



HURST-ROSCHE, INC.

**PROJECT MANUAL FOR**

CAFETERIA BUILDING HVAC REPLACEMENT  
HILLSBORO HIGH SCHOOL  
HILLSBORO C.U.S.D. NO. 3  
HILLSBORO, MONTGOMERY COUNTY, ILLINOIS  
HR # 150-0095

**Prepared for**

Hillsboro C.U.S.D. No. 3  
1311 Vandalia Road  
Hillsboro, Montgomery County, Illinois

February 10, 2025

Bid Package No. \_\_\_\_\_

**HURST-ROSCHE INC.**

1400 E. Tremont Street

Hillsboro, Illinois 62049

217 / 532-3959



DOCUMENT 000110 - TABLE OF CONTENTS

CAFETERIA BUILDING HVAC REPLACEMENT  
HILLSBORO HIGH SCHOOL  
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Section Title

PROCUREMENT AND CONTRACTION REQUIREMENTS GROUP  
DIVISION 00 - PROCUREMENT AND CONTRACTING REQUIREMENTS  
INTRODUCTORY INFORMATION

000110 Table of Contents.....000110-1-3

PROCUREMENT REQUIREMENTS

001116 Invitation to Bid.....001116-1-2  
002114 Instructions to Bidders – AIA.....002114-1-7  
004113 Bid Form - Stipulated Sum (Single-Prime Contract).....004113-1-5  
004300 Procurement Form Supplements.....004300-1-3

CONTRACTING REQUIREMENTS

005214 Agreement Form - AIA Stipulated Sum (Single-Prime Contract).....005214-1-4  
006400 Contractor’s Affidavit for Final Completion .....006400-1-1  
006450 Waiver of Lien.....006450-1-1  
006500 Affidavit of Payment to Material Suppliers and Subcontractors .....006500-1-1  
006550 Consent of Surety Company to Final Payment.....006550-1-1  
007214 General Conditions - AIA Stipulated Sum (Single-Prime Contract).....007214-1-1  
007313 Supplementary Conditions – AIA.....007313-1-6  
008250 Prevailing Rate of Wages.....008250-1-6  
008600 Drawings, Schedules, and Details.....008600-1-1

SPECIFICATIONS GROUP  
GENERAL REQUIREMENTS SUBGROUP  
DIVISION 01 - GENERAL REQUIREMENTS

011000 Summary.....011000-1-4  
012000 Price and Payment Procedures.....012000-1-4  
013000 Administrative Requirements .....013000-1-4  
013300 Submittal Procedures .....013300-1-5  
014000 Quality Requirements .....014000-1-2  
015000 Temporary Facilities and Controls.....015000-1-3  
016000 Product Requirements .....016000-1-3  
017000 Execution and Closeout Requirements .....017000-1-5

FACILITY CONSTRUCTION SUBGROUP

DIVISION 04 – MASONRY

04 05 03	Masonry Mortaring and Grouting.....	04 05 03-1-4
04 20 00	Unit Masonry.....	04 20 00-1-7

DIVISION 07 – THERMAL AND MOISTURE PROTECTION

07 90 00	Joint Sealants.....	07 90 00-1-6
----------	---------------------	--------------

DIVISION 09 – FINISHES

09 21 16	Gypsum Board Assemblies.....	09 21 16-1-4
09 51 23	Acoustical Tile Ceilings.....	09 51 23-1-5
09 90 00	Painting and Coating.....	09 90 00-1-6

DIVISION 23 – HVAC

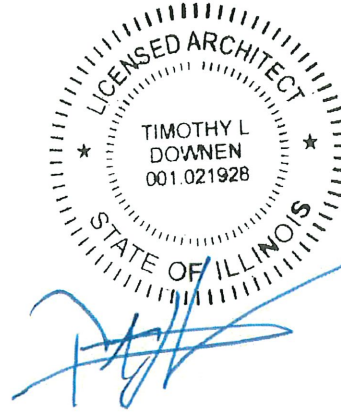
23 05 29	Hangers and Supports for HVAC Piping and Equipment.....	23 05 29-1-7
23 05 48	Vibration and Seismic Controls for HVAC Piping and Equipment .....	23 05 48-1-5
23 05 53	Identification for HVAC Piping and Equipment .....	23 05 53-1-3
23 05 93	Testing, Adjusting, and Balancing for HVAC.....	23 05 93-1-9
23 07 00	HVAC Insulation .....	23 07 00-1-7
23 21 13	Hydronic Piping.....	23 21 13-1-7
23 21 16	Hydronic Piping Specialties.....	23 21 16-1-5
23 25 00	HVAC Water Treatment.....	23 25 00-1-3
23 31 00	HVAC Ducts and Casings .....	23 31 00-1-6
23 33 00	Air Duct Accessories .....	23 33 00-1-4
23 37 00	Air Outlets and Inlets.....	23 37 00-1-3
23 81 03	Packaged Rooftop Air Conditioning Units – Small Capacity.....	23 81 03-1-6

DIVISION 26 – ELECTRICAL

26 05 19	Low-Voltage Electrical Power Conductors and Cables.....	26 05 19-1-4
26 05 26	Grounding and Bonding for Electrical Systems .....	26 05 26-1-2
26 05 29	Hangers and Supports for Electrical Systems.....	26 05 29-1-3
26 05 33	Raceway and Boxes for Electrical Systems.....	26 05 33-1-3
26 24 16	Panelboards.....	26 24 16-1-3

SPECIFIERS:

ARCHITECTURE: Timothy L. Downen, AIA, LEED AP



Date: 2/10/2025  
Expires: 11/30/2026

HVAC/ELECT.: Mark A. Ritter, PE



Date: 2/10/2025  
Expires: 11/30/2025

END OF SECTION



DOCUMENT 001116 - INVITATION TO BID

Project: **CAFETERIA BUILDING HVAC REPLACEMENT  
HILLSBORO HIGH SCHOOL  
HILLSBORO C.U.S.D. NO. 3  
HILLSBORO, MONTGOMERY COUNTY, ILLINOIS  
HR # 150-1952**

Owner: **HILLSBORO C.U.S.D. NO. 3  
1311 VANDALIA ROAD  
HILLSBORO, ILLINOIS 62049**

Architect/Engineer: **HURST-ROSCHE, INC.  
1400 E. TREMONT ST.  
HILLSBORO, ILLINOIS 62049**

Date: **February 10, 2025**

The Owner will receive Bids until 2:00 PM local prevailing time on Thursday, the 6th day of March 2025, at Hillsboro CUSD No. 3 Unit Office, 1311 Vandalia Road, Hillsboro Illinois for the following work:

**SCOPE OF WORK:**

BASE BID: Work includes abandoning of existing boilers, demolition of existing exterior boiler stack and removal of existing hydronic piping at existing boilers, as well as hydronic piping to reconnect existing loop to piping roughed-in as part of a separate new construction project. Work also includes split system equipment to provide cooling in the kitchen and roof top units to provide cooling in classrooms and library. Architectural, roofing and electrical work are commensurate with the HVAC scope of work.

ALTERNATE BID #1: Work includes the demolition and removal of existing boilers.

Contractor will be responsible for ordering equipment and all materials immediately after contract execution and shop drawing approvals, regardless of the first day available for construction. Contractor will be responsible for storing and insuring equipment and materials until the first day available for construction (approximately June 1, 2025). See Section 01 20 00 for additional information.

A Pre-bid Meeting will be held on Wednesday, February 19, 2025, at 2:00 PM, prevailing time, at Hillsboro C.U.S.D. No. 3 Unit Office, 1311 Vandalia Road, Hillsboro, Illinois.

Drawings and specifications may be obtained at the office of Hurst-Rosche, Inc., 1400 E. Tremont St., Hillsboro, Illinois, after February 10, 2025, by paying a non-refundable amount of \$30.00 (\$40.00 if mailed) for each set of drawings and specifications.

Bidding Documents, Drawings and Specifications, may be examined by prospective bidders and material suppliers at the offices of Hurst-Rosche, Inc., 1400 E. Tremont St., Hillsboro, Illinois, and the following Plan Rooms:

Central Illinois Plan Room, 1620 S. 5<sup>th</sup> Street, Springfield, IL 62703  
Greater Peoria Contractors & Suppliers Association, 1811 West Altorfer Drive, Peoria, IL 61615  
McGraw Hill Construction, [www.dodgeprojects.construction.com](http://www.dodgeprojects.construction.com)  
Southern Illinois Builders Association, 1468 Green Mount Road, O'Fallon, IL 62269

Drawings and specifications will be available for viewing on the internet at: [www.hurst-rosche.com](http://www.hurst-rosche.com). The documents are being provided for reference purposes only. Bidders are encouraged to obtain a signed and sealed hard copy set of the bidding documents. At a minimum, bidders must obtain clean copies of bid forms from the offices of Hurst-Rosche Inc. by paying a non-refundable amount of \$10.00 to submit a bid for this project.

The Owner requires the project to be substantially completed by August 8, 2025.

Bidders will be required to provide bid security of a sum no less than 10 percent of the bid sum. The bid security shall be either certified check, cashier's check, bank money order or bid bond issued by surety licensed to conduct business in the State of Illinois. Hereinafter this bid security shall be referred to as the bid bond.

Submit two copies of your bid on the bid form provided. Bidders may supplement this form as appropriate. Equipment providers to submit two copies of pricing break down on company letterhead, acknowledging any issued addenda, signed by authorized officer of company and must include all submittals indicated in the mechanical specifications.

Your bid or equipment pricing will be required to be submitted under a condition of irrevocability for a period of 45 days after submission.

The owner reserves the right to accept or reject any or all bids or any part thereof, to waive any informality in bidding, and to accept bids deemed most favorable to the owner.

**HILLSBORO C.U.S.D. NO. 3**

**MR. DAVID POWELL, SUPERINTENDENT**

END OF DOCUMENT



## DOCUMENT 002114 - INSTRUCTIONS TO BIDDERS - AIA

### 1.1 SUMMARY

- A. Document Includes:
  - 1. Instructions to Bidders.
  - 2. Site examination.
  - 3. Prebid conference.
- B. Related Documents:
  - 1. Document 001116 - Invitation To Bid.
  - 2. Document 004113 - Bid Form - Stipulated Sum.
  - 3. Document 007214 - General Conditions – AIA Stipulated Sum.
  - 4. Document 007313 - Supplementary Conditions – AIA.

### 1.2 INSTRUCTIONS TO BIDDERS

- A. These Instructions to Bidders amend or supplement AIA Document A701-1997 - Instructions to Bidders and other provisions of Bidding Documents and Contract Documents.
- B. To be considered all bids must be in accordance with these Instructions to Bidders.
- C. Bidders are encouraged to obtain a signed and sealed hard copy set of the bidding documents by paying a non-refundable amount of \$30.00 (\$40.00 if mailed). At a minimum, bidders must obtain clean copies of bid forms by paying a non-refundable amount of \$10.00 to submit a bid for this project.

### 1.3 SITE EXAMINATION

- A. Bidders shall carefully examine documents and construction site to obtain first-hand knowledge of existing conditions. Contractors will not be given extra payments for conditions which can be determined by examining site and these documents.
- B. Contact Mr. Fred Butler at the following phone number to arrange date and time to visit Project site:
  - 1. Telephone: (217) 254-8723.
- C. A visit to Project site has been arranged for Bidders following the Pre-Bid Meeting at 2:00 PM on February 19, 2025.

1.4 THE SCHEDULE FOR BIDDING THIS PROJECT IS AS FOLLOWS

- A. **Plans Available:** Monday, Monday 10, 2025
- B. **Pre-Bid Meeting:** Wednesday, February 19, 2025  
2:00 PM  
1311 Vandalia Rd.  
Hillsboro, IL 62049
- C. **Latest Time to Submit Request for Interpretation** Thursday, February 27, 2025
- D. **Latest Time to Issue an Addendum:** Monday, March 3, 2025
- E. **Bid Opening:** Thursday, March 6, 2025  
2:00 PM  
1311 Vandalia Rd.  
Hillsboro, IL 62049
- F. **Potential Award:** Tuesday, March 11, 2025
- G. All requests for interpretations shall be in writing via mail or e-mail addressed to the Architect/Engineer. All questions must be submitted on the “Request for Interpretation Pre-Bid Question and Comment Form” included at the end of this section, and questions not submitted in accordance with this form and specified time frame will not be accepted. Any and all interpretations and supplemental instructions will be made by addendum to the Drawings and Specifications and forwarded to all bidders either by mail or e-mail transmittal. All responses by the Architect/Engineer must be in writing to be binding. Any response general in nature or affecting these Instructions to Bidders shall be sent via addendum as previously described. All bidders are required to return the signature page of the addendum signed to the Architect within 24 hours after receipt. Failure of any bidder to receive any such addendum or interpretations shall not relieve such bidder from an obligation under the bid as submitted. All addenda so issued shall become part of the Contract Documents. Oral interpretations, changes or corrections will not be binding, and Bidders shall not rely upon such interpretations, changes and corrections. Each Bidder shall ascertain prior to submitting Bid that all addenda issued have been received and shall acknowledge receipt in Bid.  
**Questions shall be directed to:**  
**e-mail: [tdownen@hurst-rosche.com](mailto:tdownen@hurst-rosche.com)**
- H. Bids shall be made on unaltered Bid Forms furnished by the Architect. Fill in all blank spaces and submit two (2) copies. Bids shall be signed with name typed below signature. Where bidder is a corporation, bids must be signed with legal name of corporation followed by name of state of incorporation and legal signature of an officer authorized to bind the corporation to a contract.

- I. Each bidder shall designate on the attached bid form one person who shall serve as the bidder's contact person for all matters pertaining to the bid. In absence of such designation, the person who signs the bid shall be deemed the bidder contact.
- J. For those projects which are bid on a unit price basis, in the event in which a bidder does not fill out the extension of the unit price, or a math error has occurred in calculation, the unit prices listed shall govern.
- K. Each Bid shall be accompanied by bid security made payable to the Owner, in the amount of ten percent (10%) of the bid sum. Security shall be either certified check, cashier's check, bank money order or bid bond issued by surety licensed to conduct business in the State of Illinois. Successful bidder's security will be retained until he has signed the contract and furnished required payment and performance bonds. Owner reserves the right to retain security of the next two (2) lowest bidders until the lowest bidder enters into contract or until thirty (30) 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, Owner will retain bid security as liquidated damages, but not as a penalty.
- L. All costs associated with the preparation and submission of a bid are the sole responsibility of the bidder. These costs shall not be chargeable to the Owner by any successful or unsuccessful bidder. All bids become the property of the Owner and shall not be returned except in the case of a late submission.
- M. Simultaneously, with delivery of the executed contract, the successful bidder, at its own expense, shall furnish surety in the form of a performance bond and a labor and material payment bond in the amount of one hundred percent (100%) of the contract amount. Surety for such bonds shall be a company duly authorized and licensed in the State of Illinois and acceptable to the Owner. The Attorney-In-Fact who signs bid bonds or contract bonds must file with each bond a certified and effectively dated copy of their power of attorney.
- N. All copies of the bid, bid security and any other documents required to be submitted with bid shall be enclosed in a sealed opaque envelope. Envelope shall be addressed to **Hillsboro C.U.S.D. No. 3, Unit Office, 1311 Vandalia Rd., Hillsboro, Illinois 62049**, and shall be identified with project name, bidder's name and address. Mailed bid envelopes shall be enclosed in a separate mailing envelope with the notation "SEALED BID ENCLOSED" on the face thereof. Oral, telephonic or telegraphic Bids are invalid and will not receive consideration. Bids shall be deposited at the location designated in the Invitation to Bid prior to time and date designated for opening, or any extension thereof made by addendum. Bidder shall assume full responsibility for timely delivery at location designated for receipt of Bids. Bids received after time and date for receipt of bids will be returned unopened.

- O. A Bid may not be modified, withdrawn or canceled during the forty-five (45) days immediately following bid opening, and each bidder so agrees in submitting his Bid. Any bidder may withdraw, cancel or modify its bid, at any time prior to scheduled time for opening of bids, by letter or telegram actually received by Owner prior to bid time, or, with proper identification, by personally securing bid submitted; if by telegram, written confirmation over signature of bidder shall be mailed and postmarked on or before date and time of bid opening. Withdrawn bids may be resubmitted up to bid opening time provided that they are in full compliance with these Instructions to Bidders.
- P. Protests
1. Any bidder who submitted a bid and believes the bid was improperly rejected or that the bid selected by the Owner is not in the best interest of the Owner may submit a written notice of intent to protest the bid to the Owner within seven (7) days. The Owner shall consider all protests before execution of a contract. Each protest must specify the reasons supporting the protest. The Owner may require that additional information be provided. Failure to supply such required information shall be cause for dismissal of the protest.
  2. The Owner shall immediately investigate the allegations against the Owners actions and shall issue a written response to the protest.
  3. This provision allowing for the submission of protest shall not confer any right on any bidder but is intended solely to assist the Owner in determining the best responsible bid.
- Q. Any complaint or protest of the bidding procedure must be filed by the bidder to the Owner. Within 7 days of bid opening the bidder shall notify the Owner in writing of his intent to protest bidding. The bidder shall perfect this notice of intent within 7 days.
- R. Owner reserves right to disqualify bids and bidders, before or after opening, upon evidence of collusion with intent to defraud or other illegal practices upon part of bidder, lack of responsibility as evidenced by poor workmanship and progress of past work, incomplete work which, in judgment of Owner, might hinder or prevent prompt completion of additional work if awarded, for being in arrears on existing contracts, in litigation with the Owner, or having defaulted on a previous contract.
- S. Bidder's attention is directed to the fact that all Federal and Illinois State Laws, municipal ordinances and regulations of any and all authority having jurisdiction over construction of the project shall apply to the contract throughout, and they will be deemed to be included in the contract the same as though herein written out in full. Successful Bidders shall be required to comply with 775 ILCS 10 concerning equal employment opportunities; comply with 30 ILCS 570 concerning the employment of citizens of the State of Illinois; comply with 820 ILCS 265 concerning substance abuse prevention on public works projects; and comply with 820 ILCS 130 concerning prevailing wages.
- T. Any successful bidder that is a corporation organized in a state other than Illinois shall furnish to the Owner, upon request, a properly certified copy of its current Certificate of Authority to do business in the State of Illinois, such certificate is to remain on file with the Owner.

- U. Any successful bidder that is a corporation organized in the State of Illinois shall furnish at its own cost to the Owner, if requested, a Certificate of Good Standing issued by the Secretary of State, such certificate is to remain on file with the Owner.
- V. Owner is exempt from payment of Federal & Illinois Department of Revenue's Use and Sales Tax on material entering permanently into structure. Retail sales tax shall not be included in the bid amount.
- W. Bids will be opened as announced in Invitation for Bids.
- X. Owner reserves the right to reject any or all bids or any part thereof, to waive any informalities in bidding and to accept bids deemed most favorable to the Owner.
- Y. Notwithstanding any delay in preparation and execution of the formal Contract Agreement, each bidder shall be prepared, upon written notice of bid acceptance, to commence work within ten (10) days following receipt of official written Notice to Proceed, or on date stipulated in such notice.
- Z. Any work in providing or preparing to provide the services specified herein that is commenced by the successful bidder prior to execution of a written contract agreement shall be at the bidder's expense.
- AA. Accepted bidder shall assist and cooperate with the Owner in preparing the formal Contract Agreement, and, within fifteen (15) days following its presentation, shall execute same and return it to Owner.
- BB. The first day of construction is approximately June 1, 2025. The Owner requires the project to be substantially completed by August 8, 2025.
- CC. Contractor will be responsible for ordering equipment and all materials immediately after contract execution and shop drawing approvals, regardless of the first day available for construction. Contractor will be responsible for storing and insuring equipment and materials until the first day available for construction (approximately June 1, 2025). See Section 01 20 00 for additional information.

