D. Beam Clamps: Mechanical type, terminal, ground wire access from four directions, with dual, tin-plated or silicon bronze bolts.

E. Cable-to-Cable Connectors: Compression type, copper or copper alloy.

F. Cable Tray Ground Clamp: Mechanical type, zinc-plated malleable iron.

G. Conduit Hubs: Mechanical type, terminal with threaded hub.

E. Ground Rod Clamps: Mechanical type, copper or copper alloy, terminal with hex head bolt.

F. Lay-in Lug Connector: Mechanical type, copper rated for direct burial terminal with set screw.

G. Signal Reference Grid Clamp: Mechanical type, stamped-steel terminal with hex head screw.

H. Straps: Solid copper, copper lugs. Rated for 600 A.

I. U-Bolt Clamps: Mechanical type, copper or copper alloy, terminal listed for direct burial.

J. Water Pipe Clamps:

1. Mechanical type, two pieces with stainless-steel bolts.

a. Material: Die-cast zinc alloy.
b. Listed for direct burial.

2. U-bolt type with malleable-iron clamp and copper ground connector rated for direct burial.

PART 3 - EXECUTION

3.1 APPLICATIONS

A. Conductors: Install solid conductor for No. 10 AWG and smaller, and stranded conductors for No. 8 AWG and larger unless otherwise indicated.

B. Conductor Terminations and Connections:

1. Pipe and Equipment Grounding Conductor Terminations: Bolted connectors.

3.2 EQUIPMENT GROUNDING

A. Install insulated equipment grounding conductors with all feeders and branch circuits.

B. 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.

C. Water Heater, Heat-Tracing, and Antifrost Heating Cables: Install a separate insulated equipment grounding conductor to each electric water heater and heat-tracing cable. Bond conductor to heater units, piping, connected equipment, and components.

3.3 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. Grounding and Bonding for Piping:

1. Metal Water Service Pipe: Install insulated copper grounding conductors, in conduit, from building's main service equipment, or grounding bus, to main metal water service entrances to building. Connect grounding conductors to main metal water service pipes; use a bolted clamp connector or bolt a lug-type connector to a pipe flange by using one of the lug bolts of the flange. Where a dielectric main water fitting is installed, connect grounding conductor on street side of fitting. Bond metal grounding conductor conduit or sleeve to conductor at each end.
2. Water Meter Piping: Use braided-type bonding jumpers to electrically bypass water meters. Connect to pipe with a bolted connector.
3. Bond each aboveground portion of gas piping system downstream from equipment shutoff valve.

C. Bonding Interior Metal Ducts: Bond metal air ducts to equipment grounding conductors of associated fans, blowers, electric heaters, and air cleaners. Install bonding jumper to bond across flexible duct connections to achieve continuity.

D. Connections: Make connections so possibility of galvanic action or electrolysis is minimized. Select connectors, connection hardware, conductors, and connection methods so metals in direct contact are galvanically compatible.

1. Use electroplated or hot-tin-coated materials to ensure high conductivity and to make contact points closer in order of galvanic series.
2. Make connections with clean, bare metal at points of contact.
3. Make aluminum-to-steel connections with stainless-steel separators and mechanical clamps.
4. Make aluminum-to-galvanized-steel connections with tin-plated copper jumpers and mechanical clamps.
5. Coat and seal connections having dissimilar metals with inert material to prevent future penetration of moisture to contact surfaces.

3.4 FIELD QUALITY CONTROL

A. Perform tests and inspections.

B. Tests and Inspections:

1. After installing grounding system but before permanent electrical circuits have been energized, test for compliance with requirements.
2. Inspect physical and mechanical condition. Verify tightness of accessible, bolted, electrical connections with a calibrated torque wrench according to manufacturer's written instructions.
3. Test completed grounding system at each location where a maximum ground-resistance level is specified, at service disconnect enclosure grounding terminal, at ground test wells, and at individual ground rods. Make tests at ground rods before any conductors are connected.

    a. Measure ground resistance no fewer than two full days after last trace of precipitation and without soil being moistened by any means other than natural

drainage or seepage and without chemical treatment or other artificial means of reducing natural ground resistance.

b. Perform tests by fall-of-potential method according to IEEE 81.

C. Grounding system will be considered defective if it does not pass tests and inspections.

D. Prepare test and inspection reports.

E. Report measured ground resistances that exceed the following values:

1. Power and Lighting Equipment or System with Capacity of 500 kVA and Less: 10 ohms.
2. Power and Lighting Equipment or System with Capacity of 500 to 1000 kVA: 5 ohms.
3. Power and Lighting Equipment or System with Capacity More Than 1000 kVA: 3 ohms.
4. Power Distribution Units or Panelboards Serving Electronic Equipment: 3 ohms.
5. Substations and Pad-Mounted Equipment: 5 ohms.
6. Manhole Grounds: 10 ohms.

F. Excessive Ground Resistance: If resistance to ground exceeds specified values, notify Architect promptly and include recommendations to reduce ground resistance.

END OF SECTION 260526

SECTION 260529 - HANGERS AND SUPPORTS FOR ELECTRICAL SYSTEMS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. Section Includes:

1. Steel slotted support systems.
2. Aluminum slotted support systems.
3. Conduit and cable support devices.
4. Support for conductors in vertical conduit.
5. Structural steel for fabricated supports and restraints.
6. Mounting, anchoring, and attachment components, including powder-actuated fasteners, mechanical expansion anchors, concrete inserts, clamps, through bolts, toggle bolts, and hanger rods.
7. Fabricated metal equipment support assemblies.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product.

1. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes for the following:

a. Slotted support systems, hardware, and accessories.
b. Clamps.
c. Hangers.
d. Sockets.
e. Eye nuts.
f. Fasteners.
g. Anchors.
h. Saddles.
i. Brackets.

2. Include rated capacities and furnished specialties and accessories.

PART 2 - PRODUCTS

2.1 SUPPORT, ANCHORAGE, AND ATTACHMENT COMPONENTS

A. Steel Slotted Support Systems: Preformed steel channels and angles with minimum 13/32-inch-diameter holes at a maximum of 8 inches o.c. in at least one surface.

1. Manufacturers: Subject to compliance with requirements, undefined:

a. Allied Tube & Conduit; a part of Atkore International.
b. B-line, an Eaton business.
c. Thomas & Betts Corporation; A Member of the ABB Group.
d. Unistrut; Part of Atkore International.

2. Standard: Comply with MFMA-4 factory-fabricated components for field assembly.
3. Material for Channel, Fittings, and Accessories: Galvanized steel.
4. Channel Width: Selected for applicable load criteria.
5. Metallic Coatings: Hot-dip galvanized after fabrication and applied according to MFMA-4.
6. Protect finishes on exposed surfaces from damage by applying a strippable, temporary protective covering before shipping.

B. Aluminum Slotted Support Systems: Extruded-aluminum channels and angles with minimum 13/32-inch- diameter holes at a maximum of 8 inches o.c. in at least one surface.

1. Manufacturers: Subject to compliance with requirements, undefined:

a. Cooper Industries, Inc.
b. Thomas & Betts Corporation; A Member of the ABB Group.
c. Unistrut; Part of Atkore International.

2. Standard: Comply with MFMA-4 factory-fabricated components for field assembly.
3. Channel Material: 6063-T5 aluminum alloy.
4. Fittings and Accessories Material: 5052-H32 aluminum alloy.
5. Channel Width: Selected for applicable load criteria.
6. Painted Coatings: Manufacturer's standard painted coating applied according to MFMA-4.
7. Protect finishes on exposed surfaces from damage by applying a strippable, temporary protective covering before shipping.

C. Conduit and Cable Support Devices: Steel 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 nonarmored 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 made of 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. Manufacturers: Subject to compliance with requirements, undefined:
        1) Hilti, Inc.
        2) ITW Ramset/Red Head; Illinois Tool Works, Inc.
        3) MKT Fastening, LLC.

2. Mechanical-Expansion Anchors: Insert-wedge-type, stainless steel, for use in hardened portland cement concrete, with tension, shear, and pullout capacities appropriate for supported loads and building materials where used.

    a. Manufacturers: Subject to compliance with requirements, undefined:
        1) B-line, an Eaton business.
        2) Hilti, Inc.
        3) ITW Ramset/Red Head; Illinois Tool Works, Inc.
        4) MKT Fastening, LLC.

3. Concrete Inserts: Steel or malleable-iron, slotted support system units are similar to MSS Type 18 units and comply with MFMA-4 or MSS SP-58.
4. Clamps for Attachment to Steel Structural Elements: MSS SP-58 units are suitable for attached structural element.
5. Through Bolts: Structural type, hex head, and high strength. Comply with ASTM F 3125/F 3125M, Grade A325 .
6. Hanger Rods: Threaded steel.

2.2 FABRICATED METAL EQUIPMENT SUPPORT ASSEMBLIES

A. Description: Welded or bolted structural-steel shapes, shop or field fabricated to fit dimensions of supported equipment.

B. Materials: Comply with requirements in Section 055000 "Metal Fabrications" for steel shapes and plates.

PART 3 - EXECUTION

3.1 APPLICATION

A. Comply with the following standards for application and installation requirements of hangers and supports, except where requirements on Drawings or in this Section are stricter:

    1) NECA 1.
    2) NECA 101
    3) NECA 102.

B. Comply with requirements in Section 07270 "Firestopping" for firestopping materials and installation for penetrations through fire-rated walls, ceilings, and assemblies.

C. Comply with requirements for raceways and boxes specified in "Raceways and Boxes for Electrical Systems."

D. Maximum Support Spacing and Minimum Hanger Rod Size for Raceways: Space supports for EMT, IMC, and RMC as required by NFPA 70. Minimum rod size shall be 1/4 inch in diameter.

E. Multiple Raceways or Cables: Install trapeze-type supports fabricated with steel slottedsupport system, sized so capacity can be increased by at least 25 percent in future without exceeding specified design load limits.

1. Secure raceways and cables to these supports with two-bolt conduit clamps.

F. 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. Raceway Support Methods: In addition to methods described in NECA 1, EMT IMC and RMC may be supported by openings through structure members, according to NFPA 70.

C. Strength of Support Assemblies: Where not indicated, select sizes of components so strength will be adequate to carry present and future static loads within specified loading limits. Minimum static design load used for strength determination shall be weight of supported components plus 200 lb .

D. 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.
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 Steel: Beam clamps (MSS SP-58, Type 19, 21, 23, 25, or 27), complying with MSS SP-69.

E. Drill holes for expansion anchors in concrete at locations and to depths that avoid the need for reinforcing bars.

3.3 INSTALLATION OF FABRICATED METAL SUPPORTS

A. Comply with installation requirements in Section 055000 "Metal Fabrications" for site-fabricated metal supports.

B. Cut, fit, and place miscellaneous metal supports accurately in location, alignment, and elevation to support and anchor electrical materials and equipment.

C. Field Welding: Comply with AWS D1.1/D1.1M.

3.4 CONCRETE BASES

A. Construct concrete bases of dimensions indicated, but not less than 4 inches larger in both directions than supported unit, and so anchors will be a minimum of 10 bolt diameters from edge of the base.

B. Use 3000 psi, 28-day compressive-strength concrete. Concrete materials, reinforcement, and placement requirements are specified in Section 033000 "Cast-in-Place Concrete."

C. Anchor equipment to concrete base as follows:

1. Place and secure anchorage devices. Use supported equipment manufacturer's setting drawings, templates, diagrams, instructions, and directions furnished with items to be embedded.
2. Install anchor bolts to elevations required for proper attachment to supported equipment.
3. Install anchor bolts according to anchor-bolt manufacturer's written instructions.

END OF SECTION 260529

SECTION 260533 - RACEWAYS AND BOXES FOR ELECTRICAL SYSTEMS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. Section Includes:

1. Metal conduits and fittings.
2. Nonmetallic conduits and fittings.
3. Metal wireways and auxiliary gutters.
4. Boxes, enclosures, and cabinets.

B. Related Requirements:

1. "Penetration Firestopping" for firestopping at conduit and box entrances.
2. "Underground Ducts and Raceways for Electrical Systems" for exterior ductbanks, manholes, and underground utility construction.
3. "Pathways for Communications Systems" for conduits, wireways, surface pathways, innerduct, boxes, faceplate adapters, enclosures, cabinets, and handholes serving communications systems.

1.3 DEFINITIONS

A. ARC: Aluminum rigid conduit.

B. GRC: Galvanized rigid steel conduit.

C. IMC: Intermediate metal conduit.

1.4 ACTION SUBMITTALS

A. Product Data: For surface raceways, wireways and fittings, floor boxes, hinged-cover enclosures, and cabinets.

B. Shop Drawings: For custom enclosures and cabinets. Include plans, elevations, sections, and attachment details.

1.5 INFORMATIONAL SUBMITTALS

PART 2 - PRODUCTS

2.1 METAL CONDUITS AND FITTINGS

A. Metal Conduit:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

    a. Allied Tube & Conduit; a part of Atkore International.
    b. O-Z/Gedney; a brand of Emerson Industrial Automation.
    c. Southwire Company.
    d. Thomas & Betts Corporation; A Member of the ABB Group.
    e. Wheatland Tube Company.

2. Listing and Labeling: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.
3. GRC: Comply with ANSI C80.1 and UL 6.
4. IMC: Comply with ANSI C80.6 and UL 1242.
5. PVC-Coated Steel Conduit: PVC-coated rigid steel conduit.
    a. Comply with NEMA RN 1.
    b. Coating Thickness: 0.040 inch, minimum.

6. EMT: Comply with ANSI C80.3 and UL 797.
7. FMC: Comply with UL 1; zinc-coated steel.
8. LFMC: Flexible steel conduit with PVC jacket and complying with UL 360.

B. Metal Fittings:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

    a. Allied Tube & Conduit; a part of Atkore International.
    b. O-Z/Gedney; a brand of Emerson Industrial Automation.
    c. Southwire Company.
    d. Thomas & Betts Corporation; A Member of the ABB Group.
    e. Wheatland Tube Company.

2. Comply with NEMA FB 1 and UL 514B.
3. Listing and Labeling: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.
4. Fittings, General: Listed and labeled for type of conduit, location, and use.
5. Conduit Fittings for Hazardous (Classified) Locations: Comply with UL 1203 and NFPA 70.
6. Fittings for EMT:

    a. Material: Steel.

b. Type: Setscrew or compression.

7. 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.
8. Coating for Fittings for PVC-Coated Conduit: Minimum thickness of 0.040 inch, with overlapping sleeves protecting threaded joints.

C. 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.

2.2 NONMETALLIC CONDUITS AND FITTINGS

A. Nonmetallic Conduit:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

   a. RACO; Hubbell.
   b. Thomas & Betts Corporation; A Member of the ABB Group.
   c. United Fiberglass.

2. Listing and Labeling: Nonmetallic conduit shall be listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.
3. Fiberglass:

   a. Comply with NEMA TC 14.
   b. Comply with UL 2515 for aboveground raceways.
   c. Comply with UL 2420 for belowground raceways.

4. ENT: Comply with NEMA TC 13 and UL 1653.
5. RNC: Type EPC-40-PVC, complying with NEMA TC 2 and UL 651 unless otherwise indicated.
6. LFNC: Comply with UL 1660.