## 1.5 REQUIRED CONTRACTOR/SUBCONTRACTOR BACKGROUND SCREENING

- A. Hillsboro C.U.S.D. No. 3 requires background screening to be completed on all contractor/subcontractor employees. All employees must have documentation that a background screening has been completed on them prior to working on any district projects. All costs associated with the background screening are to be the responsibility of the contractor. The background screening must be conducted by a company acceptable to the Hillsboro C.U.S.D. No. 3
- B. All contractor/subcontractor employees working on the school grounds of Hillsboro C.U.S.D. No. 3 are required to submit to background screening. Each employee must complete, sign, and date the Consent and Waiver Release form. These forms will be submitted and the applicant cleared before the applicant may work on any part of the school grounds.
- C. The contractor is responsible for submitting the forms to a company acceptable to the Hillsboro C.U.S.D. No. 3, and for any costs involved in the screening. All information received as a result of a background check will be strictly confidential. A notice of automatic disqualification will be sent to the hiring or using entity. After the screenings, the contractor is also responsible for sending Hillsboro C.U.S.D. No. 3 copies of approved background checks for their records.

END OF DOCUMENT







DOCUMENT 004113 - BID FORM - STIPULATED SUM

To: **HILLSBORO C.U.S.D. NO. 3**  
**1311 VANDALIA ROAD**  
**HILLSBORO, ILLINOIS 62049**

Project: **CAFETERIA BUILDING HVAC REPLACEMENT**  
**HILLSBORO HIGH SCHOOL**  
**HILLSBORO C.U.S.D. NO. 3**  
**HILLSBORO, MONTGOMERY COUNTY, ILLINOIS**  
**HR # 150-0095**

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

Submitted by: \_\_\_\_\_  
(full name)

(full address) \_\_\_\_\_

Contact Name: \_\_\_\_\_

1. OFFER

Having examined the Place of The Work and all matters referred to in the Instructions to Bidders and the Contract Documents prepared by Hurst-Rosche, Inc. for the above mentioned project, we, the undersigned, hereby offer to enter into a Contract to perform the Work for the Sum of \_\_\_\_\_ dollars, (\$ \_\_\_\_\_), in lawful money of the United States of America.

We have included the bid security as required by the Instruction to Bidders.

All applicable federal taxes are excluded and State of Illinois and City of Hillsboro taxes are excluded from the Bid Sum.

2. REVIEW OF BID DOCUMENTS

The bidder represents that he is skilled and experienced in the use and interpretation of drawings and specifications such as those included in the bid documents for this contract. He has carefully reviewed the drawings, specifications and other bid documents, and has found them free of ambiguities and sufficient for bid purposes. Further, the Bidder has carefully examined the site of the work and, from his own observations, has satisfied himself as to the nature and location of the work; the character, quality and quantity of materials; the difficulties likely to be encountered; and any other items which may affect the performance of the Work. He has based his bid solely on these documents and observations and has not relied in any way on any explanation or interpretation, oral or written, from any other source.

3. CONTRACTOR'S FEE FOR CHANGES IN WORK

Undersigned herein indicates a single percentage, not to exceed **12%** for own forces and not to exceed **8%** for subcontractors, for overhead and profit to be added to net extra job cost for changes in the work required to be performed by:

a) Own Forces \_\_\_%                      b) Subcontractors \_\_\_%

Undersigned herein indicates a single percentage, not less than **10%** for own forces and not less than **5%** for subcontractors, for overhead and profit to be added to net credit for job costs for changes in the work required to be performed by:

a) Own Forces \_\_\_%                      b) Subcontractors \_\_\_%

Percentages named above shall not include any items of insurance, bond or taxes since these are considered job cost items in contractor's quotations for changes in the work.

Any percentages indicated which are higher or lower than the maximum or minimum in the typewritten language herewith, shall be disregarded and typewritten figure used.

4. CONTRACT TIME

Undersigned agrees that, if awarded the Contract for Work bid upon herein, work will start on date designated by the Owner and will be completed in accordance with the contract documents, with all phases of work completed and operational and ready for acceptance by the Owner no later than as required by the Contract Agreement.

6. ADDENDA

The following Addenda have been received. The modifications to the Bid Documents noted below have been considered and all costs are included in the Bid Sum.

Addendum # \_\_\_\_\_ Dated \_\_\_\_\_; Addendum # \_\_\_\_\_ Dated \_\_\_\_\_  
Addendum # \_\_\_\_\_ Dated \_\_\_\_\_; Addendum # \_\_\_\_\_ Dated \_\_\_\_\_

7. APPENDICES

The following documents are attached to and made a condition of the Bid:

Bid Surety in the form of \_\_\_\_\_  
Document 004300 - Procurement Form Supplements including:  
Appendix A - List of Subcontractors.  
Appendix B - List of Alternates.

8. EQUAL EMPLOYMENT OPPORTUNITY

During performance of this contract, Contractor agrees as follows:

- a. The contractor will not discriminate against any employee or applicant for employment because of race, color, religion, sex, or national origin. The contractor will 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. Such action shall include, but not be limited to, the following: Employment, upgrading, demotion, or transfer, recruitment or recruitment advertising; layoff or termination; rates of pay or other forms of compensation; and selection for training, including apprenticeship. The contractor agrees to post in conspicuous places available to employees and applicants for employment, notices to be provided by the contracting officer setting forth the provisions of this nondiscrimination clause.
- b. The contractor will in all solicitations or advertisements for employees placed by or on behalf of the contractor, state that all qualified applicants will receive consideration for employment without regard to race, color, religion, sex or national origin.
- c. The contractor will send to each labor union or representative of workers with which he has a collective bargaining agreement or other contract of understanding, notice advising the labor union or worker's representative of the contractor's commitments under Section 202 of Executive Order 11246 of September 24, 1965, and shall post copies of the notice in conspicuous places available to employees and applicants for employment.
- d. The contractor will comply with all provisions of Executive Order 11246 of September 24, 1965, and by the rules, regulations, and relevant orders of the Secretary of Labor.
- e. The contractor will furnish all information and reports required by Executive Order 11246 of September 24, 1965, and by the rules, regulations, and order of the Secretary of Labor pursuant thereto, and will permit access to his books, records and accounts by the Department of the Secretary of Labor for purposes of investigation to ascertain compliance with such rules, regulations and orders.
- f. In the event of the contractor's non-compliance with the nondiscrimination clauses of this contract or with any such rules, regulations or orders, this contract may be canceled, terminated or suspended in whole or in part and the contractor may be declared ineligible for further Government contracts in accordance with procedures authorized in Executive Order 11246 of September 24, 1965, and such other sanctions may be imposed and remedies involved as provided in Executive Order 11246 of September 24, 1965, or by rule, regulation or order of the Secretary of Labor, or as otherwise provided by law.

- g. The contractor will include the provisions of paragraphs (1) through (7) in every subcontract or purchase order unless exempted by rules, regulations or orders of the Secretary of Labor issued pursuant to Section 204 of Executive Order 11246 of September 24, 1965, so that such provisions will be binding upon each subcontractor or vendor. The contractor will take such action with respect to any subcontract or purchase order as the Department may direct as a means of enforcing such provisions including sanctions for noncompliance: Provided, however, that in the event the contractor becomes involved in, or is threatened with, litigation with the subcontractor or vendor as a result of such direction by the Department, the contractor may request the United States to enter into such litigation to protect the interest of the United States.

9. NOT BARRED

The contractor by submitting its bid certifies that the Contractor is not barred from bidding on the contract as a result of a conviction for either bid-rigging or bid-rotating. 720 ILCS 5/33/E-11.

10. DRUG FREE WORKPLACE

The Contractor by submitting its bid certifies that it will provide a drug free workplace and that it is in compliance with the requirements of the Drug Free Workplace Act 30 ILCS 580.1 et. seq., and the Substance Abuse Prevention on Public Works Projects Act PA095-0635.

11. SEXUAL HARASSMENT POLICY

The Contractor by submitting its bid certifies that it has a written sexual harassment, (ii) a description of sexual harassment, utilizing examples; (iv) an internal complaint process including penalties (v) the legal resource, investigative and compliant process through the Illinois Department of Human Rights; (vi) directions on how to contact the Department and Commission; and (vii) protection against retaliation for exercising rights under the policy in accordance with 775 ILCS 5/2-105(A)(4).

12. CRIMINAL RECORDS CHECKS

The Contractor by submitting its bid certifies that it will submit to background screening those employees, including subcontract employees, which will be working on any district project. This information is to be provided in accordance with the requirements of 105 ILCS 5/10-21.9. The Contractor by submitting its bid understands that employees found to be in violation of the Illinois School Code will not be permitted to work on school grounds.

13. BID FORM SIGNATURES

The Corporate Seal of

\_\_\_\_\_  
(Bidder - print the full name of your firm)  
was hereunto affixed in the presence of:

\_\_\_\_\_  
(Authorized signing officer Title)

(Seal)

\_\_\_\_\_  
(Authorized signing officer Title)

(Seal)

If the Bid is a joint venture or partnership, add additional forms of execution for each member of the joint venture in the appropriate form or forms as above.

END OF DOCUMENT



DOCUMENT 004300 - PROCUREMENT FORM SUPPLEMENTS

To: **HILLSBORO C.U.S.D. NO. 3**  
**1311 VANDALIA ROAD**  
**HILLSBORO, ILLINOIS 62049**

Project: **CAFETERIA BUILDING HVAC REPLACEMENT**  
**HILLSBORO HIGH SCHOOL**  
**HILLSBORO C.U.S.D. NO. 3**  
**HILLSBORO, MONTGOMERY COUNTY, ILLINOIS**  
**HR # 150-0095**

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

Submitted by: \_\_\_\_\_  
(full name)

(full address) \_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

Contact Name: \_\_\_\_\_

In accordance with Document 002114 - Instructions to Bidders - AIA and Document 004113 - Bid Form - Stipulated Sum, we include the Appendices to Bid Form Supplements listed below. The information provided shall be considered an integral part of the Bid Form.

The following Appendices are attached to this document:

Appendix A - List of Subcontractors: Include names of all Subcontractors and portions of the Work each Subcontractor will perform.

Appendix B - List of Alternates: Include cost variation to Bid Sum applicable to the Work described in Section 01 20 00 - Price and Payments.

**BID FORM SUPPLEMENTS SIGNATURES**

The Corporate Seal of

\_\_\_\_\_  
(Bidder - print the full name of your firm)

was hereunto affixed in the presence of:

(Seal)

\_\_\_\_\_  
(Authorized signing officer Title)

\_\_\_\_\_  
(Authorized signing officer Title)

(Seal)





APPENDIX B - LIST OF ALTERNATES

The following is the list of alternates referenced in the bid submitted by:

(Bidder) \_\_\_\_\_

To (Owner) **HILLSBORO C.U.S.D. NO. 3**  
**1311 VANDALIA ROAD**  
**HILLSBORO, ILLINOIS 62049**

Dated \_\_\_\_\_ and which is an integral part of the Bid Form.

The following amounts shall be added to or deducted from the Bid Sum. Refer to Section 01 20 00 - Price and Payment Procedures: Schedule of Alternates for description of alternates.

Alternate Bid #1 (Add) \$ \_\_\_\_\_

END OF DOCUMENT



DOCUMENT 005214 - AGREEMENT FORM - AIA

1.1 SUMMARY

- A. Document Includes:
  - 1. Contract Agreement.
- B. Related Documents:
  - 1. Document 007214 - General Conditions – AIA Stipulated Sum.
  - 2. Document 007313 - Supplementary Conditions - AIA.

1.2 CONTRACT AGREEMENT BETWEEN OWNER AND CONTRACTOR

- A. THIS AGREEMENT, made and entered into as of the \_\_\_\_\_ day of \_\_\_\_\_ in the year of Two Thousand and \_\_\_\_ by and between \_\_\_\_\_ hereinafter and in the Contract Documents called "Contractor" and the **HILLSBORO C.U.S.D. NO. 3**, hereinafter and in the Contract Documents called "Owner."
- B. WITNESSETH: That for and in consideration of the mutual covenants and agreements, hereinafter stated, Contractor and Owner covenant and agree as follows:
- C. THE CONTRACT WORK:
  - 1. Contractor covenants and agrees to furnish all labor, materials, equipment, transportation, construction plant and facilities necessary to perform all Work required by the Contract Documents, for the Project entitled:
    - a. CAFETERIA BUILDING HVAC REPLACEMENT  
HILLSBORO HIGH SCHOOL  
HILLSBORO C.U.S.D. NO. 3  
HILLSBORO, MONTGOMERY COUNTY, ILLINOIS

as shown on Drawings and described in Specifications prepared by Hurst-Rosche, Inc., Hillsboro, Illinois, acting as, and in these Contract Documents referred to as Architect/Engineer and covenants and agrees to do and perform all acts and things required of Contractor by this Contract and the Contract Documents.
- D. TIME OF COMPLETION:
  - 1. First day of construction is approximately June 1, 2025. The Owner requires the project to be substantially completed by August 8, 2025

E. CONTRACT SUM AND TERMS OF PAYMENT:

1. Contract Sum: The Owner, if Contractor shall faithfully fulfill and perform this Contract, covenants and agrees to pay Contractor in current funds, subject to additions and deductions by Change Order as provided in the Contract Documents, the sum of \_\_\_\_\_ Dollars (\$ \_\_\_\_\_), which sum shall constitute the Contract Sum, said Contract Sum being derived from Contractor's Bid dated \_\_\_\_\_. It is understood and agreed that should there be any increase in wage rates, or in cost of materials or equipment, or in any other of Contractor's costs or should Contractor be compelled to pay premium wages, or for overtime work, during the life of this Contract and/or prior to completion of Contractor's work thereunder, Contractor shall absorb all such increased costs, without addition to the Contract Sum except when otherwise expressly provided in Contract Documents.
2. Payments: Owner shall make payments for work performed under the Contract as provided in Article Nine of the General Conditions and in accordance with other applicable articles of the Supplementary Conditions and Contract Documents.
3. Contractor's Fees for Changes in Work: In accordance with Contractor's bid, it is agreed that the following percentages for overhead and profit shall be applied on work added to or omitted from the Contract by written Change Order approved by Architect and Owner in advance of performance of the work.

Additional Work performed by:

- |                     |                         |
|---------------------|-------------------------|
| 1. Own Forces ____% | 2. Subcontractors ____% |
|---------------------|-------------------------|

Omitted Work originally required by:

- |                     |                         |
|---------------------|-------------------------|
| 1. Own Forces ____% | 2. Subcontractors ____% |
|---------------------|-------------------------|

Note: Taxes (when applicable) are considered as incidentals, as well as bonds and insurance costs and are not included in the percentages listed above nor should they be added to change orders submitted.

F. CONTRACT DOCUMENTS:

1. Contract Documents include the Contract Agreement, Contractor's Bid as accepted by Owner, Conditions of the Contract (General, Supplementary and other Conditions), Drawings, Specifications, and all Addenda issued prior to, and all Modifications issued after execution of the Contract Agreement.
2. Bidder's attention is directed to the fact that all Federal and Illinois State Laws, municipal ordinances and regulations of any and all authority having jurisdiction over construction of the project shall apply to the contract throughout, and they will be deemed to be included in the contract the same as though herein written out in full. Successful Bidders shall be required to comply with 777 ILCS 10 concerning equal employment opportunities; comply with 30 ILCS 570 concerning the employment of citizens of the State of Illinois; comply with 820 ILCS 265 concerning substance abuse prevention on public works projects; and comply with 820 ILCS 130 concerning prevailing wages.

G. ILLINOIS LABOR:

Contractor shall comply with all Illinois statutory requirements regarding labor, including, but not limited to, the following:

1. Illinois Public Act 77-1552 and Chapter 48, Sections 39S-1 through 39S-12 of the Illinois Revised Statutes regulating wages of laborers, mechanics and other workers employed in any public works and known as the "Prevailing Wage Act," which provides in part that all laborers, mechanics and workers performing work under the Contract shall be paid not less than the prevailing rate of wages as determined by the Illinois Department of Labor (820 ILCS 130).
2. Illinois Public Act 83-1472, Article 2 and Chapter 48, Sections 2201 through 2207, 1984 of the Illinois Revised Statutes pertaining to hiring of Illinois labor and known as the "Illinois Preference Act (30 ILCS 570)."
3. "Illinois Human Rights Act of 1980," Chapter 68, Illinois Revised Statutes, and the Rules and Regulations, Title 44, Section 750 of the Illinois Administrative Code, Illinois Department of Human Rights; pertaining to equal employment opportunity (777 ILCS 10).

H. PERFORMANCE BOND AND LABOR AND MATERIAL PAYMENT BOND:

1. Within ten (10) days immediately following date of his receipt of this contract, Contractor shall furnish Owner the signed Contract and Performance Bond and Labor and Material Payment Bond as required by and in accordance with the terms of Contract Documents in a penal sum of one hundred percent (100%) of the Contract sum.
2. In the event Contractor fails to furnish Owner such Contract and Bonds within said period, this Contract shall thereupon become null and void at Owner's option, exercised by written registered notice and mailed to Contractor by said Owner within five (5) days thereafter. Owner may then retain and enforce as liquidated damages, bid guarantee heretofore deposited with it in connection with Contractor's proposal for this Contract or the difference between his bid and a subsequent awarded bid, whichever is lesser.

I. IN WITNESS HEREOF, the parties hereto have executed this agreement as of the day and year first written above.

OWNER:

HILLSBORO C.U.S.D. NO. 3

BY \_\_\_\_\_

TITLE \_\_\_\_\_

CONTRACTOR:

\_\_\_\_\_

Attest:

BY \_\_\_\_\_

Secretary

BY \_\_\_\_\_

TITLE \_\_\_\_\_

(Corporate Seal)

END OF DOCUMENT

CONTRACTOR'S AFFIDAVIT FOR FINAL COMPLETION  
(To be filed with final request for payment)

STATE OF \_\_\_\_\_)

COUNTY OF \_\_\_\_\_)

\_\_\_\_\_, being  
first duly sworn upon oath deposes and says:

That he/she is \_\_\_\_\_ of \_\_\_\_\_

hereinafter termed "The Contractor" for all work upon the hereinafter termed "Said Project," work for the HILLSBORO C.U.S.D. NO. 3, under that certain contract between said Contractor and said Owner, bearing date of \_\_\_\_\_ pertaining to said work.

Affiant further states, of his/her own knowledge, that all bills incurred by the Contractor, for services, labor and material furnished, for work done by the Contractor under said Contract, or in connection with said project have been paid and all subcontractors who have furnished services, labor or materials have no claim or demand against Owner for any services, labor and/or materials furnished and/or work done by them upon said Project.

Affiant further states that this affidavit is made on behalf of the Contractor for the purpose of obtaining payment of the sum of \_\_\_\_\_ (\$ \_\_\_\_\_) dollars, which affiant states, upon his/her own knowledge, constitutes the full balance due the Contractor for all services, labor and materials furnished and work done to and upon Said Project by the Contractor whether under and pursuant to provisions of said Contract and all subsequent modifications thereof and changes therein or otherwise; and that payment of the sum to the Contractor will constitute payment in full on everything due for such services, labor, materials and work, and will fully satisfy any and all claims or demands which Contractor may have or assert against said Owner, arising out of anything done or furnished by the Contractor or occurring in connection with said Project and/or Contract.

\_\_\_\_\_  
CONTRACTOR

By \_\_\_\_\_

Title \_\_\_\_\_

Subscribed and Sworn to before me the \_\_\_\_\_ day of \_\_\_\_\_, 20\_\_\_\_.