B. Nonmetallic Fittings:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

   a. RACO; Hubbell.
   b. Thomas & Betts Corporation; A Member of the ABB Group.
   c. United Fiberglass.

2. Fittings, General: Listed and labeled for type of conduit, location, and use.
3. Fittings for ENT and RNC: Comply with NEMA TC 3; match to conduit or tubing type and material.

   a. Fittings for LFNC: Comply with UL 514B.

4. Solvents and Adhesives: As recommended by conduit manufacturer.

2.3 METAL WIREWAYS AND AUXILIARY GUTTERS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. B-line, an Eaton business.
2. Hoffman; a brand of nVent.
3. MonoSystems, Inc.

B. Description: Sheet metal, complying with UL 870 and NEMA 250, Type 1 Type 3R unless otherwise indicated, and sized according to NFPA 70.

1. Metal wireways installed outdoors shall be listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

C. Fittings and Accessories: Include covers, couplings, offsets, elbows, expansion joints, adapters, hold-down straps, end caps, and other fittings to match and mate with wireways as required for complete system.

D. Wireway Covers: Hinged type Screw-cover type unless otherwise indicated.

E. Finish: Manufacturer's standard enamel finish.

2.4 BOXES, ENCLOSURES, AND CABINETS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Crouse-Hinds, an Eaton business.
2. EGS/Appleton Electric.
3. Hoffman; a brand of nVent.
4. Hubbell Incorporated.
5. O-Z/Gedney; a brand of Emerson Industrial Automation.
6. RACO; Hubbell.
7. Thomas & Betts Corporation; A Member of the ABB Group.
8. Wiremold / Legrand.

B. General Requirements for Boxes, Enclosures, and Cabinets: Boxes, enclosures, and cabinets installed in wet locations shall be listed for use in wet locations.

C. Sheet Metal Outlet and Device Boxes: Comply with NEMA OS 1 and UL 514A.

D. Cast-Metal Outlet and Device Boxes: Comply with NEMA FB 1, aluminum, Type FD, with gasketed cover.

E. Nonmetallic Floor Boxes: Nonadjustable, rectangular or round, as indicated on Drawings.

1. Listing and Labeling: Nonmetallic floor boxes shall be listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

F. Luminaire Outlet Boxes: Nonadjustable, designed for attachment of luminaire weighing 50 lb. Outlet boxes designed for attachment of luminaires weighing more than 50 lb shall be listed and marked for the maximum allowable weight.

G. Small Sheet Metal Pull and Junction Boxes: NEMA OS 1.

H. Cast-Metal Access, Pull, and Junction Boxes: Comply with NEMA FB 1 and UL 1773, cast aluminum with gasketed cover.

I. Device Box Dimensions: 4 inches square by 2-1/8 inches deep.

J. Gangable boxes are allowed.

K. Hinged-Cover Enclosures: Comply with UL 50 and NEMA 250, Type 1 Type 3R with continuous-hinge cover with flush latch unless otherwise indicated.

1. Metal Enclosures: Steel, finished inside and out with manufacturer's standard enamel.
2. Interior Panels: Steel; all sides finished with manufacturer's standard enamel.

L. Cabinets:

1. NEMA 250, Type 1 Type 3R galvanized-steel box with removable interior panel and removable front, finished inside and out with manufacturer's standard enamel.
2. Hinged door in front cover with flush latch and concealed hinge.
3. Key latch to match panelboards.
4. Metal barriers to separate wiring of different systems and voltage.
5. Accessory feet where required for freestanding equipment.
6. Nonmetallic cabinets shall be listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

PART 3 - EXECUTION

3.1 RACEWAY APPLICATION

A. Outdoors: Apply raceway products as specified below unless otherwise indicated:

1. Exposed Conduit: GRC IMC.
2. Concealed Conduit, Aboveground: GRC IMC EMT RNC, Type EPC-40-PVC.
3. Underground Conduit: RNC, Type EPC-40-PVC, direct buried concrete encased.
4. Connection to Vibrating Equipment (Including Transformers and Hydraulic, Pneumatic, Electric Solenoid, or Motor-Driven Equipment): LFNC.
5. Boxes and Enclosures, Aboveground: NEMA 250, Type 3R.

B. 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: IMC. 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: IMC.
7. Boxes and Enclosures: NEMA 250, Type 1, except use NEMA 250, Type 4 stainless steel in institutional and commercial kitchens and damp or wet locations.

C. Minimum Raceway Size: 1/2-inch trade size.

D. 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 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.

E. Install nonferrous conduit or tubing for circuits operating above 60 Hz. Where aluminum raceways are installed for such circuits and pass through concrete, install in nonmetallic sleeve.

F. Do not install aluminum conduits, boxes, or fittings in contact with concrete or earth.

G. Install surface raceways only where indicated on Drawings.

H. Do not install nonmetallic conduit where ambient temperature exceeds 120 deg F.

3.2 INSTALLATION

A. Comply with requirements in Section "Hangers and Supports for Electrical Systems" for hangers and supports.

B. 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.

C. Do not install raceways or electrical items on any "explosion-relief" walls or rotating equipment.

D. Do not fasten conduits onto the bottom side of a metal deck roof.

E. 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.

F. Complete raceway installation before starting conductor installation.

G. Arrange stub-ups so curved portions of bends are not visible above finished slab.

H. 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.

I. Make bends in raceway using large-radius preformed ells. Field bending shall be according to NFPA 70 minimum radii requirements. Use only equipment specifically designed for material and size involved.

J. Conceal conduit within finished walls, ceilings, and floors unless otherwise indicated. Install conduits parallel or perpendicular to building lines.

K. Support conduit within 12 inches of enclosures to which attached.

L. Raceways Embedded in Slabs:

1. Run conduit larger than 1-inch trade size, parallel or at right angles to main reinforcement. Where at right angles to reinforcement, place conduit close to slab support. Secure raceways to reinforcement at maximum 10-foot intervals.
2. Arrange raceways to cross building expansion joints at right angles with expansion fittings.
3. Arrange raceways to keep a minimum of 2 inches of concrete cover in all directions.
4. Do not embed threadless fittings in concrete unless specifically approved by Architect for each specific location.
5. Change from ENT to IMC before rising above floor.

M. Stub-Ups to Above Recessed Ceilings:

1. Use EMT, IMC, or RMC for raceways.
2. Use a conduit bushing or insulated fitting to terminate stub-ups not terminated in hubs or in an enclosure.

N. 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.

O. Coat field-cut threads on PVC-coated raceway with a corrosion-preventing conductive compound prior to assembly.

P. Raceway Terminations at Locations Subject to Moisture or Vibration: Use insulating bushings to protect conductors including conductors smaller than No. 4 AWG.

Q. 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.

R. Install raceways square to the enclosure and terminate at enclosures with locknuts. Install locknuts hand tight plus 1/4 turn more.

S. Do not rely on locknuts to penetrate nonconductive coatings on enclosures. Remove coatings in the locknut area prior to assembling conduit to enclosure to assure a continuous ground path.

T. Cut conduit perpendicular to the length. For conduits 2-inch trade size and larger, use roll cutter or a guide to make cut straight and perpendicular to the length.

U. 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.

V. Surface Raceways:

1. Install surface raceway with a minimum 2-inch radius control at bend points.
2. Secure surface raceway with screws or other anchor-type devices at intervals not exceeding 48 inches and with no less than two supports per straight raceway section. Support surface raceway according to manufacturer's written instructions. Tape and glue are not acceptable support methods.

W. 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. Install raceway sealing fittings according to NFPA 70.

X. 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. Conduit extending from interior to exterior of building.
4. Conduit extending into pressurized duct and equipment.
5. Conduit extending into pressurized zones that are automatically controlled to maintain different pressure set points.
6. Where otherwise required by NFPA 70.