\_\_\_\_\_  
NOTARY PUBLIC





(PARTIAL) (FINAL)  
WAIVER OF LIEN

STATE OF \_\_\_\_\_ }  
COUNTY OF \_\_\_\_\_ } SS

TO WHOM IT MAY CONCERN:

WHEREAS the undersigned has been employed by HILLSBORO C.U.S.D. NO. 3, hereinafter known as the OWNER,

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

For the project known as: CAFETERIA BUILDING HVAC REPLACEMENT

For the premises known as: HILLSBORO HIGH SCHOOL

Address: HILLSBORO C.U.S.D. NO. 3, HILLSBORO, ILLINOIS

THE undersigned, for and in consideration of the dollar amount shown below and other good and valuable considerations, do(es) hereby waive and release under the mechanics' lien statutes of the State where the project premises are located, to the extent of the payment recited below is received by the undersigned and is applicable to lienable labor, services, materials, fixtures, or apparatus, any and all lien or claim or right of lien on the above-described premises and the improvements, fixtures and appurtenances thereon, and on the monies or other considerations due or to become due from the Owner and on all other project-related monies from whatever source, on the account of the above-mentioned labor, services, materials, fixtures, or apparatus furnished by the undersigned for or in connection with the above-described premises.

\_\_\_\_\_  
(Payment amount written in long form)

PAYMENT AMOUNT \_\_\_\_\_

\_\_\_\_\_  
(Company Name)

\_\_\_\_\_  
(Address)

\_\_\_\_\_  
(City/State/Zip)

\_\_\_\_\_  
(Signature of Officer)

Sworn to and subscribed before me this \_\_\_\_ day of \_\_\_\_\_.

(Notary Public)

My commission expires: \_\_\_\_\_



AFFIDAVIT OF PAYMENT TO MATERIAL SUPPLIERS AND SUBCONTRACTORS

STATE OF \_\_\_\_\_

COUNTY OF \_\_\_\_\_

\_\_\_\_\_, being first duly sworn upon oath  
deposes and says, that he/she entered into a Contract with the HILLSBORO C.U.S.D. NO. 3, known as  
the Owner, for furnishing of labor, work services, materials, fixtures, and supplies for CAFETERIA  
BUILDING HVAC REPLACEMENT at the following described real estate: HILLSBORO HIGH  
SCHOOL.

That for the purpose of said Contract, the following persons, firms or corporations have been contracted  
with to furnish, have furnished or prepared, or will furnish or prepare labor, services, materials, fixtures,  
apparatus, machinery or supplies, or are furnishing and preparing material for said construction; that there  
are due or to become due to them respectively, the amounts set opposite their names for said labor,  
services, materials, fixtures, apparatus, machinery and supplies as stated; that there are no other  
contractors outstanding and there is nothing due or to become due any person, firm, or corporation, for  
labor, services, materials, fixtures, machinery, apparatus, or supplies, other than as stated herewith.

MATERIAL SUPPLIER AND/OR SUBCONTRACTOR	CONTRACT ITEM	CONTRACT AMOUNT	AMOUNT PAID TO DATE	AMOUNT DUE OR TO BECOME DUE
--	------------------	--------------------	---------------------------	-----------------------------------

\_\_\_\_\_  
CONTRACTOR

Subscribed and sworn to before me, a Notary Public, this \_\_\_\_\_ day of \_\_\_\_\_; A.D.  
20\_\_\_\_.

\_\_\_\_\_  
NOTARY PUBLIC







DOCUMENT 007214 - GENERAL CONDITIONS – AIA STIPULATED SUM

1.1 SUMMARY

- A. Document Includes:
  - 1. General Conditions.
- B. Related Documents:
  - 1. Document 005214 – Agreement Form – AIA Stipulated Sum.
  - 2. Document 007313 – Supplementary Conditions - AIA.

1.2 GENERAL CONDITIONS

- A. AIA Document A201-2007, General Conditions of the Contract for Construction, is the General Conditions of the Contract.

1.3 SUPPLEMENTARY CONDITIONS

- A. Refer to Document 007313 for modifications to General Conditions.

END OF DOCUMENT





DOCUMENT 007313 - SUPPLEMENTARY CONDITIONS - AIA

1.1 SUMMARY

- A. Document Includes:
  - 1. General Conditions.
  - 2. Supplementary Conditions.
  
- B. Related Documents:
  - 1. Document 004113 – Bid Form – Stipulated Sum
  - 2. Document 005214 – Agreement Form - AIA

1.2 GENERAL CONDITIONS

- A. The General Conditions of the Contract for Construction, AIA Document A201, Sixteenth Edition, 2007, Articles 1 through 15, is a part of this Contract and is incorporated herein as fully as if here set forth. Copies of the General Conditions are on file and may be reviewed at the offices of the Architect or may be obtained from the American Institute of Architects, St. Louis Chapter, 911 Washington St., #225, St. Louis, Missouri 63101-1203.

1.3 SUPPLEMENTARY CONDITIONS

- A. The following supplements modify, change, delete from or add to the "General Conditions of the Contract for Construction," AIA Document A201, Sixteenth Edition, 2007. Where any Article of the General Conditions is modified or changed or any Paragraph, Subparagraph or Clause thereof is modified, changed or deleted by these supplements, the unaltered provisions of that Article, Paragraph, Subparagraph or Clause shall remain in effect.

1.4 REFERENCE TO DIVISION 01

- A. Where provisions of General Conditions relate to project administrative or work-related requirements of the Contract, and those provisions differ from those specified in Division 01, provisions outlined in Division 01 shall prevail.

1.5 ARTICLE 1: GENERAL PROVISIONS

- A. 1.5.1 In the second line following the word "Specifications" insert the words "and Project Manual,".
  
- B. 1.6 TRANSMISSION OF DATA IN DIGITAL FORM: Add new subparagraph 1.6.1:

1.6.1 Electronic drawings provided by the Owner or Architect are for informational purposes only and are not intended for any other use. The paper copies provided are a true representation of the completed design and if discrepancies should exist between the paper copy and the electronic copy, the paper copy shall govern.

- C. Delete Subparagraph 1.1.8 its entirety and substitute the following:

1.1.8 INITIAL DECISION MAKER

The Initial Decision Maker is the person identified in the Agreement to render initial decisions on Claims in accordance with Section 15.2 and certify termination of the Agreement under Section 14.2.2. If the Initial Decision Maker is not specifically identified in the Agreement, the responsibilities of the Initial Decision Maker shall default to the Architect.

- D. DEFINITIONS: Add Paragraph 1.1.9

1.1.9 PROJECT MANUAL

The Project Manual is the collection of documents which includes the bidding requirements, sample forms and, certain Contract Documents such as the Conditions of the Contract and the Specifications.

1.6 ARTICLE 2: OWNER

- A. 2.2 INFORMATION AND SERVICES REQUIRED OF THE OWNER:

- B. Delete Subparagraphs 2.2.3 and 2.2.5 in their entireties and substitute the following:

2.2.3 The Owner shall, at the request of the Contractor, furnish to Contractor any survey or other similar descriptive information of project site that Owner has in his possession. Upon demonstration of need by Contractor for specific additional survey information, Owner shall obtain and furnish such information to Contractor.

2.2.5 Contractor will be furnished, free of charge, 4 copies of Drawings, Specifications, and Project Manual as set forth in Division 1 of the Specifications. Additional copies will be furnished to Contractor at cost of reproduction, postage and handling.

1.7 ARTICLE 3: CONTRACTOR

- 3.2. REVIEW OF CONTRACT DOCUMENTS AND FIELD CONDITIONS BY CONTRACTOR: Add Subparagraphs 3.2.5 and 3.2.6:

3.2.5 The Contractor by executing the Contract represents that he has carefully examined the Site of the Work at each location and that he has full knowledge of and fully understands the facilities, site conditions, difficulties and restrictions attending performance of the Work. Contractor further represents that he has taken all required measurements and carefully inspected existing constructions, irregularities and interferences which may affect the Work. No additional compensation will be allowed for conditions increasing Contractor's cost which were not known to or appreciated by him prior to executing the Contract if they could have been discovered by him following the foregoing procedures and thoroughly informing himself of all existing conditions affecting the Work.

3.2.6 Contractor will not, however, be required to excavate, penetrate or demolish any constructions or other work and conditions prior to executing the Contract in order to uncover and/or expose concealed conditions that affect the Work. If, during course of construction, Contractor uncovers conditions that affect the work that could not have been known and understood by the above-described careful examination of conditions affecting the Work, he shall promptly notify the Architect, in writing, who will determine if claims for additional costs or extensions of time are justified. If such claims are found to be justified, Contract will be modified in accordance with Article 7 of the General Conditions.

1.8 ARTICLE 4: ARCHITECT

A. 4.1 GENERAL: Delete Subparagraph 4.1.1 in its entirety and substitute the following:

4.1.1 The Owner shall retain an architect or engineer lawfully licensed to practice architecture or engineering or an entity lawfully practicing architecture or engineering in the jurisdiction where the Project is located. That person or entity is identified as the Architect in the Agreement and is referred to throughout the Contract Documents as if singular in number.

1.9 ARTICLE 5: SUBCONTRACTORS

A. 5.2 AWARD OF SUBCONTRACTS AND OTHER CONTRACTS FOR PORTIONS OF THE WORK: Add new Subparagraph 5.2.1.1.:

5.2.1.1. Within ten (10) days of notification of acceptance of his proposal, Contractor shall submit the names of those to whom he intends to award a Subcontract.

1.10 ARTICLE 6: CONSTRUCTION BY OWNER OR BY SEPARATE CONTRACTORS

A. 6.1 OWNER'S RIGHT TO PERFORM CONSTRUCTION AND TO AWARD SEPARATE CONTRACTS: Delete Subparagraph 6.1.3 in its entirety and substitute the following:

6.1.3 General Contractor shall have responsibility of coordinating efforts of all contractors and to maintain overall direction of job progress. Each Contractor shall coordinate operational methods with other contractors and encourage communications among all trades. All Contractors shall make other contractors aware of any problems, delays in materials shipments or lack of work force, and assist other contractors in maintaining job momentum and direction of overall project.

1.11 ARTICLE 9: PAYMENTS AND COMPLETION

A. 9.3 APPLICATIONS FOR PAYMENT: Add new Subparagraph 9.3.1.3

9.3.1.3.: Until Substantial Completion, the Owner will pay 90 percent of the amount due Contractor on account of approved progress payments.

1.12 ARTICLE 11: INSURANCE AND BONDS

A. 11.1.1 In the first line following the word "maintain," insert the words "in a company or companies licensed to do business in the state in which the project is located and rated 'A' or better by A.M. Best Co.."

B. Add new Subparagraph 11.1.1.9:

11.1.1.9 General Liability Insurance shall be comprehensive, on occurrence, and shall include:

- Premises and Operations.
- Independent Contractors.
- Products and Completed Operations.
- Broad Form Property Damage.
- Personal Injury.
- Explosion, Collapse and Underground damage where the hazard exists.
- Contractual liability.

C. Add the following Sub-Subparagraphs to Subparagraph 11.1.2:

11.1.2.1 The insurance required by Subparagraph 11.1.1 shall be on a project specific basis and written for not less than the following, or greater if required by law:

1. Worker's Compensation:

- a. State: Statutory
- b. Applicable Federal: Statutory
- c. Employer's Liability: \$500,000

2. Comprehensive General Liability:

a. Bodily Injury:

\$1,000,000 Combined Single Limit

b. Property Damage:

\$1,000,000 Combined Singled Limit

Limit Coverage for bodily injury and property damage per occurrence and in the same aggregate limit will be accepted in lieu of the separate limits specified above.

3. Personal Injury:

\$ 1,000,000 Combined single limit including owned non-owned and hired motor vehicle.

4. Comprehensive Automobile Liability:
  - a. Bodily Injury:
 

\$1,000,000	Combined single limit including owned, non-owned and hired motor vehicle.
-------------	---
  - b. Property Damage:
 

\$1,000,000	Combined single limit including owned, non-owned, and hired motor vehicle
-------------	---
  - c. \$1,000,000 Combined Single

Limit coverage for bodily injury and property damage per occurrence and in the same aggregate limit will be accepted in lieu of the separate limits specified above.

#### 11.1.2.2 Umbrella Form Liability Coverage:

An Umbrella Form Liability coverage to not less than \$2,000,000 for any one occurrence and subject to the same aggregate over the Employer's Liability, Comprehensive General Liability, and Comprehensive Automobile Liability coverage is required.

#### D. Add the following Subparagraph 11.1.3.1:

11.1.3.1 Contractor shall furnish one copy of each of Certificates of Insurance herein required for each copy of the Agreement which shall specifically set forth evidence of all coverage required by Paragraph 11.1. The Certificate of Insurance is to be accompanied by AIA Document G715TM-1997 (Supplemental Attachment for ACORD Certificate of Insurance 25-S). Contractor shall furnish to the Owner copies of any endorsements that are subsequently issued amending coverage or limits. The Contractor shall furnish to the Owner notice of any policy cancellation at least 30 days (10 days for nonpayment of premiums) prior to the effective date of cancellation. The Contractor shall submit copies of subcontractor's Certificates of Insurance prior to the beginning of work.

#### E. Add the following Subparagraph 11.1.4.1:

11.1.4.1 The Owner and Architect shall be named as additional insureds on ISO form 20331001 by endorsement for the purpose of coverage only with no liability for premium payments. All policies and coverages shall include a waiver of subrogation in favor of the Owner, Architect, and all subconsultants.

- F. 11.3. PROPERTY INSURANCE: Delete Subparagraph 11.3.1 in its entirety and substitute the following:

11.3.1: The General Contractor shall be responsible to maintain property (builder's risk) insurance upon the completed value of all work at the site under this contract to the full insurable value thereof. This insurance shall include the interests of the Owner, the General Contractor, Subcontractors, and Sub-subcontractors in the work and as their interests may appear in the work, and shall be an all-risk type policy, including theft, subject to the exclusions generally accepted in the insurance industry. This coverage is not intended to, and shall not, provide coverage for tools, equipment, scaffolding, forms, or other devices used by the Contractors or Subcontractors in performing work under this contract.

11.3.1.2 Delete this Paragraph in its entirety.

- G. Delete Subparagraphs 11.3.1.3 in its entirety and substitute the following:

11.3.1.3 If the property insurance requires deductibles, the Contractor shall pay costs not covered because of such deductibles.

#### 1.13 ARTICLE 13: MISCELLANEOUS PROVISIONS

- A. Add new paragraph 13.8 as follows:

##### 13.8 REFERENCED STANDARDS

13.8.1 No provision of any referenced standard specification, manual or code; whether or not specifically incorporated by reference in the Contract Documents; shall be effective to change the duties and responsibilities of Owner, Contractor or Architect, or any of their consultants, agents or employees from those set forth in the Contract Documents, nor shall it be effective to assign to Architect, or any of Architect's consultants, agents or employees, any duty or authority to supervise or direct the furnishing or performance of the Work or any duty or authority to undertake responsibility contrary to the provisions of Articles 1 through 15.

END OF SECTION

ARTICLE 25: PREVAILING RATE OF WAGES

- 25.1 Pursuant to Illinois Compiled Statutes 820 ILCS 130/0.01 et seq., these specifications list on the following pages, the Illinois Department of Labor prevailing rate of wages for the county where the contract is being performed and for each craft or type of worker needed to execute the contract.

## Montgomery County Prevailing Wage Rates posted on 1/15/2025

Trade Title	Rg	Type	C	Base	Foreman	Overtime					Pension	Vac	Trng	Other Ins	Add OT 1.5x owed	Add OT 2.0x owed
						M-F	Sa	Su	Hol	H/W						
ASBESTOS ABT-GEN	All	ALL		32.91	33.91	1.5	1.5	2.0	2.0	8.25	23.27	0.00	0.80	0.00	15.76	31.52
ASBESTOS ABT-MEC	All	BLD		37.10	38.10	1.5	1.5	2.0	2.0	10.45	7.00	0.00	0.50	0.00	0.00	0.00
BOILERMAKER	All	BLD		45.50	49.00	1.5	1.5	2.0	2.0	7.07	27.83	0.00	1.19	0.00	0.00	0.00
BRICK MASON	All	BLD		38.24	40.53	1.5	1.5	2.0	2.0	9.60	16.00	0.00	1.03		0.00	0.00
CARPENTER	All	BLD		36.08	38.83	1.5	1.5	2.0	2.0	9.70	23.00	0.00	0.80	0.00	16.35	32.70
CARPENTER	All	HWY		38.54	40.29	1.5	1.5	2.0	2.0	9.70	22.50	0.00	0.77	0.00	0.00	0.00
CEMENT MASON	All	ALL		39.00	40.00	1.5	1.5	2.0	2.0	11.50	18.50	0.00	0.60	0.00	15.30	30.60
CERAMIC TILE FINISHER	All	BLD		28.50		1.5	1.5	2.0	2.0	9.60	7.69	1.00	0.86		0.00	0.00
ELECTRIC PWR EQMT OP	NE	ALL		55.13	65.42	1.5	1.5	2.0	2.0	8.90	15.43	0.00	0.55	0.00	0.00	0.00
ELECTRIC PWR EQMT OP	SW	ALL		54.62	65.84	1.5	1.5	2.0	2.0	7.84	15.30	0.00	0.55	0.00	11.85	23.69
ELECTRIC PWR GRNDMAN	NE	ALL		37.46	65.42	1.5	1.5	2.0	2.0	8.37	10.49	0.00	0.37	0.00	0.00	0.00
ELECTRIC PWR GRNDMAN	SW	ALL		40.78	65.84	1.5	1.5	2.0	2.0	5.85	11.42	0.00	0.41	0.00	8.85	17.68
ELECTRIC PWR LINEMAN	NE	ALL		61.36	65.42	1.5	1.5	2.0	2.0	9.09	17.18	0.00	0.61	0.00	0.00	0.00
ELECTRIC PWR LINEMAN	SW	ALL		62.80	65.84	1.5	1.5	2.0	2.0	9.01	17.58	0.00	0.63	0.00	13.62	27.22
ELECTRIC PWR TRK DRV	NE	ALL		39.31	65.42	1.5	1.5	2.0	2.0	8.43	11.01	0.00	0.39	0.00	0.00	0.00
ELECTRIC PWR TRK DRV	SW	ALL		44.59	65.84	1.5	1.5	2.0	2.0	6.40	12.48	0.00	0.45		9.67	19.33
ELECTRICIAN	E	BLD		45.25	49.78	1.5	1.5	2.0	2.0	8.95	12.86	0.00	0.68		1.02	2.04
ELECTRICIAN	NW	BLD		39.80	42.30	1.5	1.5	2.0	2.0	9.40	13.28	0.00	0.40		0.99	1.99
ELECTRICIAN	SW	ALL		48.41	51.31	1.5	1.5	2.0	2.0	9.19	14.79	0.00	1.33	3.16	14.23	28.47
ELECTRONIC SYSTEM TECH	E	BLD		38.91	41.91	1.5	1.5	2.0	2.0	9.10	9.49	0.00	0.40		0.58	1.17
ELECTRONIC SYSTEM TECH	NW	BLD		36.99	39.99	1.5	1.5	2.0	2.0	8.60	11.91	0.00	0.40		0.55	1.11
ELECTRONIC SYSTEM TECH	SW	BLD		39.14	42.14	1.5	1.5	2.0	2.0	4.40	11.18	0.00	0.40	2.00	0.58	1.17
ELEVATOR CONSTRUCTOR	All	BLD		62.73	70.57	2.0	2.0	2.0	2.0	16.27	21.36	5.02	0.80		0.00	0.00
GLAZIER	All	BLD		39.77	41.77	1.5	1.5	2.0	2.0	8.10	13.85	0.00	0.68		0.00	0.00
HEAT/FROST INSULATOR	All	BLD		42.63	43.63	1.5	1.5	2.0	2.0	11.79	13.80	0.00	1.15		0.00	0.00
IRON WORKER	N	BLD		36.20	38.20	1.5	1.5	2.0	2.0	10.75	19.50	0.00	1.10	0.00	0.00	0.00
IRON WORKER	N	HWY		37.60	39.35	1.5	1.5	2.0	2.0	10.75	21.09	0.00	1.10	0.00	0.00	0.00