Y. Comply with manufacturer's written instructions for solvent welding RNC and fittings.

Z. Expansion-Joint Fittings:

1. Install in each run of aboveground RNC that is located where environmental temperature change may exceed 30 deg F and that has straight-run length that exceeds 25 feet. Install in each run of aboveground RMC and EMT conduit that is located where environmental temperature change may exceed 100 deg F and that has straight-run length that exceeds 100 feet.
2. Install type and quantity of fittings that accommodate temperature change listed for each of the following locations:

a. Outdoor Locations Not Exposed to Direct Sunlight: 125 deg F temperature change.
b. Outdoor Locations Exposed to Direct Sunlight: 155 deg F temperature change.
c. Indoor Spaces Connected with Outdoors without Physical Separation: 125 deg F temperature change.
d. Attics: 135 deg F temperature change.

3. Install fitting(s) that provide expansion and contraction for at least 0.00041 inch per foot of length of straight run per deg F of temperature change for PVC conduits. Install fitting(s) that provide expansion and contraction for at least 0.000078 inch per foot of length of straight run per deg F of temperature change for metal conduits.
4. Install expansion fittings at all locations where conduits cross building or structure expansion joints.
5. 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.

AA. 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.

BB. Mount boxes at heights indicated on Drawings. If mounting heights of boxes are not individually indicated, give priority to ADA requirements. Install boxes with height measured to center of box unless otherwise indicated.

CC. Recessed Boxes in Masonry Walls: Saw-cut opening for box in center of cell of masonry block, and install box flush with surface of wall. Prepare block surfaces to provide a flat surface for a raintight connection between box and cover plate or supported equipment and box.

DD. Horizontally separate boxes mounted on opposite sides of walls so they are not in the same vertical channel.

EE. Locate boxes so that cover or plate will not span different building finishes.

FF. Support boxes of three gangs or more from more than one side by spanning two framing members or mounting on brackets specifically designed for the purpose.

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

HH. Set metal floor boxes level and flush with finished floor surface.

II. Set nonmetallic floor boxes level. Trim after installation to fit flush with finished floor surface.

3.3 INSTALLATION OF UNDERGROUND CONDUIT

A. Direct-Buried Conduit:

1. Excavate trench bottom to provide firm and uniform support for conduit. Prepare trench bottom as specified in Section 312000 "Earth Moving" for pipe less than 6 inches in nominal diameter.
2. Install backfill as specified in Section 312000 "Earth Moving."
3. After installing conduit, backfill and compact. Start at tie-in point, and work toward end of conduit run, leaving conduit at end of run free to move with expansion and contraction as temperature changes during this process. Firmly hand tamp backfill around conduit to provide maximum supporting strength. After placing controlled backfill to within 12 inches of finished grade, make final conduit connection at end of run and complete backfilling with normal compaction as specified in Section 312000 "Earth Moving."
4. Install manufactured duct elbows for stub-ups at poles and equipment and at building entrances through floor unless otherwise indicated. Encase elbows for stub-up ducts throughout length of elbow.
5. Install manufactured rigid steel conduit elbows for stub-ups at poles and equipment and at building entrances through floor.
    a. Couple steel conduits to ducts with adapters designed for this purpose, and encase coupling with 3 inches of concrete for a minimum of 12 inches on each side of the coupling.
    b. For stub-ups at equipment mounted on outdoor concrete bases and where conduits penetrate building foundations, extend steel conduit horizontally a minimum of 60 inches from edge of foundation or equipment base. Install insulated grounding bushings on terminations at equipment.
6. Warning Planks: Bury warning planks approximately 12 inches above direct-buried conduits but a minimum of 6 inches below grade. Align planks along centerline of conduit.
7. Underground Warning Tape: Comply with requirements in Section "Identification for Electrical Systems."

3.4 SLEEVE AND SLEEVE-SEAL INSTALLATION FOR ELECTRICAL PENETRATIONS

A. RELATED DOCUMENTS

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

B. SUMMARY

1. Section Includes:

    a. Sleeves for raceway and cable penetration of non-fire-rated construction walls and floors.
    b. Sleeve-seal systems.
    c. Sleeve-seal fittings.
    d. Grout.
    e. Silicone sealants.

2. Related Requirements:

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

C. ACTION SUBMITTALS

1. Product Data: For each type of product.

D. PRODUCTS

1. SLEEVES

2. Wall Sleeves:

a. Steel Pipe Sleeves: ASTM A 53/A 53M, Type E, Grade B, Schedule 40, zinc coated, plain ends.

3. 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.

4. PVC-Pipe Sleeves: ASTM D 1785, Schedule 40.

E. SLEEVE-SEAL SYSTEMS

1. Description: Modular sealing device, designed for field assembly, to fill annular space between sleeve and raceway or cable.

a. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1) Advance Products & Systems, Inc.
2) Metraflex Company (The).
3) Pipeline Seal and Insulator, Inc.

b. Sealing Elements: EPDM rubber interlocking links shaped to fit surface of pipe. Include type and number required for pipe material and size of pipe.
c. Pressure Plates: Carbon steel.
d. Connecting Bolts and Nuts: Carbon steel, with corrosion-resistant coating, of length required to secure pressure plates to sealing elements.

F. SLEEVE-SEAL FITTINGS

1. Description: Manufactured plastic, sleeve-type, waterstop assembly made for embedding in concrete slab or wall. Unit shall have plastic or rubber waterstop collar with center opening to match piping OD.

a. Manufacturers: Subject to compliance with requirements, provide products by the following:

1) Emerson
2) Innerlynx, Eaton Crouse-Hinds, a Cooper Industries Company
3) Link-Seal, GPT an EnPro Industries Company
4) Metraflex

G. GROUT

1. Description: Nonshrink; recommended for interior and exterior sealing openings in non-fire-rated walls or floors.

2. Standard: ASTM C 1107/C 1107M, Grade B, post-hardening and volume-adjusting, dry, hydraulic-cement grout.

3. Design Mix: 5000-psi, 28-day compressive strength.

4. Packaging: Premixed and factory packaged.

H. SILICONE SEALANTS

1. Silicone Sealants: Single-component, silicone-based, neutral-curing elastomeric sealants of grade indicated below.

a. Grade: Pourable (self-leveling) formulation for openings in floors and other horizontal surfaces that are not fire rated.
b. Sealant shall have a VOC content of 50 g/L or less.

2. Silicone Foams: Multicomponent, silicone-based liquid elastomers that, when mixed, expand and cure in place to produce a flexible, nonshrinking foam.

I. EXECUTION

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.

2. Sleeves for Conduits Penetrating Non-Fire-Rated Gypsum Board Assemblies:

a. Use circular metal sleeves unless penetration arrangement requires rectangular sleeved opening.
b. Seal space outside of sleeves with approved joint compound for gypsum board assemblies.

3. Roof-Penetration Sleeves: Seal penetration of individual raceways and cables with flexible boot-type flashing units applied in coordination with roofing work.

4. Aboveground, Exterior-Wall Penetrations: Seal penetrations using steel pipe 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.

5. Underground, Exterior-Wall and Floor Penetrations: Install cast-iron pipe sleeves. Size sleeves to allow for 1-inch annular clear space between raceway or cable and sleeve for installing sleeve-seal system.

J. SLEEVE-SEAL-SYSTEM INSTALLATION

1. Install sleeve-seal systems in sleeves in exterior concrete walls and slabs-on-grade at raceway entries into building.

2. 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.

K. SLEEVE-SEAL-FITTING INSTALLATION

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

2. 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.

3. Secure nailing flanges to concrete forms.

4. Using grout, seal the space around outside of sleeve-seal fittings.

3.5 FIRESTOPPING

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

3.6 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 260553 - IDENTIFICATION FOR ELECTRICAL SYSTEMS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. Section Includes:

1. Color and legend requirements for raceways, conductors, and warning labels and signs.
2. Labels.
3. Bands and tubes.
4. Tapes and stencils.
5. Tags.
6. Signs.
7. Cable ties.
8. Paint for identification.
9. Fasteners for labels and signs.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product.