## Montgomery County Prevailing Wage Rates posted on 1/15/2025

IRON WORKER	S	ALL		41.65	43.65	1.5	1.5	2.0	2.0	10.75	19.75	0.00	0.68	0.00	15.59	31.18
LABORER	All	ALL		32.41	33.41	1.5	1.5	2.0	2.0	8.25	23.27	0.00	0.80	0.00	15.76	31.52
LATHER	All	BLD		36.08	38.83	1.5	1.5	2.0	2.0	9.70	23.00	0.00	0.80	0.00	16.35	32.70
MACHINIST	All	BLD		58.39	62.39	1.5	1.5	2.0	2.0	9.93	8.95	1.85	1.47		0.00	0.00
MARBLE FINISHER	All	BLD		28.50		1.5	1.5	2.0	2.0	9.60	7.69	1.00	0.86		0.00	0.00
MILLWRIGHT	All	BLD		37.25	40.00	1.5	1.5	2.0	2.0	9.70	22.32	0.00	0.80	0.00	16.01	32.02
MILLWRIGHT	All	HWY		41.00	42.75	1.5	1.5	2.0	2.0	9.70	23.25	0.00	0.77	0.00	0.00	0.00
OPERATING ENGINEER	All	BLD	1	46.65	48.65	1.5	1.5	2.0	2.0	14.95	20.25	0.00	1.70		18.45	36.90
OPERATING ENGINEER	All	BLD	2	45.52	47.52	1.5	1.5	2.0	2.0	14.95	20.25	0.00	1.70		18.45	36.90
OPERATING ENGINEER	All	BLD	3	41.04	43.04	1.5	1.5	2.0	2.0	14.95	20.25	0.00	1.70		18.45	36.90
OPERATING ENGINEER	All	BLD	4	47.65	49.65	1.5	1.5	2.0	2.0	14.95	20.25	0.00	1.70		18.45	36.90
OPERATING ENGINEER	All	BLD	5	48.65	50.65	1.5	1.5	2.0	2.0	14.95	20.25	0.00	1.70		18.45	36.90
OPERATING ENGINEER	All	BLD	6	49.20	51.20	1.5	1.5	2.0	2.0	14.95	20.25	0.00	1.70		18.45	36.90
OPERATING ENGINEER	All	BLD	7	49.50	51.50	1.5	1.5	2.0	2.0	14.95	20.25	0.00	1.70		18.45	36.90
OPERATING ENGINEER	All	BLD	8	49.80	51.80	1.5	1.5	2.0	2.0	14.95	20.25	0.00	1.70		18.45	36.90
OPERATING ENGINEER	All	BLD	9	50.45	52.45	1.5	1.5	2.0	2.0	14.95	20.25	0.00	1.70		18.45	36.90
OPERATING ENGINEER	All	BLD	10	50.95	52.95	1.5	1.5	2.0	2.0	14.95	20.25	0.00	1.70		18.45	36.90
OPERATING ENGINEER	All	BLD	11	48.65	50.65	1.5	1.5	2.0	2.0	14.95	20.25	0.00	1.70		18.45	36.90
OPERATING ENGINEER	All	BLD	12	49.65	51.65	1.5	1.5	2.0	2.0	14.95	20.25	0.00	1.70		18.45	36.90
OPERATING ENGINEER	All	BLD	13	46.65	48.65	1.5	1.5	2.0	2.0	14.95	20.25	0.00	1.70		18.45	36.90
OPERATING ENGINEER	All	BLD	14	41.10	43.10	1.5	1.5	2.0	2.0	14.95	20.25	0.00	1.70		18.45	36.90
OPERATING ENGINEER	All	HWY	1	45.15	47.15	1.5	1.5	2.0	2.0	14.95	20.25	0.00	1.70		18.45	36.90
OPERATING ENGINEER	All	HWY	2	44.02	46.02	1.5	1.5	2.0	2.0	14.95	20.25	0.00	1.70		18.45	36.90
OPERATING ENGINEER	All	HWY	3	39.54	41.54	1.5	1.5	2.0	2.0	14.95	20.25	0.00	1.70		18.45	36.90
OPERATING ENGINEER	All	HWY	4	46.15	48.15	1.5	1.5	2.0	2.0	14.95	20.25	0.00	1.70		18.45	36.90
OPERATING ENGINEER	All	HWY	5	47.15	49.15	1.5	1.5	2.0	2.0	14.95	20.25	0.00	1.70		18.45	36.90
OPERATING ENGINEER	All	HWY	6	47.70	49.70	1.5	1.5	2.0	2.0	14.95	20.25	0.00	1.70		18.45	36.90
OPERATING ENGINEER	All	HWY	7	48.00	50.00	1.5	1.5	2.0	2.0	14.95	20.25	0.00	1.70		18.45	36.90
OPERATING ENGINEER	All	HWY	8	48.30	50.30	1.5	1.5	2.0	2.0	14.95	20.25	0.00	1.70		18.45	36.90
OPERATING ENGINEER	All	HWY	9	48.95	50.95	1.5	1.5	2.0	2.0	14.95	20.25	0.00	1.70		18.45	36.90

## Montgomery County Prevailing Wage Rates posted on 1/15/2025

OPERATING ENGINEER	All	HWY	10	49.45	51.45	1.5	1.5	2.0	2.0	14.95	20.25	0.00	1.70		18.45	36.90
OPERATING ENGINEER	All	HWY	11	47.15	49.15	1.5	1.5	2.0	2.0	14.95	20.25	0.00	1.70		18.45	36.90
OPERATING ENGINEER	All	HWY	12	48.15	50.15	1.5	1.5	2.0	2.0	14.95	20.25	0.00	1.70		18.45	36.90
OPERATING ENGINEER	All	HWY	13	39.60	41.60	1.5	1.5	2.0	2.0	14.95	20.25	0.00	1.70		18.45	36.90
PAINTER	All	BLD		33.49	34.99	1.5	1.5	2.0	2.0	8.10	14.83	0.00	0.70		0.00	0.00
PAINTER	All	HWY		34.69	36.19	1.5	1.5	2.0	2.0	8.10	14.83	0.00	0.70		0.00	0.00
PAINTER OVER 30 FT.	All	BLD		34.49	35.99	1.5	1.5	2.0	2.0	8.10	14.83	0.00	0.70		0.00	0.00
PAINTER PWR EQMT	All	BLD		34.49	35.99	1.5	1.5	2.0	2.0	8.10	14.83	0.00	0.70		0.00	0.00
PAINTER PWR EQMT	All	HWY		35.69	37.19	1.5	1.5	2.0	2.0	8.10	14.83	0.00	0.70		0.00	0.00
PILEDRIIVER	All	BLD		38.08	40.83	1.5	1.5	2.0	2.0	9.70	23.00	0.00	0.80	0.00	16.35	32.70
PILEDRIIVER	All	HWY		39.54	41.29	1.5	1.5	2.0	2.0	9.70	22.50	0.00	0.77	0.00	0.00	0.00
PIPEFITTER	NE	BLD		43.73	47.73	1.5	1.5	2.0	2.0	9.45	13.86	0.00	1.33	0.00	0.00	0.00
PIPEFITTER	SW	BLD		50.11	55.12	1.5	1.5	2.0	2.0	7.55	11.40	0.00	1.20	0.00	0.00	0.00
PLASTERER	All	BLD		37.30	38.80	1.5	1.5	2.0	2.0	11.50	12.50	0.00	0.75	0.00	12.38	24.75
PLUMBER	NE	BLD		43.73	47.73	1.5	1.5	2.0	2.0	9.45	13.86	0.00	1.33	0.00	0.00	0.00
PLUMBER	SW	BLD		50.11	55.12	1.5	1.5	2.0	2.0	7.55	11.40	0.00	1.20	0.00	0.00	0.00
ROOFER	All	BLD		35.00	38.10	1.5	1.5	2.0	2.0	10.62	14.00	0.00	0.50	0.00	0.00	0.00
SHEETMETAL WORKER	All	ALL		42.03	44.53	1.5	1.5	2.0	2.0	11.30	9.91	2.52	0.71	1.88	0.00	0.00
SPRINKLER FITTER	All	BLD		47.09	50.09	1.5	1.5	2.0	2.0	11.45	14.92	0.00	0.52		0.00	0.00
TERRAZZO FINISHER	All	BLD		28.50		1.5	1.5	2.0	2.0	9.60	7.60	1.00	0.86		0.00	0.00
TERRAZZO MASON	All	BLD		34.09		1.5	1.5	2.0	2.0	9.60	9.36	1.00	0.95		0.00	0.00
TRUCK DRIVER	All	ALL	1	43.31	47.67	1.5	1.5	2.0	2.0	16.27	8.04	0.00	0.25	0.00	0.00	0.00
TRUCK DRIVER	All	ALL	2	43.89	47.67	1.5	1.5	2.0	2.0	16.27	8.04	0.00	0.25	0.00	0.00	0.00
TRUCK DRIVER	All	ALL	3	44.21	47.67	1.5	1.5	2.0	2.0	16.27	8.04	0.00	0.25	0.00	0.00	0.00
TRUCK DRIVER	All	ALL	4	44.56	47.67	1.5	1.5	2.0	2.0	16.27	8.04	0.00	0.25	0.00	0.00	0.00
TRUCK DRIVER	All	ALL	5	45.67	47.67	1.5	1.5	2.0	2.0	16.27	8.04	0.00	0.25	0.00	0.00	0.00
TRUCK DRIVER	All	O&C	1	34.65	38.14	1.5	1.5	2.0	2.0	16.27	8.04	0.00	0.25	0.00	0.00	0.00
TRUCK DRIVER	All	O&C	2	35.11	38.14	1.5	1.5	2.0	2.0	16.27	8.04	0.00	0.25	0.00	0.00	0.00
TRUCK DRIVER	All	O&C	3	35.37	38.14	1.5	1.5	2.0	2.0	16.27	8.04	0.00	0.25	0.00	0.00	0.00
TRUCK DRIVER	All	O&C	4	35.65	38.14	1.5	1.5	2.0	2.0	16.27	8.04	0.00	0.25	0.00	0.00	0.00

## Montgomery County Prevailing Wage Rates posted on 1/15/2025

TRUCK DRIVER	All	O&C	5	36.54	38.14	1.5	1.5	2.0	2.0	16.27	8.04	0.00	0.25	0.00	0.00	0.00
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### Legend

**Rg** Region

**Type** Trade Type - All,Highway,Building,Floating,Oil & Chip,Rivers

**C** Class

**Base** Base Wage Rate

**OT M-F** Unless otherwise noted, OT pay is required for any hour greater than 8 worked each day, Mon through Fri. The number listed is the multiple of the base wage.

**OT Sa** Overtime pay required for every hour worked on Saturdays

**OT Su** Overtime pay required for every hour worked on Sundays

**OT Hol** Overtime pay required for every hour worked on Holidays

**H/W** Health/Welfare benefit

**Vac** Vacation

**Trng** Training

**Other Ins** Employer hourly cost for any other type(s) of insurance provided for benefit of worker.

Explanations MONTGOMERY COUNTY

CARPENTERS AND PILEDRIVERS (NORTH) - The area north of Route 108, running east to Route 55, then north to Routes 48/127, east following Route 48 from Raymond to Harvel.

ELECTRICIANS (EAST) - Townships of Audubon, East Fork, Fillmore, Irving, Nikomis, Roundtree, South Fillmore and Witt.

ELECTRICIANS (NW) - Townships of Bois D'Arc, Pitman, and Harvel (Northern projection).

ELECTRICIANS (SW) - Townships of Zanesville, Raymond, North and South Litchfield, Butler Grove, Hillsboro, Walshville and Grishman.

ELECTRONIC SYSTEMS TECHNICIAN (EAST) – The entirety of Montgomery County except for the portions defined as the Southwest and Northwest regions.

ELECTRONIC SYSTEMS TECHNICIAN (NORTHWEST) – Townships of Bois D'Arc, Pitman, and Harvel.

ELECTRONIC SYSTEMS TECHNICIAN (SOUTHWEST) – Townships of Zanesville, Raymond, North and South Litchfield, Butler Grove, Hillsboro, Walshville and Grisham.

ELECTRIC POWER LINEMAN, GROUNDMAN, EQUIPMENT OPERATOR, TRUCK DRIVER (NE) - Entire county except Butler Grove, Grisham, Hillsboro, North and South Litchfield, Raymond, Walshville, and Zanesville Townships.

IRONWORKERS (NORTH) - That part of the county north of a diagonal line through Taylor Springs and Chapman.



BIDDING & CONTRACT REQUIREMENTS

Document 008600 - Drawings, Schedules and Details

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<u>DRAWING NO.</u>	<u>TITLE</u>
G-101	COVER SHEET
A-101	BASEMENT PLAN
A-102	FIRST FLOOR PLAN
A-103	ROOF PLAN & ROOF DETAILS
MD-101	BASEMENT PLAN – DEMOLITION – HVAC
MD-102	FIRST FLOOR PLAN – DEMOLITION – HVAC
M-101	BASEMENT PLAN – RENOVATION – HVAC
M-102	FIRST FLOOR PLAN – RENOVATION – HVAC
M-201	NOTES, SCHEDULES AND DETAILS – HVAC
M-202	DETAILS – HVAC
E-101	ELECTRICAL PLANS

All Drawings dated February 10, 2025.

END OF SECTION



## SECTION 01 10 00 - SUMMARY

### PART 1 GENERAL

#### 1.1 SECTION INCLUDES

- A. Contract description.
- B. Owner supplied products.
- C. Contractor's use of site and premises.
- D. Owner occupancy.
- E. Specification Conventions.
- F. Contractor's Duties
- G. Contract Documents

#### 1.2 CONTRACT DESCRIPTION

- A. BASE BID: Work includes abandoning of existing boilers, demolition of existing exterior boiler stack and removal of existing hydronic piping at existing boilers, as well as new hydronic piping to reconnect existing loop to piping roughed-in as a part of separate new construction project. Work also includes split system equipment to provide cooling in the kitchen and roof top units to provide cooling in classrooms and library. Architectural, roofing and electrical work are commensurate with the HVAC scope of work.
- B. ALTERNATE BID #1: Work includes the demolition and removal of existing boilers.

#### 1.3 OWNER SUPPLIED PRODUCTS

- A. Owner's Responsibilities:
  - 1. Arrange for and deliver Owner-reviewed Shop Drawings, Product Data, and Samples, to Contractor.
  - 2. Arrange and pay for delivery to site.
  - 3. On delivery, inspect products jointly with Contractor.
  - 4. Submit claims for transportation damage and replace damaged, defective, or deficient items.
  - 5. Arrange for manufacturers' warranties, inspections, and service.
- B. Contractor's Responsibilities:
  - 1. Review Owner-reviewed Shop Drawings, Product Data, and Samples.
  - 2. Receive and unload products at site; inspect for completeness or damage jointly with Owner.
  - 3. Handle, store, install and finish products.
  - 4. Repair or replace items damaged after receipt.

- C. Items furnished by Owner for installation by Contractor:
  - 1. As indicated on drawings.

#### 1.4 CONTRACTOR'S USE OF SITE AND PREMISES

- A. Limit use of site and premises to allow:
  - 1. Owner occupancy.
  - 2. Use of site and premises by the public.
- B. Construction Operations: Limited to areas noted on Drawings.
- C. Allow for public use of all adjoining streets and sidewalks.
- D. Light duty vehicle parking is permitted. All parking lots and sidewalks are to be restored to their original condition.

#### 1.5 OWNER OCCUPANCY

- A. The Owner will occupy the site during the entire period of construction for the conduct of normal operations.
- B. Cooperate with Owner to minimize conflict, and to facilitate Owner's operations.
- C. Schedule the Work to accommodate Owner occupancy.

#### 1.6 SPECIFICATION CONVENTIONS

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

#### 1.7 CONTRACTOR'S DUTIES

- A. Except as specifically noted, Contractor shall provide and pay for:
  - 1. All labor, materials, and equipment used for construction of and/or incorporated into the project.
  - 2. All tools, construction equipment and machinery.
  - 3. Required building permits, and all inspection fees by governmental authorities.
  - 4. Other facilities and services necessary for proper execution and completion of work.
- B. Owner is exempt from sales tax on product permanently incorporated in work.
  - 1. Obtain sales tax exemption certificate number from Owner.
  - 2. Place exemption certificate number on invoices for materials incorporated in work.



3. Upon completion of work, file with Owner a notarized statement that all purchases made under exemption certificate were entitled to be exempt and furnish copies of invoice to Owner.
  4. Pay legally assessed penalties for improper use of exemption certificate number.
- C. Comply with codes, ordinances, rules, regulations, orders, and other legal requirements of public authorities which bear on performance of work.
- D. Promptly submit written notice to Architect/Engineer of observed variance of contract documents from legal requirements.
1. It is not the Contractor's responsibility to make certain that drawings and specifications comply with codes and regulations.
    - a. Appropriate modifications to contract documents will account for/reflect necessary changes.
    - b. Assume responsibility for work known to be contrary to such requirements if written notice is not provided by the Contractor to the Architect.
- E. Enforce strict discipline and good order among employees.
- F. Do not unreasonably encumber site with materials or equipment.
- G. Do not load structure with weight that will endanger structure.
- H. Assume full responsibility for protection and safekeeping of products stored on premises.
- I. Move any stored products which interfere with operations of Owner or other Contractors.
- J. Obtain and pay for use of additional storage or work areas needed for operations.
- K. The School Board shall prohibit the use of tobacco on school property when the property is being used for any school purposes. Tobacco shall mean cigarette, cigar, pipe or tobacco in any other form including smokeless tobacco which is any loose, cut, shredded, ground, powdered, compressed or leaf tobacco that is intended to be placed in the mouth without being smoked. All members of work crews must remain fully clothed and refrain from using obscene or profane language during these same time parameters. School purposes include, but are not limited to, all interscholastic or extracurricular athletic, academic, or other events sponsored by the School Board or in which students of the District participate.
- L. Contractor shall maintain building free from entrance of water at all times during construction.
- M. Contractor shall furnish, erect and maintain temporary ladders, ramps, or hoists as may be required for performance of his work.
1. All such equipment shall be substantially designed, constructed, and maintained in accordance with applicable federal, state, and local laws, ordinances, and regulations, and shall be promptly removed when no longer needed.

- N. Contractor shall design, furnish, erect, maintain, and move all ladders and scaffolding required for this work.
  - 1. All ladders and scaffolding shall be designed, constructed, and maintained in accordance with applicable federal, state, and local law, ordinances, and regulations, and shall be promptly removed when no longer needed.

1.8 CONTRACT DOCUMENTS

- A. Contractor will be furnished free of charge two (2) copies of drawings and specifications.
- B. On request, additional copies will be furnished to Contractor at cost of reproduction, postage and handling.

PART 2 PRODUCTS

Not Used.

PART 3 EXECUTION

Not Used.

END OF SECTION

## SECTION 01 20 00 - PRICE AND PAYMENT PROCEDURES

### PART 1 GENERAL

#### 1.1 SECTION INCLUDES

- A. Schedule of values.
- B. Applications for payment.
- C. Change procedures.
- D. Defect assessment.
- E. Alternates.