B. Samples: For each type of label and sign to illustrate composition, size, colors, lettering style, mounting provisions, and graphic features of identification products.

C. Delegated-Design Submittal: For arc-flash hazard study.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Comply with NFPA 70.

B. Comply with 29 CFR 1910.144 and 29 CFR 1910.145.

C. Comply with ANSI Z535.4 for safety signs and labels.

D. Comply with NFPA 70E and "Arc-Flash Hazard Analysis" requirements for arc-flash warning labels.

E. Adhesive-attached labeling materials, including label stocks, laminating adhesives, and inks used by label printers, shall comply with UL 969.

F. Thermal Movements: Allow for thermal movements from ambient and surface temperature changes.

1. Temperature Change: 120 deg F (67 deg C), ambient; 180 deg F (100 deg C), material surfaces.

2.2 COLOR AND LEGEND REQUIREMENTS

A. Raceways and Cables Carrying Circuits at 600 V or Less:

1. Black letters on a white field.
2. Legend: Indicate voltage and system or service type.

B. Color-Coding for Phase Identification, 600 V or Less: Use colors listed below for ungrounded service, feeder and branch-circuit conductors.

1. Color shall be factory applied or field applied for sizes larger than No. 8 AWG if authorities having jurisdiction permit.
2. Colors for 208/120-V Circuits:

    a. Phase A: Black.
    b. Phase B: Red.
    c. Phase C: Blue.

3. Colors for 480/277-V Circuits:

    a. Phase A: Brown.
    b. Phase B: Orange.
    c. Phase C: Yellow.

4. Color for Neutral: White or gray.
5. Color for Equipment Grounds: Bare copper, Green, or Green with a yellow stripe.

C. Warning Label Colors:

1. Identify system voltage with black letters on an orange background.

D. Warning labels and signs shall include, but are not limited to, the following legends:

1. Multiple Power Source Warning: "DANGER - ELECTRICAL SHOCK HAZARD - EQUIPMENT HAS MULTIPLE POWER SOURCES."
2. Workspace Clearance Warning: "WARNING - OSHA REGULATION - AREA IN FRONT OF ELECTRICAL EQUIPMENT MUST BE KEPT CLEAR FOR 36 INCHES ."

E. Equipment Identification Labels:

1. Black letters on a white field.

2.3 LABELS

A. Self-Adhesive Wraparound Labels: Preprinted, 3-mil thick, vinyl flexible label with acrylic pressure-sensitive adhesive.

1. Self-Lamination: Clear; UV-, weather- and chemical-resistant; self-laminating, protective shield over the legend. Labels sized such that the clear shield overlaps the entire printed legend.
2. Marker for Labels: Machine-printed, permanent, waterproof, black ink recommended by printer manufacturer.

B. Self-Adhesive Labels: Vinyl, thermal, transfer-printed, 3.5-mil thick, multicolor, weather- and UV-resistant, pressure-sensitive adhesive labels, configured for intended use and location.
1. Minimum Nominal Size:

a. 1-1/2 by 6 inches for raceway and conductors.
b. 4 by 6 inches for equipment fault current label.
c. 4 by 6 inches for arch flash warning label

2.4 BANDS AND TUBES

A. Snap-around, Color-Coding Bands: Slit, pretensioned, flexible, solid-colored acrylic sleeves, 2 inches long, with diameters sized to suit diameter and that stay in place by gripping action.

B. Heat-Shrink Preprinted Tubes: Flame-retardant polyolefin tubes with machine-printed identification labels, sized to suit diameters of and shrunk to fit firmly around item being identified. Full shrink recovery occurs at a maximum of 200 deg F. Comply with UL 224.

2.5 TAPES AND STENCILS

A. Marker Tapes: Vinyl or vinyl-cloth, self-adhesive wraparound type, with circuit identification legend machine printed by thermal transfer or equivalent process.

B. Self-Adhesive Vinyl Tape: Colored, heavy duty, waterproof, fade resistant; not less than 3 mils thick by 1 to 2 inches wide; compounded for outdoor use.

C. Tape and Stencil: 4-inch- wide black stripes on 10-inch centers placed diagonally over orange background and is 12 inches wide. Stop stripes at legends.

D. Floor Marking Tape: 2-inch- wide, 5-mil pressure-sensitive vinyl tape, with yellow and black stripes and clear vinyl overlay.

E. Underground-Line Warning Tape:

1. Tape:

a. Recommended by manufacturer for the method of installation and suitable to identify and locate underground electrical and communications lines.
b. Printing on tape shall be permanent and shall not be damaged by burial operations.

c. Tape material and ink shall be chemically inert and not subject to degradation when exposed to acids, alkalis, and other destructive substances commonly found in soils.

2. Color and Printing:

a. Comply with ANSI Z535.1, ANSI Z535.2, ANSI Z535.3, ANSI Z535.4, and ANSI Z535.5.
b. Inscriptions for Red-Colored Tapes: "ELECTRIC LINE, HIGH VOLTAGE"
c. Inscriptions for Orange-Colored Tapes: "TELEPHONE CABLE, CATV CABLE, COMMUNICATIONS CABLE, OPTICAL FIBER CABLE".

3. Description:

a. Detectable three-layer laminate, consisting of a printed pigmented polyolefin film, a solid aluminum-foil core, and a clear protective film that allows inspection of the continuity of the conductive core; bright colored, compounded for direct-burial service.
b. Width: 3 inches.
c. Overall Thickness: 5 mils.
d. Foil Core Thickness: 0.35 mil.
e. Weight: 28 lb/1000 sq. ft.
f. Tensile according to ASTM D882: 70 lbf and 4600 psi.

F. Stenciled Legend: In nonfading, waterproof, black ink or paint. Minimum letter height shall be 1 inch.

2.6 SIGNS

A. Baked-Enamel Signs:
1. Preprinted aluminum signs, high-intensity reflective, punched or drilled for fasteners, with colors, legend, and size required for application.
2. 1/4-inch grommets in corners for mounting.
3. Nominal Size: 7 by 10 inches.

B. Metal-Backed Butyrate Signs:
1. Weather-resistant, nonfading, preprinted, cellulose-acetate butyrate signs, with 0.0396-inch galvanized-steel backing, punched and drilled for fasteners, and with colors, legend, and size required for application.
2. 1/4-inch grommets in corners for mounting.
3. Nominal Size: 10 by 14 inches.

C. Laminated Acrylic or Melamine Plastic Signs:
1. Engraved legend.
2. Thickness:

a. For signs up to 20 sq. in., minimum 1/16 inch thick.
b. For signs larger than 20 sq. in., 1/8 inch thick.
c. Engraved legend with white letters on black face
d. Punched or drilled for mechanical fasteners with 1/4-inch grommets in corners for mounting.

e. Framed with mitered acrylic molding and arranged for attachment at applicable equipment.

2.7 CABLE TIES

A. General-Purpose Cable Ties: Fungus inert, self-extinguishing, one piece, self-locking, and Type 6/6 nylon.

1. Minimum Width: 3/16 inch (5 mm).
2. Tensile Strength at 73 Deg F (23 Deg C) according to ASTM D638: 12,000 psi (82.7 MPa).
3. Temperature Range: Minus 40 to plus 185 deg F (Minus 40 to plus 85 deg C).
4. Color: Black, except where used for color-coding.

B. UV-Stabilized Cable Ties: Fungus inert, designed for continuous exposure to exterior sunlight, self-extinguishing, one piece, self-locking, and Type 6/6 nylon.