#### 1.2 SCHEDULE OF VALUES

- A. Submit printed schedule on AIA Form G703 - Continuation Sheet for G702.
- B. Submit Schedule of Values in duplicate within 15 days after date established in Notice to Proceed.
- C. Format: Utilize Table of Contents of this Project Manual. Identify each line item with number and title of major specification Section. Identify site mobilization, bonds and insurance.
- D. Include separately from each line item, direct proportional amount of Contractor's overhead and profit.
- E. Revise schedule to list approved Change Orders, with each Application For Payment.

#### 1.3 APPLICATIONS FOR PAYMENT

- A. Submit three copies of each application on AIA Form G702-Application and Certificate for Payment.
- B. Content and Format: Utilize Schedule of Values for listing items in Application for Payment.
- C. Submit updated construction schedule with each Application for Payment.
- D. Payment Period: Submit applications for payment to Architect/Engineer for processing no later than 10 days prior to date established for progress payment meeting.
- E. Submit with transmittal letter as specified for Submittals in Section 01 33 00.
- F. Submit lien waivers.

- G. Substantiating Data: When Architect/Engineer requires substantiating information, submit data justifying dollar amounts in question. Include the following with Application for Payment:
1. Current construction photographs.
  2. Partial release of liens from major subcontractors and vendors.
  3. Affidavits attesting to off-site stored products.
- H. Application for Progress Payment No. 1 shall be accompanied by a notarized statement on Contractor's letterhead as follows:
1. I certify that the funds requested for the accompanying Pay Request No. 1 will be used to pay all just and lawful bills against the undersigned and his subcontractors for labor, material and equipment employed in the performance of the work. I further certify that such bills will be paid no later than ten (10) calendar days from date of receipt of the Owner's disbursement.
  2. Execute statement with signature of a responsible officer of contracting firm.
- I. Each subsequent application for progress payment shall be accompanied by the following supporting documents:
1. Partial or final waivers of lien in monetary amount from Contractor, each material supplier and/or subcontractor reflecting amounts incorporated into preceding request for progress payment.
  2. A notarized Affidavit of Payment to Material Suppliers and Subcontractors.
    - a. Affidavit shall be submitted in exact text as exhibit furnished by Architect/Engineers, signed by Contractor or Subcontractor.
    - b. Include unit item, actual amount of contract without overhead or profit, amount paid to date, and amount to become due (balance of account).
- J. Progress payments will be made for materials and equipment not incorporated in the work provided that:
1. Such materials and equipment have been delivered to and suitable stored at site or some other location approved in writing by Owner and Architect/Engineer. All such materials stored off-site shall be marked or tagged with identification of project to which they are assigned.
  2. Contractor submits evidence of title to such materials and equipment.
  3. Care and custody of such materials and equipment and all costs incurred for movement and storage shall be responsibility of Contractor.
  4. Such materials and equipment are suitably insured by Contractor. Contractor shall submit a certificate of insurance showing the Owner as an additional insured and showing amount of insurance overage of suitable proof that material and equipment are stored in a bonded warehouse.
- K. Refer to section 01 70 00 for submittal requirements for application for final payment and related closeout procedures.

## 1.4 CHANGE PROCEDURES

- A. Submittals: Submit name of individual authorized to receive change documents and be responsible for informing others in Contractor's employ or Subcontractors of changes to the Work.
- B. The Architect/Engineer will advise of minor changes in the Work not involving adjustment to Contract Sum/Price or Contract Time by issuing supplemental instructions in writing.
- C. The Architect/Engineer may issue a Proposal Request including a detailed description of proposed change with supplementary or revised Drawings and specifications, a change in Contract Time for executing the change and the period of time during which the requested price will be considered valid. Contractor will prepare and submit estimate within seven days.
- D. Stipulated Sum/Price Change Order: Based on Proposal Request and Contractor's fixed price quotation.
- E. Architect/Engineer may issue directive, on Hurst-Rosche Change Order form signed by Owner, instructing Contractor to proceed with change in the Work, for subsequent inclusion in a Change Order. Document will describe changes in the Work, and designate method of determining any change in Contract Sum/Price or Contract Time. Promptly execute change.
- F. Time and Material Change Order: Submit itemized account and supporting data after completion of change, within time limits indicated in Conditions of the Contract. Architect/Engineer will determine change allowable in Contract Sum/Price and Contract Time as provided in Contract Documents.
- G. Maintain detailed records of work done on Time and Material basis. Provide full information required for evaluation of proposed changes, and to substantiate costs for changes in the Work.
- H. Document each quotation for change in cost or time with sufficient data to allow evaluation of quotation.
- I. Execution of Change Orders: Architect/Engineer will issue Change Orders for signatures of parties as provided in Conditions of the Contract.
- J. Correlation Of Contractor Submittals:
  - 1. Promptly revise Schedule of Values and Application for Payment forms to record each authorized Change Order as separate line item and adjust Contract Sum/Price.
  - 2. Promptly revise progress schedules to reflect change in Contract Time, revise sub-schedules to adjust times for other items of work affected by the change, and resubmit.
  - 3. Promptly enter changes in Project Record Documents.

## 1.5 DEFECT ASSESSMENT

- A. Replace the Work, or portions of the Work, not conforming to specified requirements.
- B. If, in the opinion of the Architect/Engineer, it is not practical to remove and replace the Work, the Architect/Engineer will direct appropriate remedy or adjust payment.
- C. The defective Work may remain, but unit sum/price will be adjusted to new sum/price at discretion of Architect/Engineer.
- D. Defective Work will be partially repaired to instructions of Architect/Engineer, and unit sum/price will be adjusted to new sum/price at discretion of Architect/Engineer.
- E. Authority of Architect/Engineer to assess defects and identify payment adjustments, is final.
- F. Non-Payment For Rejected Products: Payment will not be made for rejected products for any of the following:
  - 1. Products wasted or disposed of in a manner that is not acceptable.
  - 2. Products determined as unacceptable before or after placement.
  - 3. Products not completely unloaded from transporting vehicle.
  - 4. Products placed beyond lines and levels of required Work.
  - 5. Products remaining on hand after completion of the Work.
  - 6. Loading, hauling, and disposing of rejected products.

## 1.6 ALTERNATES

- A. Alternates quoted on Bid Forms will be reviewed and accepted or rejected at Owner's option. Accepted Alternates will be identified in Owner-Contractor Agreement.
- B. Coordinate related work and modify surrounding work.
- C. Schedule of Alternates:
  - 1. Alternate Bid #1:
    - a. Work includes the demolition and removal of existing boilers.

## PART 2 PRODUCTS

Not Used.

## PART 3 EXECUTION

Not Used.

END OF SECTION

## SECTION 01 30 00 - ADMINISTRATIVE REQUIREMENTS

### PART 1 GENERAL

#### 1.1 SECTION INCLUDES

- A. Coordination and project conditions.
- B. Preconstruction meeting.
- C. Progress meetings.
- D. Cutting and patching.
- E. Special procedures.

#### 1.2 COORDINATION AND PROJECT CONDITIONS

- A. Coordinate scheduling, submittals, and Work of various sections of Project Manual to ensure efficient and orderly sequence of installation of interdependent construction elements, with provisions for accommodating items installed later.
- B. Verify utility requirements and characteristics of operating equipment are compatible with building utilities. Coordinate work of various sections having interdependent responsibilities for installing, connecting to, and placing in service, operating equipment.
- C. Coordinate space requirements, supports, and installation of mechanical and electrical Work indicated diagrammatically on Drawings. Follow routing shown for pipes, ducts, and conduit, as closely as practicable; place runs parallel with lines of building. Utilize spaces efficiently to maximize accessibility for other installations, for maintenance, and for repairs.
- D. In finished areas except as otherwise indicated, conceal pipes, ducts, and wiring within construction. Coordinate locations of fixtures and outlets with finish elements.
- E. Coordinate completion and clean-up of Work of separate sections in preparation for Substantial Completion and for portions of Work designated for Owner's occupancy.
- F. After Owner occupancy of premises, coordinate access to site for correction of defective Work and Work not in accordance with Contract Documents, to minimize disruption of Owner's activities.

#### 1.3 PRECONSTRUCTION MEETING

- A. Architect/Engineer will schedule meeting after Notice of Award.
- B. Attendance Required: Owner, Architect/Engineer, and Contractor.

- C. Agenda:
  - 1. Execution of Owner-Contractor Agreement.
  - 2. Submission of executed bonds and insurance certificates.
  - 3. Distribution of Contract Documents.
  - 4. Submission of list of Subcontractors, list of products, schedule of values, and progress schedule.
  - 5. Designation of personnel representing parties in Contract and Architect/Engineer.
  - 6. Procedures and processing of field decisions, submittals, substitutions, applications for payments, proposal request, Change Orders, and Contract closeout procedures.
  - 7. Scheduling.
- D. Architect/Engineer will record minutes and distribute copies with reasonable promptness after meeting to participants, with copies to Owner, and those affected by decisions made.

#### 1.4 PROGRESS MEETINGS

- A. Schedule and administer meetings throughout progress of the Work at maximum monthly intervals.
- B. Architect/Engineer will make arrangements for meetings, prepare agenda with copies for participants, preside at meetings.
- C. Attendance Required: Job superintendent, major subcontractors and suppliers, Owner, Architect/Engineer, as appropriate to agenda topics for each meeting.
- D. Agenda:
  - 1. Review minutes of previous meetings.
  - 2. Review of Work progress.
  - 3. Field observations, problems, and decisions.
  - 4. Identification of problems impeding planned progress.
  - 5. Review of submittals schedule and status of submittals.
  - 6. Review of off-site fabrication and delivery schedules.
  - 7. Maintenance of progress schedule.
  - 8. Corrective measures to regain projected schedules.
  - 9. Planned progress during succeeding work period.
  - 10. Coordination of projected progress.
  - 11. Maintenance of quality and work standards.
  - 12. Effect of proposed changes on progress schedule and coordination.
  - 13. Other business relating to Work.
- E. Architect/Engineer will record minutes and distribute copies with reasonable promptness after meeting to participants, with copies to Owner, and those affected by decisions made.

#### PART 2 PRODUCTS

Not Used.



## PART 3 EXECUTION

### 3.1 CUTTING AND PATCHING

- A. Employ skilled and experienced installer to perform cutting and patching.
- B. Submit written request in advance of cutting or altering elements affecting:
  - 1. Structural integrity of element.
  - 2. Integrity of weather-exposed or moisture-resistant elements.
  - 3. Efficiency, maintenance, or safety of element.
  - 4. Visual qualities of sight exposed elements.
  - 5. Work of Owner or separate contractor.
- C. Execute cutting, fitting, and patching including excavation and fill, to complete Work, and to:
  - 1. Fit the several parts together, to integrate with other Work.
  - 2. Uncover Work to install or correct ill-timed Work.
  - 3. Remove and replace defective and non-conforming Work.
  - 4. Remove samples of installed Work for testing.
  - 5. Provide openings in elements of Work for penetrations of mechanical and electrical Work.
- D. Execute work by methods to avoid damage to other Work, and to provide proper surfaces to receive patching and finishing.
- E. Cut masonry and concrete materials using masonry saw or core drill.
- F. Restore Work with new products in accordance with requirements of Contract Documents.
- G. Fit Work tight to pipes, sleeves, ducts, conduit, and other penetrations through surfaces.
- H. Maintain integrity of wall, ceiling, or floor construction; completely seal voids.
- I. Refinish or restore surfaces and finished to match existing finishes. For continuous surfaces, refinish to nearest intersection; for assembly, refinish entire unit.
- J. Identify hazardous substances or conditions exposed during the Work to Architect/Engineer for decision or remedy.

### 3.2 SPECIAL PROCEDURES

- A. Materials: As specified in product sections; match existing with new products and salvaged products for patching and extending work.
- B. Employ skilled and experienced installer to perform alteration work.
- C. Cut, move, or remove items as necessary for access to alterations and renovation Work. Replace and restore at completion.

- D. Remove unsuitable material not marked for salvage, including rotted wood, corroded metals, and deteriorated masonry and concrete. Replace materials as specified for finished Work.
- E. Remove debris and abandoned items from area and from concealed spaces.
- F. Prepare surface and remove surface finishes to permit installation of new work and finishes.
- G. Close openings in exterior surfaces to protect existing work from weather and extremes of temperature and humidity.
- H. Remove, cut, and patch Work in manner to minimize damage and to permit restoring products and finishes to original or specified condition.
- I. Refinish existing visible surfaces to remain to specified condition for each material, with neat transition to adjacent finishes.
- J. Where new Work abuts or aligns with existing, provide smooth and even transition. Patch Work to match existing adjacent Work in texture and appearance.
- K. When finished surfaces are cut so that smooth transition with new Work is not possible, terminate existing surface along straight line at natural line of division and submit recommendation to Architect/Engineer for review.
- L. Where change of plane of 1/4 inch or more occurs, submit recommendation for providing smooth transition; to Architect/Engineer for review.
- M. Patch or replace portions of existing surfaces which are damaged, lifted, discolored, or showing other imperfections.
- N. Finish surfaces as specified in individual product sections.

END OF SECTION

## SECTION 01 33 00 - SUBMITTAL PROCEDURES

### PART 1 GENERAL

#### 1.1 SECTION INCLUDES

- A. Submittal procedures.
- B. Construction progress schedules.
- C. Proposed products list.
- D. Product data.
- E. Shop drawings.
- F. Design data.
- G. Manufacturer's instructions.

#### 1.2 SUBMITTAL PROCEDURES

- A. **Transmit each submittal with shop drawing submittal form found at the end of this section. A copy of submittal form must be attached to each copy of the submittal; if not, the submittal will be rejected and returned to the Contractor.**
- B. Sequentially number transmittal forms. Mark revised submittals with original number and sequential alphabetic suffix.
- C. Identify Project, Contractor, subcontractor and supplier, pertinent drawing and detail number, and specification section number, appropriate to submittal.
- D. Apply Contractor's stamp, signed or initialed certifying that review, approval, verification of products required, field dimensions, adjacent construction Work, and coordination of information is in accordance with requirements of the Work and Contract Documents.
- E. Schedule submittals to expedite Project and deliver to Architect/Engineer at business address. Coordinate submission of related items.
- F. For each submittal for review, allow 15 days excluding delivery time to and from Contractor.
- G. Identify variations from Contract Documents and product or system limitations which may be detrimental to successful performance of completed Work.
- H. Allow space on submittals for Contractor and Architect/Engineer review stamps.
- I. When revised for resubmission, identify changes made since previous submission.

- J. Distribute copies of reviewed submittals as appropriate. Instruct parties to promptly report inability to comply with requirements.
- K. Submittals not requested will not be recognized or processed.

### 1.3 CONSTRUCTION PROGRESS SCHEDULES

- A. Submit initial schedules within 15 days after date of Owner-Contractor Agreement. After review, resubmit required revised data within ten days.
- B. Submit revised Progress Schedules with each Application for Payment.
- C. Distribute copies of reviewed schedules to Project site file, subcontractors, suppliers, and other concerned parties.
- D. Instruct recipients to promptly report, in writing, problems anticipated by projections indicated in schedules.
- E. Submit computer generated horizontal bar chart with separate line for each major portion of Work or operation, identifying first workday of each week.
- F. Submit separate schedule of submittal dates for shop drawings, product data, and samples, including Owner furnished products and dates reviewed submittals will be required from Architect/Engineer. Indicate decision dates for selection of finishes.
- G. Revisions To Schedules:
  - 1. Indicate progress of each activity to date of submittal, and projected completion date of each activity.
  - 2. Identify activities modified since previous submittal, major changes in scope, and other identifiable changes.
  - 3. Prepare narrative report to define problem areas, anticipated delays, and impact on Schedule. Report corrective action taken, or proposed, and its effect including effect of changes on schedules of separate contractors.

### 1.4 PROPOSED PRODUCTS LIST

- A. Within 15 days after date of Owner-Contractor Agreement, submit list of major products proposed for use, with name of manufacturer, trade name, and model number of each product.
- B. For products specified only by reference standards, give manufacturer, trade name, model or catalog designation, and reference standards.

### 1.5 PRODUCT DATA

- A. Product Data: Submit to Architect/Engineer for review for limited purpose of checking for conformance with information given and design concept expressed in Contract Documents.
- B. Submit number of copies Contractor requires, plus 3 copies Architect/Engineer will retain.

- C. Mark each copy to identify applicable products, models, options, and other data. Supplement manufacturers' standard data to provide information specific to this Project.
- D. Indicate product utility and electrical characteristics, utility connection requirements, and location of utility outlets for service for functional equipment and appliances.
- E. After review, produce copies and distribute in accordance with SUBMITTAL PROCEDURES article and for record documents described in Section 01 70 00.

#### 1.6 SHOP DRAWINGS

- A. Shop Drawings: Submit to Architect/Engineer for review for limited purpose of checking for conformance with information given and design concept expressed in Contract Documents.
- B. Indicate special utility and electrical characteristics, utility connection requirements, and location of utility outlets for service for functional equipment and appliances.
- C. When required by individual specification sections, provide shop drawings signed and sealed by professional engineer responsible for designing components shown on shop drawings.
  - 1. Include signed and sealed calculations to support design.
  - 2. Submit drawings and calculations in form suitable for submission to and approval by authorities having jurisdiction.
  - 3. Make revisions and provide additional information when required by authorities having jurisdiction.
- D. Submit number of opaque reproductions Contractor requires, plus 3 copies Architect/Engineer will retain.
- E. After review, produce copies and distribute in accordance with SUBMITTAL PROCEDURES article and for record documents described in Section 01 70 00.

#### 1.7 DESIGN DATA

- A. Submit for Architect/Engineer's knowledge as contract administrator or for Owner.
- B. Submit for information for limited purpose of assessing conformance with information given and design concept expressed in Contract Documents.

#### 1.8 MANUFACTURER'S INSTRUCTIONS

- A. When specified in individual specification sections, submit printed instructions for delivery, storage, assembly, installation, adjusting, and finishing, to Architect/Engineer for delivery to Owner in quantities specified for Product Data.
- B. Indicate special procedures, perimeter conditions requiring special attention, and special environmental criteria required for application or installation.

PART 2 PRODUCTS

Not Used.

PART 3 EXECUTION

Not Used.

END OF SECTION



HURST-ROSCHE, INC.

## SHOP DRAWING SUBMITTAL

PROJECT: Cafeteria Building HVAC Replacement  
Hillsboro High School  
Hillsboro C.U.S.D. No. 3  
Hillsboro, Montgomery County, Illinois

DATE: \_\_\_\_\_

A/E PROJECT NO: 150-0095

CONTRACTOR: \_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

PRESENTED BY:  
(Subcontractor/Supplier)

\_\_\_\_\_  
Company Name

\_\_\_\_\_  
Address

\_\_\_\_\_  
Phone/Fax

\_\_\_\_\_  
Contact Person

ITEM: \_\_\_\_\_

SPEC SECTION: \_\_\_\_\_

By approving and submitting these shop drawings, product data and samples, we represent that we have determined and verified all materials, field measurements and field construction criteria related thereto, or will do so, and that we have checked and coordinated information contained within submittal with requirements of the work and contract documents.

\_\_\_\_\_  
Contractor's Signature

\_\_\_\_\_  
Date





## SECTION 01 40 00 - QUALITY REQUIREMENTS

### PART 1 GENERAL

#### 1.1 SECTION INCLUDES

- A. Quality control and control of installation.
- B. Tolerances.
- C. References.
- D. Examination.
- E. Preparation.

#### 1.2 QUALITY CONTROL AND CONTROL OF INSTALLATION

- A. Monitor quality control over suppliers, manufacturers, products, services, site conditions, and workmanship, to produce Work of specified quality.
- B. Comply with manufacturers' instructions, including each step in sequence.
- C. When manufacturers' instructions conflict with Contract Documents, request clarification from Architect/Engineer before proceeding.
- D. Comply with specified standards as minimum quality for the Work except where more stringent tolerances, codes, or specified requirements indicate higher standards or more precise workmanship.
- E. Perform Work by persons qualified to produce required and specified quality.
- F. Verify field measurements are as indicated on Shop Drawings or as instructed by manufacturer.
- G. Secure products in place with positive anchorage devices designed and sized to withstand stresses, vibration, physical distortion, or disfigurement.

#### 1.3 TOLERANCES

- A. Monitor fabrication and installation tolerance control of products to produce acceptable Work. Do not permit tolerances to accumulate.
- B. Comply with manufacturers' tolerances. When manufacturers' tolerances conflict with Contract Documents, request clarification from Architect/Engineer before proceeding.
- C. Adjust products to appropriate dimensions; position before securing products in place.

## 1.4 REFERENCES

- A. For products or workmanship specified by association, trade, or other consensus standards, comply with requirements of standard, except when more rigid requirements are specified or are required by applicable codes.
- B. Conform to reference standard by date of issue current on date of Contract Documents, except where specific date is established by code.
- C. Obtain copies of standards where required by product specification sections.
- D. When specified reference standards conflict with Contract Documents, request clarification from Architect/Engineer before proceeding.
- E. Neither contractual relationships, duties, nor responsibilities of parties in Contract nor those of Architect/Engineer shall be altered from Contract Documents by mention or inference otherwise in reference documents.

## PART 2 PRODUCTS

Not Used.

## PART 3 EXECUTION

### 3.1 EXAMINATION

- A. Verify existing site conditions and substrate surfaces are acceptable for subsequent Work. Beginning new Work means acceptance of existing conditions.
- B. Verify existing substrate is capable of structural support or attachment of new Work being applied or attached.
- C. Examine and verify specific conditions described in individual specification sections.
- D. Verify utility services are available, of correct characteristics, and in correct locations.

### 3.2 PREPARATION

- A. Clean substrate surfaces prior to applying next material or substance.
- B. Seal cracks or openings of substrate prior to applying next material or substance.
- C. Apply manufacturer required or recommended substrate primer, sealer, or conditioner prior to applying new material or substance in contact or bond.

END OF SECTION

## SECTION 015000 - TEMPORARY FACILITIES AND CONTROLS

### PART 1 GENERAL

#### 1.1 SECTION INCLUDES

- A. Temporary Utilities.
  - 1. Temporary electricity.
  - 2. Temporary water service.
  - 3. Temporary sanitary facilities.
- B. Construction Facilities:
  - 1. Vehicular access.
  - 2. Parking.
  - 3. Progress cleaning and waste removal.
- C. Temporary Controls:
  - 1. Barriers.
  - 2. Dust control.
  - 3. Noise control.
  - 4. Pollution control.
- D. Removal of utilities, facilities, and controls.

#### 1.2 TEMPORARY ELECTRICITY

- A. Owner will pay cost of energy used. Exercise measures to conserve energy.
- B. Permanent convenience receptacles may be utilized during construction.

#### 1.3 TEMPORARY WATER SERVICE

- A. Owner will pay cost of temporary water. Exercise measures to conserve energy. Utilize Owner's existing water system when available, extend and supplement with temporary devices as needed to maintain specified conditions for construction operations.
- B. Extend branch piping with outlets located so water is available by hoses with threaded connections.

#### 1.4 TEMPORARY SANITARY FACILITIES

- A. Provide and maintain required facilities and enclosures. Existing facility use is not permitted. Provide facilities at time of project mobilization.

#### 1.5 VEHICULAR ACCESS

- A. Provide and maintain access to fire hydrants and control valves free of obstructions.
- B. Use existing on-site roads for construction traffic.

## 1.6 PARKING

- A. Use of designated existing on-site streets and driveways used for construction traffic is permitted as directed by the Owner. Tracked vehicles not allowed on paved areas.
- B. Use of designated areas of existing parking facilities used by construction personnel is permitted.
- C. Do not allow heavy vehicles or construction equipment in parking areas.
- D. Maintenance:
  - 1. Maintain traffic and parking areas in sound condition free of excavated material, construction equipment, products, mud, snow, and ice.
  - 2. Maintain existing and permanent paved areas used for construction; promptly repair breaks, potholes, low areas, standing water, and other deficiencies, to maintain paving and drainage in original, or specified, condition.
- E. Removal, Repair:
  - 1. Repair existing facilities damaged by use, to original condition.

## 1.7 PROGRESS CLEANING AND WASTE REMOVAL

- A. Maintain areas free of waste materials, debris, and rubbish. Maintain site in clean and orderly condition.
- B. Remove debris and rubbish from pipe chases, plenums, attics, crawl spaces, and other closed or remote spaces, prior to enclosing spaces.
- C. Collect and remove waste materials, debris, and rubbish from site periodically and dispose off-site.

## 1.8 BARRIERS

- A. Provide barriers to prevent unauthorized entry to construction areas to allow for Owner's use of site, and to protect existing facilities and adjacent properties from damage from construction operations and demolition.
- B. Protect non-owned vehicular traffic, stored materials, site, and structures from damage.

## 1.9 DUST CONTROL

- A. Execute Work by methods to minimize raising dust from construction operations.
- B. Provide positive means to prevent air-borne dust from dispersing into atmosphere.

## 1.10 NOISE CONTROL

- A. Provide methods, means, and facilities to minimize noise produced by construction operations.

1.11 POLLUTION CONTROL

- A. Provide methods, means, and facilities to prevent contamination of soil, water, and atmosphere from discharge of noxious, toxic substances, and pollutants produced by construction operations.
- B. Comply with pollution and environmental control requirements of authorities having jurisdiction.

1.12 REMOVAL OF UTILITIES, FACILITIES, AND CONTROLS

- A. Remove temporary utilities, equipment, facilities, materials, prior to Substantial Completion inspection.
- B. Clean and repair damage caused by installation or use of temporary work.
- C. Restore existing and permanent facilities used during construction to original condition. Restore permanent facilities used during construction to specified condition.

PART 2 PRODUCTS

Not Used.

PART 3 EXECUTION

Not Used.

END OF SECTION



## SECTION 01 60 00 - PRODUCT REQUIREMENTS

### PART 1 GENERAL

#### 1.1 SECTION INCLUDES

- A. Products.
- B. Product delivery requirements.
- C. Product storage and handling requirements.
- D. Product options.
- E. Product substitution procedures.
- F. Equipment electrical characteristics and components.

#### 1.2 PRODUCTS

- A. Furnish products of qualified manufacturers suitable for intended use. Furnish products of each type by single manufacturer unless specified otherwise.
- B. Do not use materials and equipment removed from existing premises, except as specifically permitted by Contract Documents.
- C. Furnish interchangeable components from same manufacturer for components being replaced.

#### 1.3 PRODUCT DELIVERY REQUIREMENTS

- A. Transport and handle products in accordance with manufacturer's instructions.
- B. Promptly inspect shipments to ensure products comply with requirements, quantities are correct, and products are undamaged.
- C. Provide equipment and personnel to handle products by methods to prevent soiling, disfigurement, or damage.

#### 1.4 PRODUCT STORAGE AND HANDLING REQUIREMENTS

- A. Store and protect products in accordance with manufacturers' instructions.
- B. Store with seals and labels intact and legible.
- C. Store sensitive products in weather tight, climate controlled, enclosures in an environment favorable to product.
- D. For exterior storage of fabricated products, place on sloped supports above ground.

- E. Provide bonded off-site storage and protection when site does not permit on-site storage or protection.
- F. Cover products subject to deterioration with impervious sheet covering. Provide ventilation to prevent condensation and degradation of products.
- G. Provide equipment and personnel to store products by methods to prevent soiling, disfigurement, or damage.
- H. Arrange storage of products to permit access for inspection. Periodically inspect to verify products are undamaged and are maintained in acceptable condition.

#### 1.5 PRODUCT OPTIONS

- A. Products Specified by Reference Standards or by Description Only: Any product meeting those standards or description.
- B. Products Specified by Naming One or More Manufacturers: Products of one of manufacturers named and meeting specifications, no options or substitutions allowed.
- C. Products Specified by Naming One or More Manufacturers with Provision for Substitutions: Submit request for substitution for any manufacturer not named in accordance with the following article.

#### 1.6 PRODUCT SUBSTITUTION PROCEDURES

- A. Instructions to Bidders specify time restrictions for submitting requests for Substitutions during bidding period to requirements specified in this section.
- B. Substitutions may be considered when a product becomes unavailable through no fault of Contractor.
- C. Document each request with complete data substantiating compliance of proposed Substitution with Contract Documents.
- D. A request constitutes a representation that Contractor:
  - 1. Has investigated proposed product and determined that it meets or exceeds quality level of specified product.
  - 2. Will provide same warranty for Substitution as for specified product.
  - 3. Will coordinate installation and make changes to other Work which may be required for the Work to be complete with no additional cost to Owner.
  - 4. Waives claims for additional costs or time extension which may subsequently become apparent.
  - 5. Will reimburse Owner and Architect/Engineer for review or redesign services associated with re-approval by authorities having jurisdiction.
- E. Substitutions will not be considered when they are indicated or implied on Shop Drawing or Product Data submittals, without separate written request, or when acceptance will require revision to Contract Documents.



- F. Substitution Submittal Procedure:
1. Submit three copies of request for Substitution for consideration. Limit each request to one proposed Substitution.
  2. Submit Shop Drawings, Product Data, and certified test results attesting to proposed product equivalence. Burden of proof is on proposer.
  3. Architect/Engineer will notify Contractor in writing of decision to accept or reject request.

## PART 2 PRODUCTS

### 2.1 EQUIPMENT ELECTRICAL CHARACTERISTICS AND COMPONENTS

- A. Wiring Terminations: Furnish terminal lugs to match branch circuit conductor quantities, sizes, and materials indicated. Include lugs for terminal box.
- B. Cord and Plug: Furnish minimum 6-foot cord and plug including grounding connector for connection to electric wiring system. Cord of longer length is specified in individual specification sections.

## PART 3 EXECUTION

Not Used.

END OF SECTION



## SECTION 01 70 00 - EXECUTION AND CLOSEOUT REQUIREMENTS

### PART 1 GENERAL

#### 1.1 SECTION INCLUDES

- A. Closeout procedures.
- B. Final cleaning.
- C. Demonstration and instructions.
- D. Protecting installed construction.
- E. Project record documents.
- F. Operation and maintenance data.
- G. Product warranties and product bonds.

#### 1.2 CLOSEOUT PROCEDURES

- A. Submit written certification that Contract Documents have been reviewed, Work has been inspected, and that Work is complete in accordance with Contract Documents and ready for Architect/Engineer's review.
- B. Provide submittals to Architect/Engineer required by authorities having jurisdiction.
- C. Submit final Application for Payment identifying total adjusted Contract Sum, previous payments, and sum remaining due.
- D. Provide a notarized Affidavit for Final Completion in exact text as exhibit furnished by Architect/Engineer, signed by Contractor.
- E. Owner will occupy all portions of building as specified in Section 01 10 00.

#### 1.3 FINAL CLEANING

- A. Execute final cleaning prior to final project assessment.
- B. Clean interior and exterior glass, surfaces exposed to view; remove temporary labels, stains and foreign substances, polish transparent and glossy surfaces, vacuum carpeted and soft surfaces.
- C. Clean equipment and fixtures to sanitary condition with cleaning materials appropriate to surface and material being cleaned.
- D. Replace filters of operating equipment.
- E. Clean debris from roofs, gutters, downspouts, and drainage systems.

- F. Clean site: sweep paved areas, rake clean landscaped surfaces.
- G. Remove waste and surplus materials, rubbish, and construction facilities from site.

#### 1.4 DEMONSTRATION AND INSTRUCTIONS

- A. Demonstrate operation and maintenance of products to Owner's personnel two weeks prior to date of Substantial Completion.
- B. Demonstrate Project equipment and instruction in classroom environment located at site and instructed by qualified manufacturer's representative who is knowledgeable about the Project.
- C. For equipment or systems requiring seasonal operation, perform demonstration for other season within six months.
- D. Utilize operation and maintenance manuals as basis for instruction. Review contents of manual with Owner's personnel in detail to explain all aspects of operation and maintenance.
- E. Demonstrate start-up, operation, control, adjustment, troubleshooting, servicing, maintenance, and shutdown of each item of equipment at agreed time at equipment location.
- F. Prepare and insert additional data in operations and maintenance manuals when need for additional data becomes apparent during instruction.
- G. Required instruction time for each item of equipment and system is specified in individual sections.

#### 1.5 PROTECTING INSTALLED CONSTRUCTION

- A. Protect installed Work and provide special protection where specified in individual specification sections.
- B. Provide temporary and removable protection for installed products. Control activity in immediate work area to prevent damage.
- C. Provide protective coverings at walls, projections, jambs, sills, and soffits of openings.
- D. Protect finished floors, stairs, and other surfaces from traffic, dirt, wear, damage, or movement of heavy objects, by protecting with durable sheet materials.
- E. Prohibit traffic or storage upon waterproofed or roofed surfaces. When traffic or activity is necessary, obtain recommendations for protection from waterproofing or roofing material manufacturer.
- F. Prohibit traffic from landscaped areas.

## 1.6 PROJECT RECORD DOCUMENTS

- A. Maintain on site one set of the following record documents; record actual revisions to the Work:
  - 1. Drawings.
  - 2. Specifications.
  - 3. Addenda.
  - 4. Change Orders and other modifications to the Contract.
  - 5. Reviewed Shop Drawings, Product Data, and Samples.
  - 6. Manufacturer's instruction for assembly, installation, and adjusting.
- B. Ensure entries are complete and accurate, enabling future reference by Owner.
- C. Store record documents separate from documents used for construction.
- D. Record information concurrent with construction progress, not less than weekly.
- E. Specifications: Legibly mark and record at each product section description of actual products installed, including the following:
  - 1. Manufacturer's name and product model and number.
  - 2. Product substitutions or alternates utilized.
  - 3. Changes made by Addenda and modifications.
- F. Record Drawings and Shop Drawings: Legibly mark each item to record actual construction including:
  - 1. Measured horizontal and vertical locations of underground utilities and appurtenances, referenced to permanent surface improvements.
  - 2. Measured locations of internal utilities and appurtenances concealed in construction, referenced to visible and accessible features of the Work.
  - 3. Field changes of dimension and detail.
  - 4. Details not on original Contract drawings.
- G. Submit documents to Architect/Engineer with claim for final Application for Payment.

## 1.7 OPERATION AND MAINTENANCE DATA

- A. Submit data bound in 8-1/2 x 11-inch (A4) text pages, three D side ring binders with durable plastic covers.
- B. Prepare binder cover with printed title "OPERATION AND MAINTENANCE INSTRUCTIONS", title of project, and subject matter of binder when multiple binders are required.
- C. Internally subdivide binder contents with permanent page dividers, logically organized as described below; with tab titling clearly printed under reinforced laminated plastic tabs.
- D. Drawings: Provide with reinforced punched binder tab. Bind in with text; fold larger drawings to size of text pages.

- E. Contents: Prepare Table of Contents for each volume, with each product or system description identified, typed on white paper, in three parts as follows:
  - 1. Part 1: Directory, listing names, addresses, and telephone numbers of Architect/Engineer, Contractor, Subcontractors, and major equipment suppliers.
  - 2. Part 2: Operation and maintenance instructions, arranged by system and subdivided by specification section. For each category, identify names, addresses, and telephone numbers of Subcontractors and suppliers. Identify the following:
    - a. Significant design criteria.
    - b. List of equipment.
    - c. Parts list for each component.
    - d. Operating instructions.
    - e. Maintenance instructions for equipment and systems.
    - f. Maintenance instructions for special finishes, including recommended cleaning methods and materials, and special precautions identifying detrimental agents.
  - 3. Part 3: Project documents and certificates, including the following:
    - a. Shop drawings and product data.
    - b. Air and water balance reports.
    - c. Certificates.
    - d. Photocopies of warranties and bonds.

#### 1.8 PRODUCT WARRANTIES AND PRODUCT BONDS

- A. Obtain warranties and bonds executed in duplicate by responsible subcontractors, suppliers, and manufacturers, within ten days after completion of applicable item of work.
- B. Execute and assemble transferable warranty documents and bonds from subcontractors, suppliers, and manufacturers.
- C. Verify documents are in proper form, contain full information, and are notarized.
- D. Co-execute submittals when required.
- E. Include Table of Contents and assemble in three D side ring binder with durable plastic cover.
- F. Submit prior to final Application for Payment.
- G. Time Of Submittals:
  - 1. For equipment or component parts of equipment put into service during construction with Owner's permission, submit documents within ten days after acceptance.
  - 2. Make other submittals within ten days after Date of Substantial Completion, prior to final Application for Payment.
  - 3. For items of Work for which acceptance is delayed beyond Date of Substantial Completion, submit within ten days after acceptance, listing date of acceptance as beginning of warranty or bond period.

PART 2 PRODUCTS

Not Used.

PART 3 EXECUTION

Not Used.

END OF SECTION





## SECTION 04 05 03

### MASONRY MORTARING AND GROUTING

#### PART 1 GENERAL

##### 1.1 SUMMARY

- A. Section includes mortar and grout for masonry.
- B. Related Sections:
  - 1. Section 04 20 00 – Unit Masonry.

##### 1.2 REFERENCES

- A. American Concrete Institute:
  - 1. ACI 530 - Building Code Requirements for Masonry Structures.
  - 2. ACI 530.1 - Specifications for Masonry Structures.
- B. ASTM International:
  - 1. ASTM C5 - Standard Specification for Quicklime for Structural Purposes.
  - 2. ASTM C91 - Standard Specification for Masonry Cement.
  - 3. ASTM C94/C94M - Standard Specification for Ready-Mixed Concrete.
  - 4. ASTM C143/C143M - Standard Test Method for Slump of Hydraulic Cement Concrete.
  - 5. ASTM C144 - Standard Specification for Aggregate for Masonry Mortar.
  - 6. ASTM C150 - Standard Specification for Portland Cement.
  - 7. ASTM C199 - Standard Test Method for Pier Test for Refractory Mortars.
  - 8. ASTM C206 - Standard Specification for Finishing Hydrated Lime.
  - 9. ASTM C270 - Standard Specification for Mortar for Unit Masonry.
  - 10. ASTM C387 - Standard Specification for Packaged, Dry, Combined Materials for Mortar and Concrete.
  - 11. ASTM C404 - Standard Specification for Aggregates for Masonry Grout.
  - 12. ASTM C476 - Standard Specification for Grout for Masonry.
  - 13. ASTM C595 - Standard Specification for Blended Hydraulic Cements.
  - 14. ASTM C780 - Standard Test Method for Preconstruction and Construction Evaluation of Mortars for Plain and Reinforced Unit Masonry.
  - 15. ASTM C1019 - Standard Test Method for Sampling and Testing Grout.
  - 16. ASTM C1142 - Standard Specification for Extended Life Mortar for Unit Masonry.
  - 17. ASTM C1314 - Standard Test Method for Constructing and Testing Masonry Prisms Used to Determine Compliance with Specified Compressive Strength of Masonry.
  - 18. ASTM C1329 - Standard Specification for Mortar Cement.
  - 19. ASTM C1357 - Standard Test Method for Evaluating Masonry Bond Strength.

### 1.3 SUBMITTALS

- A. Section 01 33 00 - Submittal Procedures: Submittal requirements.
- B. Samples: Submit two samples of mortar, illustrating mortar color and color range.
- C. Design Data: Submit design mix when Property specification of ASTM C270 is to be used, required environmental conditions, and admixture limitations.
- D. Manufacturer's Installation Instructions: Submit premix mortar manufacturer's installation instructions.
- E. Manufacturer's Certificate: Certify products meet or exceed specified requirements.

### 1.4 QUALITY ASSURANCE

- A. Perform Work in accordance with ACI 530 and ACI 530.1.