1. Minimum Width: 3/16 inch (5 mm).
2. Tensile Strength at 73 Deg F (23 Deg C) according to ASTM D638: 12,000 psi (82.7 MPa).
3. Temperature Range: Minus 40 to plus 185 deg F (Minus 40 to plus 85 deg C).
4. Color: Black.

C. Plenum-Rated Cable Ties: Self-extinguishing, UV stabilized, one piece, and self-locking.

1. Minimum Width: 3/16 inch (5 mm).
2. Tensile Strength at 73 Deg F (23 Deg C) according to ASTM D638: 7000 psi (48.2 MPa).
3. UL 94 Flame Rating: 94V-0.
4. Temperature Range: Minus 50 to plus 284 deg F (Minus 46 to plus 140 deg C).
5. Color: Black.

2.8 MISCELLANEOUS IDENTIFICATION PRODUCTS

A. Paint: Comply with requirements in painting Sections for paint materials and application requirements. Retain paint system applicable for surface material and location (exterior or interior).

B. Fasteners for Labels and Signs: Self-tapping, stainless-steel screws or stainless-steel machine screws with nuts and flat and lock washers.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Verify and coordinate identification names, abbreviations, colors, and other features with requirements in other Sections requiring identification applications, Drawings, Shop Drawings, manufacturer's wiring diagrams, and operation and maintenance manual. Use consistent designations throughout Project.

B. Install identifying devices before installing acoustical ceilings and similar concealment.

C. Verify identity of each item before installing identification products.

D. Coordinate identification with Project Drawings, manufacturer's wiring diagrams, and operation and maintenance manual.

E. Apply identification devices to surfaces that require finish after completing finish work.

F. Install signs with approved legend to facilitate proper identification, operation, and maintenance of electrical systems and connected items.

G. Self-Adhesive Identification Products: Before applying electrical identification products, clean substrates of substances that could impair bond, using materials and methods recommended by manufacturer of identification product.

H. System Identification for Raceways and Cables under 600 V: Identification shall completely encircle cable or conduit. Place identification of two-color markings in contact, side by side.

1. Secure tight to surface of conductor, cable, or raceway.

I. Auxiliary Electrical Systems Conductor Identification: Identify field-installed alarm, control, and signal connections.

J. Emergency Operating Instruction Signs: Install instruction signs with white legend on a red background with minimum 3/8-inch- (10-mm-) high letters for emergency instructions at equipment used for power transfer and/or any emergency operations.

K. Elevated Components: Increase sizes of labels, signs, and letters to those appropriate for viewing from the floor.

L. Accessible Fittings for Raceways: Identify the covers of each junction and pull box of the following systems with the wiring system legend and system voltage. System legends shall be as follows:

1. "EMERGENCY POWER"
2. "POWER"
3. "UPS"
4. “LIFE SAFETY”

M. Self-Adhesive Wraparound Labels: Secure tight to surface of raceway or cable at a location with high visibility and accessibility.

N. Self-Adhesive Labels:

O. Snap-around Color-Coding Bands: Secure tight to surface at a location with high visibility and accessibility.

P. Heat-Shrink, Preprinted Tubes: Secure tight to surface at a location with high visibility and accessibility.

Q. Marker Tapes: Secure tight to surface at a location with high visibility and accessibility.

R. Self-Adhesive Vinyl Tape: Secure tight to surface at a location with high visibility and accessibility.

1. Field-Applied, Color-Coding Conductor Tape: Apply in half-lapped turns for a minimum distance of 6 inches (150 mm) where splices or taps are made. Apply last two turns of tape with no tension to prevent possible unwinding.

S. Tape and Stencil: Comply with requirements in painting Sections for surface preparation and paint application.

T. Floor Marking Tape: Apply stripes to finished surfaces following manufacturer's written instructions.

U. Underground Line Warning Tape:

1. During backfilling of trenches, install continuous underground-line warning tape directly above cable or raceway at 6 to 8 inches (150 to 200 mm) below finished grade. Use multiple tapes where width of multiple lines installed in a common trench or concrete envelope exceeds 16 inches (400 mm) overall.
2. Install underground-line warning tape for direct-buried cables and cables in raceways.

V. Write-on Tags:

1. Place in a location with high visibility and accessibility.

W. Baked-Enamel Signs:

1. Attach signs that are not self-adhesive type with mechanical fasteners appropriate to the location and substrate.
2. Unless otherwise indicated, provide a single line of text with 1/2-inch- (13-mm-) high letters on minimum 1-1/2-inch- (38-mm-) high sign; where two lines of text are required, use signs minimum 2 inches (50 mm) high.

X. Metal-Backed Butyrate Signs:

1. Attach signs that are not self-adhesive type with mechanical fasteners appropriate to the location and substrate.
2. Unless otherwise indicated, provide a single line of text with 1/2-inch- (13-mm-) high letters on minimum 1-1/2-inch- (38-mm-) high sign; where two lines of text are required, use signs minimum 2 inches (50 mm) high.

Y. Laminated Acrylic or Melamine Plastic Signs:

1. Attach signs and plastic labels that are not self-adhesive type with mechanical fasteners appropriate to the location and substrate.
2. Unless otherwise indicated, provide a single line of text with 1/2-inch- (13-mm-) high letters on minimum 1-1/2-inch- (38-mm-) high sign; where two lines of text are required, use signs minimum 2 inches (50 mm) high.

Z. Cable Ties: General purpose, for attaching tags, except as listed below:

1. Outdoors: UV-stabilized nylon.
2. In Spaces Handling Environmental Air: Plenum rated.

3.2 IDENTIFICATION SCHEDULE

A. Install identification materials and devices at locations for most convenient viewing without interference with operation and maintenance of equipment. Install access doors or panels to provide view of identifying devices.

B. Identify conductors, cables, and terminals in enclosures and at junctions, terminals, pull points, and locations of high visibility. Identify by system and circuit designation.

C. Accessible Raceways and Metal-Clad Cables, 600 V or Less, for Service, Feeder, and Branch Circuits, More Than 30 A and 120 V to Ground: Identify with self-adhesive raceway labels.

1. Locate identification at changes in direction, at penetrations of walls and floors, at 50-foot (15-m) maximum intervals in straight runs, and at 25-foot (7.6-m) maximum intervals in congested areas.

D. Accessible Fittings for Raceways and Cables within Buildings: Identify the covers of each junction and pull box of the following systems with self-adhesive labels containing the wiring system legend and system voltage. System legends shall be as follows:

1. "EMERGENCY POWER"
2. "POWER"
3. "UPS"
4. “LIFE SAFETY”

E. Power-Circuit Conductor Identification, 600 V or Less: For conductors in vaults, pull and junction boxes, manholes, and handholes, use self-adhesive wraparound labels to identify the phase.

1. Locate identification at changes in direction, at penetrations of walls and floors, at 50-foot (15-m) maximum intervals in straight runs, and at 25-foot (7.6-m) maximum intervals in congested areas.

F. Control-Circuit Conductor Identification: For conductors and cables in pull and junction boxes, manholes, and handholes, use write-on tags self-adhesive wraparound labels with the conductor or cable designation, origin, and destination.

G. Control-Circuit Conductor Termination Identification: For identification at terminations, provide heat-shrink preprinted tubes with the conductor designation.

H. Auxiliary Electrical Systems Conductor Identification: Self-adhesive vinyl tape that is uniform and consistent with system used by manufacturer for factory-installed connections.

1. Identify conductors, cables, and terminals in enclosures and at junctions, terminals, and pull points. Identify by system and circuit designation.

I. Locations of Underground Lines: Underground-line warning tape for power, lighting, communication, and control wiring and optical-fiber cable.

J. Workspace Indication: Apply floor marking tape and stencil] to finished surfaces. Show working clearances in the direction of access to live parts. Workspace shall comply with NFPA 70 and 29 CFR 1926.403 unless otherwise indicated. Do not install at flush-mounted panelboards and similar equipment in finished spaces.

K. Instructional Signs: Self-adhesive labels, including the color code for grounded and ungrounded conductors.

L. Warning Labels for Indoor Cabinets, Boxes, and Enclosures for Power and Lighting: Baked-enamel warning signs.

1. Apply to exterior of door, cover, or other access.
2. For equipment with multiple power or control sources, apply to door or cover of equipment, including, but not limited to, the following:

a. Power-transfer switches.
b. Controls with external control power connections.

M. Arc Flash Warning Labeling: Self-adhesive labels.

N. Operating Instruction Signs: Laminated acrylic or melamine plastic signs.

O. Emergency Operating Instruction Signs: Laminated acrylic or melamine plastic signs with white legend on a red background with minimum 3/8-inch- (10-mm-) high letters for emergency instructions at equipment used for power transfer and other emergency operations.

P. Equipment Identification Labels:

1. Indoor Equipment: Laminated acrylic or melamine plastic sign.
2. Outdoor Equipment: Laminated acrylic or melamine sign.

END OF SECTION 260553

SECTION 260923 - LIGHTING CONTROL DEVICES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. Section Includes:

1. Indoor occupancy and vacancy sensors.
2. Switchbox-mounted occupancy sensors.
3. Conductors and Cables

B. Related Requirements:

1. Section "Wiring Devices" for wall-box dimmers, and manual light switches.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product.

B. Shop Drawings:

1. Show installation details for the following:

a. Occupancy sensors.
b. Vacancy sensors.

2. Interconnection diagrams showing field-installed wiring.
3. Include diagrams for power, signal, and control wiring.

1.4 INFORMATIONAL SUBMITTALS

A. Sample Warranty: For manufacturer's warranties.

1.5 CLOSEOUT SUBMITTALS

A. Operation and Maintenance Data: For each type of lighting control device to include in operation and maintenance manuals.

1.6 WARRANTY

A. Manufacturer's Warranty: Manufacturer and Installer agree to replace lighting control devices that fail(s) in materials or workmanship within specified warranty period.

1. Failures include, but are not limited to, the following:

a. Faulty operation of lighting control software.
b. Faulty operation of lighting control devices.

2. Warranty Period: Two year(s) from date of Substantial Completion and consisting of a one for one device replacement.

PART 2 - PRODUCTS

2.1 INDOOR OCCUPANCY AND VACANCY SENSORS

A. General Requirements for Sensors:

1. Wall or Ceiling-mounted, solid-state indoor occupancy and vacancy sensors.
2. Passive infrared or Dual technology (as indicated on drawings).
3. Separate power pack.
4. Hardwired connection to switch.
5. Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.
6. Operation:

a. Occupancy Sensor: Unless otherwise indicated, turn lights on when coverage area is occupied, and turn them off when unoccupied; with a time delay for turning lights off, adjustable over a minimum range of 1 to 20 minutes.
b. Vacancy Sensor: Unless otherwise indicated, lights are manually turned on and sensor turns lights off when the room is unoccupied; with a time delay for turning lights off, adjustable over a minimum range of 1 to 20 minutes.

7. Sensor Output: Contacts rated to operate the connected relay, complying with UL 773A. Sensor is powered from the power pack.
8. Power: Integral photovoltaic collector.
9. Power Pack: Digital controller capable of accepting 2 RJ45 inputs with one or two (as indicated on the drawings) outputs rated for 10-A LED total load at 120- and 277-V ac and for 1 hp at 120-V ac. Sensor has 24-V dc Class 2 power source, as defined by NFPA 70.

a. Compatible with digital addressable lighting interface.
b. Plenum rated.

10. Mounting:

a. Sensor: Suitable for mounting in any position on a standard outlet box.

b. Relay: Externally mounted through a 1/2-inch (13-mm) knockout in a standard electrical enclosure.
c. Time-Delay and Sensitivity Adjustments: Recessed and concealed behind hinged door.

11. Indicator: Digital display, to show when motion is detected during testing and normal operation of sensor.
12. Bypass Switch: Override the "on" function in case of sensor failure.

B. Dual-Technology Type: Ceiling mounted; detect occupants in coverage area using PIR and ultrasonic detection methods. The particular technology or combination of technologies that control on-off functions is selectable in the field by operating controls on unit.

1. Sensitivity Adjustment: Separate for each sensing technology.
2. Detector Sensitivity: Detect occurrences of 6-inch- (150-mm-) minimum movement of any portion of a human body that presents a target of not less than 36 sq. in. (232 sq. cm), and detect a person of average size and weight moving not less than 12 inches (305 mm) in either a horizontal or a vertical manner at an approximate speed of 12 inches/s (305 mm/s).
3. Detection Coverage (Standard Room): Detect occupancy anywhere within a circular area of 2000 sq. ft. (186 sq. m) when mounted on a 96-inch- (2440-mm-) high ceiling.

2.2 SWITCHBOX-MOUNTED OCCUPANCY SENSORS

A. General Requirements for Sensors: Automatic-wall-switch occupancy sensor with manual on-off switch, suitable for mounting in a single gang switchbox using hardwired connection.

1. Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.
2. Occupancy Sensor Operation: Unless otherwise indicated, turn lights on when coverage area is occupied, and turn lights off when unoccupied; with a time delay for turning lights off, adjustable over a minimum range of 1 to 20 minutes.
3. Operating Ambient Conditions: Dry interior conditions, 32 to 120 deg F (0 to 49 deg C).
4. Switch Rating: Not less than 1000-VA LED load at 120 V, 1200-VA LED load at 277 V.

B. Wall-Switch Sensor:

1. Standard Range: 180-degree field of view, field adjustable from 180 to 40 degrees; with a minimum coverage area of 2100 sq. ft (196 sq. m).
2. Sensing Technology: Dual technology.
3. Switch Type: SP, manual "on," automatic "off."
4. Capable of controlling load in three-way application.
5. Voltage: Dual voltage - 120 and 277 V.
6. Concealed, field-adjustable, "off" time-delay selector at up to 20 minutes.
7. Color: Coordinate color of switch and faceplate requirements with Section “Wiring Devices”.

2.3 CONDUCTORS AND CABLES

A. Power Wiring to Supply Side of Remote-Control Power Sources: Not smaller than No. 12 AWG. Comply with requirements in Section "Low-Voltage Electrical Power Conductors and Cables."

B. Classes 2 and 3 Control Cable: Multiconductor cable with stranded-copper conductors not smaller than No. 18 AWG. Comply with requirements in Section "Low-Voltage Electrical Power Conductors and Cables."

C. Class 1 Control Cable: Multiconductor cable with stranded-copper conductors not smaller than No. 14 AWG. Comply with requirements in Section "Low-Voltage Electrical Power Conductors and Cables."

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine lighting control devices before installation. Reject lighting control devices that are wet, moisture damaged, or mold damaged.

B. Examine walls and ceilings for suitable conditions where lighting control devices will be installed.

C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 SENSOR INSTALLATION

A. Comply with NECA 1.

B. Coordinate layout and installation of ceiling-mounted devices with other construction that penetrates ceilings or is supported by them, including light fixtures, HVAC equipment, smoke detectors, fire-suppression systems, and partition assemblies.

C. Install and aim sensors in locations to achieve not less than 90 percent coverage of areas indicated. Do not exceed coverage limits specified in manufacturer's written instructions.

3.3 WIRING INSTALLATION

A. Comply with NECA 1.

B. Wiring Method: Comply with Section "Low-Voltage Electrical Power Conductors and Cables." Minimum conduit size is 1/2 inch (13 mm) when installed in inaccessible spaces. Utilizing adjacent line voltage power conduit is acceptable providing that insulation requirements are maintained (600V). Exposed conductors in accessible spaces is acceptable when proper cabling installation techniques are utilized.