### 1.5 ENVIRONMENTAL REQUIREMENTS

- A. Section 01 60 00 - Product Requirements.
- B. Cold Weather Requirements: In accordance with ACI 530.1 when ambient temperature or temperature of masonry units is less than 40 degrees F.
- C. Hot Weather Requirements: In accordance with ACI 530.1 when ambient temperature is greater than 100 degrees F or ambient temperature is greater than 90 degrees F with wind velocity greater than 8 mph.

## PART 2 PRODUCTS

### 2.1 MORTAR AND MASONRY GROUT

- A. Manufacturers:
  - 1. CTS Cement Manufacturing Co.
  - 2. Glen-Gery.
  - 3. Holcim Ltd.
  - 4. LaFarge Corp.
  - 5. Lehigh Portland Cement.
  - 6. Substitutions: Section 01 60 00 - Product Requirements.

### 2.2 COMPONENTS

- A. Portland Cement:
  - 1. ASTM C150, Type I, white color.
- B. Mortar Aggregate:
  - 1. ASTM C144, standard masonry type.

- C. Hydrated Lime:
  - 1. ASTM C206, Type S.
- D. Grout Aggregate:
  - 1. ASTM C404, fine.
- E. Water:
  - 1. Clean and potable.
- F. Mortar Color:
  - 1. Mineral oxide pigment; color as selected from manufacturer's full range of available colors.
- G. Plasticizer.
- H. Water Repellent:
  - 1. Liquid type.
- I. Accelerator.
- J. Retardant.
- K. Bonding Agent:
  - 1. Latex type.
- L. Calcium chloride is not permitted.

### 2.3 MIXES

- A. Mortar Mixes:
  - 1. Mortar For Non-Structural Masonry: ASTM C270, Type S using Proportion specification.
- B. Mortar Mixing:
  - 1. Thoroughly mix mortar ingredients in accordance with ASTM C270 in quantities needed for immediate use.
  - 2. Achieve uniformly damp sand immediately before mixing process.
  - 3. Add mortar color to achieve uniformity of mix and coloration.
  - 4. Re-temper only within two hours of mixing.
- C. Grout Mixes:
  - 1. Grout for Non-Structural Masonry: 2,000 psi strength at 28 days; 8-11 inches slump; mixed in accordance with ASTM C476 Fine grout.
  - 2. Grout for Structural Masonry: 2,500 psi strength at 28 days; 8-11 inches slump; mixed in accordance with ASTM C476 Fine grout.
  - 3. Application:
    - a. Coarse Grout: For grouting spaces with minimum 4 inches dimension in every direction.
    - b. Fine Grout: For grouting other spaces.

- D. Grout Mixing:
  - 1. Mix grout in accordance with ASTM C94, modified to use ingredients complying with ASTM C476.

## PART 3 EXECUTION

### 3.1 EXAMINATION

- A. Section 01 30 00 - Administrative Requirements: Coordination and project conditions.
- B. Request inspection of spaces to be grouted.

### 3.2 PREPARATION

- A. Apply bonding agent to existing concrete surfaces.

### 3.3 INSTALLATION

- A. Install mortar and grout in accordance with ACI 530.1 Specifications for Masonry Structures.

### 3.4 FIELD QUALITY CONTROL

- A. Section 01 40 00 - Quality Requirements: Field inspecting, testing, adjusting, and balancing.
- B. Testing Frequency: One set of specified tests for every 5,000 sf of completed wall area.
- C. Testing of Mortar Mix: In accordance with ASTM C780 for aggregate ratio and water content, air content, consistency, and compressive strength.
- D. Testing of Grout Mix: In accordance with ASTM C1019 for compressive strength, and in accordance with ASTM C143/C143M for slump.
- E. Test flexural bond strength of mortar and masonry units to ASTM C1357; test in conjunction with masonry unit sections specified.
- F. Test compressive strength of mortar and masonry to ASTM C1314; test in accordance with masonry unit sections specified.

END OF SECTION

## SECTION 04 20 00

### UNIT MASONRY

#### PART 1 GENERAL

##### 1.1 SUMMARY

- A. Section includes brick; concrete masonry units; reinforcement, anchorage, and accessories.
- B. Related Sections:
  - 1. Section 04 05 03 - Masonry Mortaring and Grouting: Mortar and grout.

##### 1.2 REFERENCES

- A. American Concrete Institute:
  - 1. ACI 530 - Building Code Requirements for Masonry Structures.
  - 2. ACI 530.1 - Specifications for Masonry Structures.
- B. ASTM International:
  - 1. ASTM A307 - Standard Specification for Carbon Steel Bolts and Studs, 60 000 PSI Tensile Strength.
  - 2. ASTM A580/A580M - Standard Specification for Stainless Steel Wire.
  - 3. ASTM A615/A615M - Standard Specification for Deformed and Plain Billet-Steel Bars for Concrete Reinforcement.
  - 4. ASTM A653/A653M - Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process.
  - 5. ASTM A951/A951M - Standard Specification for Steel Wire for Masonry Joint Reinforcement.
  - 6. ASTM C67 - Standard Test Methods for Sampling and Testing Brick and Structural Clay Tile.
  - 7. ASTM C126 - Standard Specification for Ceramic Glazed Structural Clay Facing Tile, Facing Brick, and Solid Masonry Units.
  - 8. ASTM C129 - Standard Specification for Nonloadbearing Concrete Masonry Units.
  - 9. ASTM C140 - Standard Test Methods for Sampling and Testing Concrete Masonry Units and Related Units.
  - 10. ASTM C216 - Standard Specification for Facing Brick (Solid Masonry Units Made from Clay or Shale).
  - 11. ASTM E119 - Standard Test Methods for Fire Tests of Building Construction and Materials.
- C. National Fire Protection Association:
  - 1. NFPA 255 - Standard Method of Test of Surface Burning Characteristics of Building Materials.
- D. Underwriters Laboratories Inc.:
  - 1. UL 723 - Tests for Surface Burning Characteristics of Building Materials.

### 1.3 PERFORMANCE REQUIREMENTS

- A. Concrete Masonry Compressive Strength (f'm): 2,500 determined by unit strength method.
  - 1. Concrete Masonry Units: 2,500 psi minimum net area compressive strength.

### 1.4 SUBMITTALS

- A. Section 01 33 00 - Submittal Procedures: Submittal requirements.
- B. Product Data:
  - 1. Submit data for brick and concrete masonry units.
- C. Manufacturer's Certificate: Certify products meet or exceed specified requirements.

### 1.5 QUALITY ASSURANCE

- A. Perform Work in accordance with ACI 530 Building Code Requirements for Masonry Structures and ACI 530.1 Specification for Masonry Structures.

### 1.6 QUALIFICATIONS

- A. Installer: Company specializing in performing Work of this section with minimum three years documented experience.

### 1.7 DELIVERY, STORAGE, AND HANDLING

- A. Section 01 60 00 - Product Requirements: Product storage and handling requirements.
- B. Accept units on site. Inspect for damage.

### 1.8 ENVIRONMENTAL REQUIREMENTS

- A. Section 01 60 00 - Product Requirements.
- B. Cold Weather Requirements: In accordance with ACI 530.1 when ambient temperature or temperature of masonry units is less than 40 degrees F.
- C. Hot Weather Requirements: In accordance with ACI 530.1 when ambient temperature is greater than 100 degrees F or ambient temperature is greater than 90 degrees F with wind velocity greater than 8 miles per hour.

### 1.9 COORDINATION

- A. Section 01 30 00 - Administrative Requirements: Coordination and project conditions.

## 1.10 FIELD CONDITIONS

- A. Protection of Masonry: During construction, cover tops of walls, projections, and sills with waterproof sheeting at end of each day's work. Cover partially completed masonry when construction is not in progress.
  - 1. Extend cover a minimum of 24 inches down both sides of walls, and hold cover securely in place.
  - 2. Where one wythe of multiwythe masonry walls is completed in advance of other wythes, secure cover a minimum of 24 inches down face next to unconstructed wythe and hold cover in place.
- B. Stain Prevention: Prevent grout, mortar, and soil from staining the face of masonry to be left exposed or painted. Immediately remove grout, mortar, and soil that come in contact with such masonry.
  - 1. Protect base of walls from rain-splashed mud and from mortar splatter by spreading coverings on ground and over wall surface.
  - 2. Protect sills, ledges, and projections from mortar droppings.
  - 3. Protect surfaces of window and door frames, as well as similar products with painted and integral finishes, from mortar droppings.
  - 4. Turn scaffold boards near the wall on edge at the end of each day to prevent rain from splashing mortar and dirt onto completed masonry.
- C. Cold-Weather Requirements: Do not use frozen materials or materials mixed with or coated with ice or frost. Do not build on frozen substrates. Remove and replace unit masonry damaged by frost or by freezing conditions. Comply with cold-weather construction requirements contained in TMS 602.
  - 1. Cold-Weather Cleaning: Use liquid cleaning methods only when air temperature is 40 degrees F and higher and will remain so until masonry has dried, but not less than seven days after completing cleaning.
- D. Hot-Weather Requirements: Comply with hot-weather construction requirements contained in TMS 602.

## PART 2 PRODUCTS

### 2.1 COMPONENTS

- A. Facing Brick 1 (FB1) – Blend of One Brick Selection to Match Existing Cafeteria Building: ASTM C216, Type FBS, Grade SW.
  - 1. Manufacturer:
    - a. Belden Brick Company: Napier Blend Velour (blend), Brown, Plant 4, Extruded.
    - b. Average Compressive Strength: 16,310 pounds per square inch.
    - c. Average 24-Hour Cold-Water Absorption: 2.50.
    - d. Average 5 Hour Boil Absorption: 4.40.
    - e. Average Saturation Coefficient: 0.58.

- f. Average Initial Rate Absorption: 3.80.
  - g. Brick Size and Shape: Nominal size of 3-5/8 inch by 2-1/4 inch by 7-5/8 inch. Furnish special units with surface texture on exposed sides and ends. Furnish special shapes to maintain one-half running bond.
2. Mortar: To be selected by Architect / Engineer from manufacturer's full range of color selection to match existing mortar.

B. Hollow Non-Load Bearing Concrete Masonry Units (CMU): ASTM C129; Type I – moisture controlled medium weight.

C. Concrete Masonry Unit Size and Shape: Nominal modular size of 10 x 8 x 16 inches, 8 x 8 x 16 inches, 6 x 8 x 16 inches or 4 x 8 x 16 inches as necessary to infill existing wall opening.

## 2.2 ACCESSORIES

A. Mortar and Grout: As specified in Section 04 05 03.

B. Primer and Adhesive: As recommended by flashing manufacturer for specific application.

## 2.3 SOURCE QUALITY CONTROL

A. Section 01 40 00 - Quality Requirements: Testing, inspection and analysis requirements.

## PART 3 EXECUTION

### 3.1 EXAMINATION

A. Section 01 30 00 - Administrative Requirements: coordination and project conditions.

B. Verify field conditions are acceptable and are ready to receive work.

C. Verify items provided by other sections of work are properly sized and located.

D. Verify built-in items are in proper location, and ready for roughing into masonry work.

### 3.2 PREPARATION

A. Wet clay and shale brick before laying when initial rate of absorption is greater than 30 grams when tested in accordance with ASTM C67.

### 3.3 INSTALLATION

A. Establish lines, levels, and coursing indicated. Protect from displacement.

B. Maintain masonry courses to uniform dimension. Form bed and head joints of uniform thickness.



- C. Coursing of Concrete Masonry Units:
1. Bond: Running.
  2. Coursing: One unit and one mortar joint to equal 8 inches.
  3. Mortar Joints: Concave.
- D. Coursing of Brick Units:
1. Bond: One-half running.
  2. Coursing: Three units and three mortar joints to equal 8 inches.
  3. Mortar Joints: Concave.
- E. Placing And Bonding:
1. Lay hollow masonry units with face shell bedding on head and bed joints.
  2. Buttering corners of joints or excessive furrowing of mortar joints are not permitted.
  3. Remove excess mortar as work progresses.
  4. Interlock intersections and external corners.
  5. Do not shift or tap masonry units after mortar has achieved initial set. Where adjustment is required, remove mortar and replace.
  6. Perform job site cutting of masonry units with proper tools to assure straight, clean, unchipped edges. Prevent broken masonry unit corners or edges.
  7. Cut mortar joints flush where wall tile is scheduled, cement parging is required, resilient base is scheduled, cavity insulation vapor retarder adhesive is applied, or bitumen damp proofing is applied.
  8. Isolate masonry from vertical structural framing members with movement joint as indicated on Drawings.
  9. Isolate top of masonry from horizontal structural framing members and slabs or decks with compressible joint filler.
  10. Lay out walls in advance for accurate spacing of surface bond patterns with uniform joint thicknesses and for accurate location of openings, movement-type joints, returns, and offsets. Avoid using less-than-half-size units, particularly at corners, jambs, and, where possible, at other locations.
  11. Bond Pattern for Exposed Masonry: Unless otherwise indicated, lay exposed masonry in running bond do not use units with less-than-nominal 4-inch horizontal face dimensions at corners or jambs
  12. Lay concealed masonry with all units in a wythe in running bond. Bond and interlock each course of each wythe at corners. Do not use units with less-than-nominal 4-inch horizontal face dimensions at corners or jambs.
  13. Stopping and Resuming Work: Stop work by stepping back units in each course from those in course below; do not tooth. When resuming work, clean masonry surfaces that are to receive mortar, remove loose masonry units and mortar, and wet brick if required before laying fresh masonry.
  14. Built-in Work: As construction progresses, build in items specified in this and other Sections. Fill in solidly with masonry around built-in items.
  15. Frames and masonry solidly with mortar unless otherwise indicated.
  16. Where built-in items are to be embedded in cores of hollow masonry units, place a layer of metal lath, wire mesh, or plastic mesh in the joint below, and rod mortar or grout into core.
  17. Hollow CMUs with grout 24 inches under bearing plates, beams, lintels, and posts unless otherwise indicated.

- F. Grouted Components:
1. Reinforce bond beams as scheduled or indicated on the Drawings.
  2. Reinforce pilasters with steel reinforcing bars as indicated on drawings.
  3. Lap splices bar diameters required by code.
  4. Support and secure reinforcing bars from displacement.
  5. Place and consolidate grout fill without displacing reinforcing.
- G. Built-In Work:
1. As work progresses, install built-in metal door and glazed frames, fabricated metal frames, window frames, wood nailing strips, fireplace accessories, anchor bolts, plates, and other items to be built-in the work and furnished by other sections.
  2. Install built-in items plumb and level.
  3. Bed anchors of metal door and glazed frames in adjacent mortar joints. Fill frame voids solid with grout or mortar. Fill adjacent masonry cores with grout minimum of 12 inches from framed openings.
  4. Do not build in materials subject to deterioration.
- H. ANCHORED MASONRY VENEERS
1. Provide not less than 2 inches of airspace between back of masonry veneer and face of insulation.
    - a. Keep airspace clean of mortar droppings and other materials during construction. Bevel beds away from airspace, to minimize mortar protrusions into airspace. Do not attempt to trowel or remove mortar fins protruding into airspace

### 3.4 ERECTION TOLERANCES

- A. Section 01 40 00 - Quality Requirements: Tolerances.
- B. Maximum Variation from Alignment of Columns: Pilasters: 1/4 inch.
- C. Maximum Variation from Unit to Adjacent Unit: 1/16 inch.
- D. Maximum Variation from Plane of Wall: 1/4 inch in 10 feet and 1/2 inch in 20 feet or more.
- E. Maximum Variation from Plumb: 1/4 inch per story non-cumulative; 1/2 inch in two stories or more.
- F. Maximum Variation from Level Coursing: 1/8 inch in 3 feet and 1/4 inch in 10 feet; 1/2 inch in 30 feet.
- G. Maximum Variation of Joint Thickness: 1/8 inch in 3 feet.
- H. Maximum Variation from Cross Sectional Thickness of Walls: 1/4 inch.
- I. Maximum Variation for Steel Reinforcement:
1. Install reinforcement within the tolerances specified in ACI 530.1 for foundation walls.
  2. Plus or minus 1/2 inch when distance from centerline of steel to opposite face of masonry is 8 inches or less.

3. Plus or minus 1 inch when distance is between 8 and 24 inches.
4. Plus or minus 1-1/4 inch when distance is greater than 24 inches.
5. Plus or minus 2 inches from location along face of wall.

### 3.5 FIELD QUALITY CONTROL

- A. Section 01 40 00 - Quality Requirements: Field inspecting, testing, adjusting, and balancing.
- B. Concrete Masonry Units: Test each type in accordance with ASTM C140.

### 3.6 CLEANING

- A. Section 01 70 00 - Execution and Closeout Requirements: Final cleaning.
- B. Remove excess mortar and mortar smears as work progresses.
- C. Replace defective mortar. Match adjacent work.
- D. Clean soiled surfaces with cleaning solution.
- E. Use non-metallic tools in cleaning operations.

### 3.7 PROTECTION OF FINISHED WORK

- A. Section 01 70 00 - Execution and Closeout Requirements: Requirements for protecting finished Work.
- B. Protect base of walls from mud and mortar splatter.
- C. Protect masonry and other items built into masonry walls from mortar droppings and staining caused by mortar.

END OF SECTION



## SECTION 07 90 00

### JOINT SEALANTS

#### PART 1 GENERAL

##### 1.1 SUMMARY

- A. Section includes preparing sealant substrate surface and sealant and backing.

##### 1.2 REFERENCES

- A. American Society for Testing and Materials (ASTM):
  1. ASTM C717 - Standard Terminology of Building Seals and Sealants.
  2. ASTM C834 - Specification for Latex Sealants.
  3. ASTM C920 - Specification for Elastomeric Joint Sealants.
  4. ASTM D1056 - Flexible Cellular Material- Sponge or Expanded Rubber.
- B. Federal Specifications (FS):
  1. FS TT-S-1657 - Sealing Compound, Single Component Butyl Rubber Based Solvent Release Type (for Buildings and other Types of Construction).

##### 1.3 SUBMITTALS

- A. Product Data: Product chemical characteristics, performance criteria, substrate preparation, limitations, and color availability.
- B. Warranty: Submit manufacturer warranty information.

##### 1.4 QUALITY ASSURANCE

- A. Installer Qualifications: Company specializing in performing Work of this Section with minimum 5 years documented experience.

##### 1.4 DELIVERY, STORAGE AND HANDLING

- A. Deliver Products in manufacturer's original unopened containers or packages with labels intact, identifying product and manufacturer, date of manufacture, lot number, shelf life, curing time, and mixing instructions, where applicable.
- B. Store and handle materials to prevent deterioration or damage due to moisture, temperature changes, contaminants, or other causes.

## 1.6 PROJECT CONDITIONS OR SITE CONDITIONS

- A. Environmental Requirements: Install sealant during manufacturers' recommended temperature ranges and weather conditions for application and cure. Consult manufacturer when sealant cannot be applied during recommended conditions.

## 1.7 WARRANTY

- A. Warranty:
  - 1. Submit written warranty signed by sealant manufacturer agreeing to replace sealants and accessories which fail because of loss of cohesion or adhesion, or which do not cure.
  - 2. Warranty Period: 5 years or longer per the manufacturers' standard warranties.

## PART 2 PRODUCTS

### 2.1 MANUFACTURERS

- A. Bostik, Inc, Huntingdon Valley, PA, (800) 523-2678, (125) 674-5600.
- B. Dow Corning, Midland, MI (517) 496-4000.
- C. GE Silicones, Waterford, NY (518) 233-3330.
- D. Mameco International, Cleveland, OH, (800) 321-6412, (216) 752-4400.
- E. Nomaco, Inc., Zebulon, NC, (919) 269-6500.
- F. Pecora Corporation, Harleysville, PA, (800) 523-6688, (215) 723-6051.
- G. Sonneborn Building Products Div. ChemRex, Inc., Shakopee, MN (800) 243-6739, (612) 496-6000.
- H. USG Corp., Chicago, IL (800) 874-4968, (312) 606-4000.