C. Wiring within Enclosures: Comply with NECA 1. Separate power-limited and nonpower-limited conductors according to conductor manufacturer's written instructions.

D. Size conductors according to lighting control device manufacturer's written instructions unless otherwise indicated.

E. Splices, Taps, and Terminations: Make connections only on numbered terminal strips in junction, pull, and outlet boxes; terminal cabinets; and equipment enclosures.

F. Provide written or computer-generated documentation on the configuration of the system including room by room description including:
1. Sensor parameters, time delays, and sensitivities.
2. Sequence of operation, (e.g. manual ON, Auto OFF. etc.)
3. Load Parameters (e.g. blink warning, etc.)

3.4 IDENTIFICATION

A. Identify components and power and control wiring according to Section "Identification for Electrical Systems."

1. Identify circuits or luminaires controlled by photoelectric and occupancy sensors at each sensor.

3.5 FIELD QUALITY CONTROL

A. Tests and Inspections: Perform the following inspections and prepare reports.

1. Verify Class I and II wiring connections are terminated properly by validating system performance.
2. Verify / complete task programming for all switches, dimmers, and sensors.
3. Verify that the control of each space complies with the Sequence of Operation.
4. Correct any system issues and retest.

B. Lighting control devices will be considered defective if they do not pass tests and inspections.

C. Provide a report in table format with drawings or using a software file that can be opened in the manufacturer's system software including each room or space that has lighting control installed. Indicate the following:

1. Date of test or inspection.
2. Loads per space, or Fixture Address identification.
3. Quantity and Type of each device installed
4. Reports providing each device's settings.

3.6 ADJUSTING

A. Occupancy Adjustments: When requested within 12 months from date of Substantial Completion, provide on-site assistance in adjusting lighting control devices to suit actual

occupied conditions. Provide up to two visits to Project during other-than-normal occupancy hours for this purpose.

1. For occupancy and motion sensors, verify operation at outer limits of detector range. Set time delay to suit Owner's operations.

3.7 DEMONSTRATION

A. Before Substantial Completion, arrange and provide a one-day Owner instruction period to designated Owner personnel. Set-up, starting of the lighting control system and Owner instruction includes:

1. Confirmation of entire system operation and communication to each device.
2. Confirmation of operation of individual relays, switches, and sensors.
3. Confirmation of system Programming, override settings, etc.
4. Provide training to cover installation, programming, operation, and troubleshooting of the lighting control system.

3.8 PRODUCT SUPPORT AND SERVICE

A. Factory telephone support shall be available at no cost to the Owner following acceptance. Factory assistance shall consist of assistance in solving application issues pertaining to the control equipment.

END OF SECTION 260923

SECTION 262726 - WIRING DEVICES

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. GFCI receptacles, 125 V, 20 A.
2. Toggle switches.
3. Wall plates.

1.2 ACTION SUBMITTALS

A. Product Data: For each type of product.

B. Shop Drawings: List of legends and description of materials and process used for premarking wall plates.

C. Samples: One for each type of device and wall plate specified, in each color specified.

1.3 INFORMATIONAL SUBMITTALS

A. Field quality-control reports.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Subject to compliance with requirements, provide products by one of the following:

B. Wiring Devices:

1. Bryant Electric, Inc., Hubbell Subsidiary.
2. Eagle Electric Manufacturing Co.
3. Hubbell Incorporated; Wiring Device-Kellems.
4. Leviton Mfg Company
5. Pass & Seymour/Legrand; Wiring Devices Div.

2.2 GENERAL WIRING-DEVICE REQUIREMENTS

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

B. Comply with NFPA 70.

C. RoHS compliant.

D. Comply with NEMA WD 1.

E. Device Color:

1. Wiring Devices Connected to Normal Power System: As selected by Architect unless otherwise indicated or required by NFPA 70 or device listing.
2. SPD Devices: Blue.

F. Wall Plate Color: For plastic covers, match device color.

G. Source Limitations: Obtain each type of wiring device and associated wall plate from single source from single manufacturer.

2.3 GFCI RECEPTACLES, 125 V, 20 A

A. Weather-Resistant, GFCI Duplex Receptacles, 125 V, 20 A:

1. Description: Integral GFCI with "Test" and "Reset" buttons and LED indicator light. Two pole, three wire, and self-grounding.
2. Configuration: NEMA WD 6, Configuration 5-20R.
3. Type: Feed through.
4. Standards: Comply with UL 498 and UL 943 Class A.
5. Marking: Listed and labeled as complying with NFPA 70, "Receptacles in Damp or Wet Locations" article.

2.4 TOGGLE SWITCHES, 120/277 V, 20 A

A. Two-Pole Switches, 120/277 V, 20 A: Comply with UL 20 and FS W-S-896.

B. Three-Way Switches, 120/277 V, 20 A: Comply with UL 20 and FS W-S-896.

2.5 WALL PLATES

A. Single Source: Obtain wall plates from same manufacturer of wiring devices.

B. Single and combination types shall match corresponding wiring devices.

1. Plate-Securing Screws: Metal with head color to match plate finish.
2. Material for Finished Spaces: 0.035-inch- (1-mm-) thick, satin-finished, Type 302 stainless steel.
3. Material for Unfinished Spaces: Galvanized steel
4. Material for Damp Locations: Cast aluminum with spring-loaded lift cover, and listed and labeled for use in wet and damp locations.

C. Wet-Location, Weatherproof Cover Plates: NEMA 250, complying with Type 3R, weather-resistant thermoplastic with lockable while in-use cover.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Comply with NECA 1, including mounting heights listed in that standard, unless otherwise indicated.

B. Coordination with Other Trades:

1. Keep outlet boxes free of plaster, drywall joint compound, mortar, cement, concrete, dust, paint, and other material that may contaminate the raceway system, conductors, and cables.
2. Install device boxes in brick or block walls so that the cover plate does not cross a joint unless the joint is troweled flush with the face of the wall.
3. Install wiring devices after all wall preparation, including painting, is complete.

C. Device Installation:

1. Connect devices to branch circuits using pigtails that are not less than 6 inches (152 mm) in length.
2. When mounting into metal boxes, remove the fiber or plastic washers used to hold device-mounting screws in yokes, allowing metal-to-metal contact.

D. Receptacle Orientation:

1. Install ground pin of vertically mounted receptacles down, and on horizontally mounted receptacles to the right.

E. Device Plates: Do not use oversized or extra-deep plates. Repair wall finishes and remount outlet boxes when standard device plates do not fit flush or do not cover rough wall opening.

F. Arrangement of Devices: Unless otherwise indicated, mount flush, with long dimension vertical and with grounding terminal of receptacles on bottom. Group adjacent switches under single, multigang wall plates.

3.2 FIELD QUALITY CONTROL

A. Perform the following tests and inspections:

1. In healthcare facilities, prepare reports that comply with NFPA 99.
2. Test Instruments: Use instruments that comply with UL 1436.
3. Test Instrument for Receptacles: Digital wiring analyzer with digital readout or illuminated digital-display indicators of measurement.

B. Tests for Receptacles:

1. Line Voltage: Acceptable range is 105 to 132 V.

2. Percent Voltage Drop under 15-A Load: A value of 6 percent or higher is unacceptable.
3. Ground Impedance: Values of up to 2 ohms are acceptable.
4. GFCI Trip: Test for tripping values specified in UL 1436 and UL 943.
5. Using the test plug, verify that the device and its outlet box are securely mounted.

C. Test straight-blade for the retention force of the grounding blade according to NFPA 99. Retention force shall be not less than 4 oz. (115 g).

D. Wiring device will be considered defective if it does not pass tests and inspections.

E. Prepare test and inspection reports.

END OF SECTION 262726