### 2.2 BUILDING SEALANTS (See Sealant Schedule at the end of this Section for specific use of sealants.)

- A. Urethanes:
  - 1. Type 1: Two-Part Urethane: Self-Leveling, ASTM C920, Type M, Grade P, Class 25.
    - a. Chem-Calk CC-550, by Bostik.
    - b. Vulkem 245, by Mameco.
    - c. Vulkem 255, Wide-Joint, by Mameco.
    - d. NR-200 Urexpan, by Pecora Corporation.
  - 2. Type 2: Two-Part Urethane: Non-Sag, ASTM C920, Type M, Grade NS, Class 25.
    - a. Chem-Calk 500, by Bostik.
    - b. Vulkem 227, by Mameco.
    - c. Sonolastic NP 2, by Sonneborn Building Products, ChemRex Inc.

3. Type 3: One-Part Urethane: Self-Leveling, ASTM C920, Type S, Grade P, Class 25.
    - a. Vulkem 45, by Mameco.
    - b. Urexpam NR-201, by Pecora Corporation.
    - c. Sonolastic SL1, by Sonneborn Building Products, ChemRex Inc.
  4. Type 4: One-Part Urethane: Non-Sag, ASTM C920, Type S, Grade NS, Class 25.
    - a. Chem-Calk 900, by Bostik.
    - b. Vulkem 116, by Mameco.
    - c. Sonolastic NP I, by Sonneborn Building Products, ChemRex Inc.
- B. Silicones:
1. Type 1: One-Part Silicones: ASTM C920, Type S, Grade NS, Class 50.
    - a. 795 Silicone Building Sealant, by Dow Corning.
    - b. 864 Architectural Silicone Sealant, by Pecora Corporation.
    - c. Spectrum 3 by Mameco.
  2. Type 2: One-Part Silicones: ASTM C920, Type S, Grade NS, Class 25. Vertical Surfaces Only.
    - a. Construction 1200 Sealant, General Electric Company.
    - b. 999-A, Dow Corning.
    - c. 860 Glaziers and Contractors Silicone Sealant, by Pecora Corporation. (colors only)
  3. Type 3: One-Part Silicones: ASTM C920, Type S, Grade NS, Class 25 or 50.
    - a. 786 Mildew Resistant Silicone Sealant, Dow Corning.
    - b. SCS 1700 Sanitary Sealant, General Electric.
    - c. 898 Silicone Sanitary Sealant, Pecora Corporation.
- C. Acrylics, Latex:
1. Type 1: One-Part Acrylic Latex, Non-Sag, ASTM-C-834-76.
    - a. Chem-Calk 600, by Bostik.
    - b. AC-20+Silicone Acrylic Latex, by Pecora Corporation.
    - c. Sonolac, Sonneborn Building Products, ChemRex Inc.
- D. Acoustical Sealants:
1. Type 1: AC-20 FTR Acoustical and Insulation Sealant, by Pecora Corporation.
  2. Type 2: 60+ Unicrylic, by Pecora Corporation.
  3. Type 3: Sheetrock Acoustical Sealant, by United States Gypsum.
- E. Butyls:
1. Type 1: One-Part Butyl, Non-Sag, FS TT-S-1657.
    - a. Chem-Calk 300, by Bostik.
    - b. BC-158 Butyl Rubber, by Pecora Corporation. (ASTM C1085)
    - c. Tremco Butyl Sealant by Mameco.
- F. Preformed Compressible & Non-Compressible Fillers:
1. Type 1: Backer Rod - Closed cell polyethylene foam:
    - a. HBR Backer Rod, by Nomaco.
    - b. #92 Greenrod, by Nomaco.
    - c. Sonofoam Closed-Cell Backer Rod, Sonneborn Building Products, ChemRex Inc.
- G. Bond Breaker Tape: Polyethylene tape of plastic as recommended by sealant manufacturer, to be applied to sealant-contact surfaces where bond to substrate of joint filler must be avoided for proper performance of sealant

## 2.4 COLORS

- A. Generally use sealant colors matching color of material joint is located in.
- B. Where a joint occurs between two materials of differing colors and Contractor cannot determine which material to match, contact Architect / Engineer for selection.

## 2.5 ACCESSORIES

- A. Joint Cleaner: Provide type of joint cleaning compound recommended by sealant manufacturer for joint surfaces to be cleaned.
- B. Primer: As recommended by sealant manufacturer.
- C. Masking tape and similar accessories to protect surfaces from damage.

# PART 3 EXECUTION

## 3.1 EXAMINATION

- A. Verification of Conditions: Verify that field measurements, surfaces, substrates and conditions are as required, and ready to receive Work.
  - 1. Verify that joint widths are in conformance with sealant manufacturer allowable limits.
  - 2. Verify that contaminants capable of interfering with adhesion have been cleaned from joint and joint properly prepared.
- B. Report in writing to Architect / Engineer prevailing conditions that will adversely affect satisfactory execution of the Work of this Section. Do not proceed with Work until unsatisfactory conditions have been corrected.
- C. By beginning Work, Contractor accepts conditions and assumes responsibility for correcting unsuitable conditions encountered at no additional cost to the Using Agency.

## 3.2 PREPARATION

- A. Prepare and size joints in accordance with manufacturer's instructions. Clean substrates of dirt, laitance, dust, or mortar using solvent, abrasion, or sandblasting as recommended by manufacturer. Remove loose materials and foreign matter which might impair adhesion of sealant.
- B. Verify that joint backing and release tapes are compatible with sealant. Verify sealant is suitable for substrate. Verify that sealant is paintable if painted finish is indicated.
- C. Protect materials surrounding work of this Section from damage or disfiguration.



### 3.3 INSTALLATION

- A. Install sealant in accordance with manufacturer's published instructions.
- B. Prime or seal joint surfaces where recommended by sealant manufacturer. Do not allow primer or sealer to spill or migrate onto adjoining surfaces.
- C. Install backer rod and bond breaker tape where required by manufacturer.
- D. Install preformed compressible and non-compressible fillers in accordance with manufacturer's published instructions.
- E. Install sealants to depths recommended by sealant manufacturer in uniform, continuous ribbons free of air pockets, foreign embedded matter, ridges, and sags, "wetting" joint bond surfaces equally on both sides.
- F. Tool joints concave unless shown otherwise. Where horizontal joints are between a horizontal surface and a vertical surface, fill joint to form slight cove so that joint will not trap moisture and foreign matter. Dry tool joints. Do not use soap, water, or solvent to tool joints.
- G. Epoxy Floor Joint Sealant: Install sealant at floor construction and control joints in accordance with manufacturer's published instructions and initially under manufacturer's supervision.

### 3.4 CURING

- A. Cure sealants in compliance with manufacturer's published instructions.

### 3.5 CLEANING

- A. Remove excess and spillage of sealants promptly as the work progresses, using materials and methods as recommended by sealant and substrate manufacturers. Clean adjoining surfaces to eliminate evidence of spillage without damage to adjoining surfaces or finishes.

### 3.6 SEALANT SCHEDULE

- A. Exterior Joints:
  - 1. Coping joints, coping-to-facade joints, cornice and wash, or horizontal surface joints not subject to foot or vehicular traffic.
    - a. Sealant Urethane Type 2
    - b. Sealant Urethane Type 4
    - c. Sealant Silicone Type 1 (for prefinished materials only)
  - 2. Exterior joints in horizontal wearing and non-wearing surfaces.
    - a. Sealant No. Urethane Type 1
    - b. Sealant No. Urethane Type 3
    - c. Preformed Compressible & Non-Compressible Filler Type 1

B. Interior Joints:

1. Seal interior perimeters of exterior openings.
2. For all the above interior joints:
  - a. Sealant Urethane Type 2
  - b. Sealant Urethane Type 4
  - c. Sealant Silicone Type 1 (for prefinished materials only)
3. Exposed interior control joints in drywall and concealed joints.
  - a. Sealant Acrylic, Latex, Type 1
  - b. Sealant Acoustical Type 1
  - c. Sealant Acoustical Type 3
  - d. Sealant Butyl Type 1

END OF SECTION

## SECTION 09 21 16

### GYPSUM BOARD ASSEMBLIES

#### PART 1 GENERAL

##### 1.1 SUMMARY

- A. Section Includes:
1. Metal stud bulkhead framing.
  2. Gypsum board and joint treatment.

##### 1.2 REFERENCE STANDARDS

- A. ASTM International:
1. ASTM C475/C475M - Standard Specification for Joint Compound and Joint Tape for Finishing Gypsum Board.
  2. ASTM C645 - Standard Specification for Nonstructural Steel Framing Members.
  3. ASTM C840 - Standard Specification for Application and Finishing of Gypsum Board.
  4. ASTM C954 - Standard Specification for Steel Drill Screws for the Application of Gypsum Panel Products or Metal Plaster Bases to Steel Studs from 0.033 in. (0.84 mm) to 0.112 in. (2.84 mm) in Thickness.
  5. ASTM C1002 - Standard Specification for Steel Drill Screws for the Application of Gypsum Panel Products or Metal Plaster Bases.
  6. ASTM C1178/C1178M - Standard Specification for Coated Glass Mat Water-Resistant Gypsum Backing Panel.
  7. ASTM C1396/C1396M - Standard Specification for Gypsum Board.
  8. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials.
  9. ASTM E119 - Standard Test Methods for Fire Tests of Building Construction and Materials.
- B. Gypsum Association:
1. GA 214 - Recommended Levels of Gypsum Board Finish.
  2. GA 216 - Application and Finishing of Gypsum Board.
- C. Intertek Testing Services (Warnock Hersey Listed):
1. WH - Certification Listings.
- D. National Fire Protection Association:
1. NFPA 265 - Standard Methods of Fire Tests for Evaluating Room Fire Growth Contribution of Textile Coverings on Full Height Panels and Walls, Method B.
  2. NFPA 286 - Standard Methods of Fire Tests for Evaluating Room Fire Growth Contribution of Wall and Ceiling Interior Finish.
- E. Underwriters Laboratories Inc.:
1. UL - Fire Resistance Directory.

### 1.3 SUBMITTALS

- A. Section 01 33 00 - Submittal Procedures: Requirements for submittals.
- B. Product Data: Submit data on metal framing, gypsum board, joint tape, accessories, and joint material.

### 1.4 QUALITY ASSURANCE

- A. Perform Work in accordance with ASTM C840, ASTM C1280; GA-214, GA-216 and GA-600.

### 1.5 QUALIFICATIONS

- A. Manufacturer: Company specializing in manufacturing products specified in this section with minimum three years' documented experience.
- B. Installer: Company specializing in performing Work of this section with minimum three years experience.

## PART 2 PRODUCTS

### 2.1 GYPSUM BOARD ASSEMBLIES

- A. Manufacturer List:
  - 1. CertainTeed.
  - 2. Georgia-Pacific.
  - 3. National Gypsum Co.
  - 4. United States Gypsum Co.
  - 5. Substitutions: Section 01 60 00 – Product Requirements.

### 2.2 COMPONENTS

- A. Framing Materials:
  - 1. Studs and Tracks: ASTM C645; GA-216 and GA-600; galvanized sheet steel, 20 gauge minimum, unless indicated otherwise on Drawings; C shape, of depth as shown on Drawings.
  - 2. Fasteners: ASTM C1002, screws.
  - 3. Anchorage to Substrate: Tie wire, screws, and other metal supports, of type and size to suit application; to rigidly secure materials in place.
- B. Gypsum Board Materials: ASTM C1396.
  - 1. Fire Rated Gypsum Board: ASTM C36; fire resistive type, UL or WH rated; 5/8-inch thick, maximum available length in place; ends square cut, tapered edges.

## 2.3 ACCESSORIES

- A. Gypsum Board Accessories: ASTM C1047; plastic; corner beads, edge trim, and expansion joints.
  - 1. Plastic Accessories: PVC plastic.
- B. Joint Materials: ASTM C475; GA-216; reinforcing tape, joint compound, and water.
- C. Gypsum Board Screws: ASTM C1002; length to suit application.
  - 1. Screws for Steel Framing: Type S.

## PART 3 EXECUTION

### 3.1 EXAMINATION

- A. Section 01 70 00 - Execution and Closeout Requirements: Requirements for installation examination.
- B. Verify site conditions are ready to receive Work and opening dimensions are as indicated on shop drawings and as instructed by manufacturer.

### 3.2 INSTALLATION

- A. Metal Stud Installation:
  - 1. Install studs in accordance with ASTM C754, ASTM C1007, GA-216 and GA-600.
  - 2. Metal Stud Spacing: 16 inches on center.
- B. Gypsum Board Installation:
  - 1. Install gypsum board in accordance with GA-216 and GA-600.
  - 2. Erect single layer fire rated gypsum board in most economical direction, with edges and ends occurring over firm bearing.
  - 3. Use screws when fastening gypsum board to metal furring or framing.
  - 4. Place control joints consistent with lines of building spaces, as per manufacturer's recommendations consistent with lines of building spaces and at all openings.
  - 5. Place corner beads at external corners. Use longest practical length. Place edge trim where gypsum board abuts dissimilar materials as indicated on Drawings.
- C. Joint Treatment:
  - 1. Tape, fill, and sand exposed joints, edges, and corners to produce smooth surface ready to receive finishes.
  - 2. Feather coats on to adjoining surfaces so that camber is maximum 1/32 inch.
- D. Provide skim coat of joint compound in accordance with GA-214 to provide a Level 5 finish as specified.

### 3.3 TOLERANCES

- A. Section 01 40 00 - Quality Requirements: Tolerances.
- B. Maximum Variation of Finished Gypsum Board Surface from Flat Surface: 1/8 inch in 10 feet.

### 3.4 SCHEDULE

- A. Finishes in accordance with GA-214 Level:
  - 1. Level 5: Walls exposed to view.

END OF SECTION

## SECTION 09 51 13

### ACOUSTICAL PANEL CEILINGS

#### PART 1 GENERAL

##### 1.1 SUMMARY

- A. Section includes suspended metal grid ceiling system, perimeter trim and acoustic panels, and accessories.
- B. Related Requirements:
  - 1. Section 07 90 00 - Joint Protection.

##### 1.2 REFERENCE STANDARDS

- A. ASTM International:
  - 1. ASTM C635 - Standard Specification for the Manufacture, Performance, and Testing of Metal Suspension Systems for Acoustical Tile and Lay-in Panel Ceilings.
  - 2. ASTM C636 - Standard Practice for Installation of Metal Ceiling Suspension Systems for Acoustical Tile and Lay-In Panels.
  - 3. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials.
  - 4. ASTM E119 - Standard Test Methods for Fire Tests of Building Construction and Materials.
  - 5. ASTM E580 - Standard Practice for Application of Ceiling Suspension Systems for Acoustical Tile and Lay-in Panels in Areas Requiring Seismic Restraint.
  - 6. ASTM E1264 - Standard Classification for Acoustical Ceiling Products.
- B. Ceilings and Interior Systems Construction Association:
  - 1. CISCA - Acoustical Ceilings: Use and Practice.
- C. Intertek Testing Services (Warnock Hersey Listed):
  - 1. WH - Certification Listings.
- D. National Fire Protection Association:
  - 1. NFPA 255 – Standard Method of Test of Surface Burning Characteristics of Building materials.
  - 2. NFPA 286 - Standard Methods of Fire Tests for Evaluating Contribution of Wall and Ceiling Interior Finish to Room Fire Growth.
- E. Underwriters Laboratories Inc.:
  - 1. UL - Fire Resistance Directory.
  - 2. UL 723 - Tests for Surface Burning Characteristics of Building Materials.

### 1.3 PERFORMANCE REQUIREMENTS

- A. Suspension System: Rigidly secure acoustic ceiling system including integral mechanical and electrical components with maximum deflection of 1:240.

### 1.4 SUBMITTALS

- A. Section 01 33 00 - Submittal Procedures: Requirements for submittals.
- B. Product Data: Submit data on metal grid system components and acoustic units.
- C. Shop Drawings:
  - 1. Indicate grid layout and related dimensioning, junctions with other work or ceiling finishes, interrelation of mechanical and electrical items related to system. Indicate method of suspension where interference exists.
- D. Samples:
  - 1. Submit two samples 4 x 4 inch in size illustrating material and finish of acoustic units.
  - 2. Submit two samples each, 12 inches long, of suspension system main runner, cross runner, perimeter molding.
- E. Manufacturer's Instructions: Submit special procedures, perimeter conditions requiring special attention.

### 1.5 QUALITY ASSURANCE

- A. Conform to CISCA requirements.

### 1.6 QUALIFICATIONS

- A. Manufacturer: Company specializing in manufacturing products specified in this section with minimum three years' experience.
- B. Installer: Company specializing in performing Work of this section with minimum three years' experience.

### 1.7 ENVIRONMENTAL REQUIREMENTS

- A. Section 01 60 00 - Product Requirements.
- B. Maintain uniform temperature of minimum 55 degrees F, and maximum humidity of 65 to 70 percent prior to, during, and after acoustic unit installation.



## 1.8 SEQUENCING

- A. Section 01 10 00 - Summary: Requirements for sequencing.
- B. Sequence Work to ensure acoustic ceilings are not installed until dust generating activities have terminated, and overhead work is completed, tested, and approved.
- C. Install acoustic units after interior wet work is dry.

## PART 2 PRODUCTS

### 2.1 SUSPENDED ACOUSTICAL CEILINGS

- A. Salvage and reinstall existing panels in Corridor. Supplement Corridor with new panels as necessary. Ceiling in Cafeteria consists of all new materials.
- B. Manufacturers:
  - 1. Armstrong World Industries:
    - a. Fine Fissured (1728) panel.
  - 2. CertainTeed Corporation:
    - a. Fine Fissured (HHF-157) panel.
  - 3. USG Interiors:
    - a. Radar ClimaPlus (2210) panel.
  - 4. Substitutions: Section 01 60 00 - Product Requirements.

### 2.2 COMPONENTS

- A. Acoustic Panels: ASTM E1264, conforming to the following:
  - 1. Size: 24 x 48 inches.
  - 2. Thickness: 5/8 inches.
  - 3. Composition: Mineral.
  - 4. NRC Range: 0.50 to 0.60.
  - 5. Edge: Square.
  - 6. Surface Color: White.
  - 7. Surface Finish: Non-directional fissured.
- B. Grid:
  - 1. Non-fire Rated Grid: ASTM C635, Heavy Duty; exposed T components die cut and interlocking.
    - a. Armstrong: Prelude XL.
    - b. Celotex: Classic Stab System.
    - c. USG: Donn DX.
    - d. Substitutions: Section 01 60 00 - Product Requirements.
  - 2. Grid Materials: Commercial quality cold rolled steel with galvanized coating.
  - 3. Exposed Grid Surface Width: As per applicable code for seismic design category indicated on Drawings.
  - 4. Grid Finish: White color.

5. Accessories: Stabilizer bars, clips, splices, perimeter moldings, and hold down clips, as required for suspended grid system.
6. Support Channels and Hangers: Galvanized Primed steel; size and type to suit application, seismic requirements, and ceiling system flatness requirement specified.

## 2.3 ACCESSORIES

- A. Touch-up Paint: Type and color to match acoustic and grid units.

## PART 3 EXECUTION

### 3.1 EXAMINATION

- A. Section 01 70 00 - Execution and Closeout Requirements: Requirements for installation examination.
- B. Verify layout of hangers will not interfere with other Work.

### 3.2 INSTALLATION

- A. Lay-In Grid Suspension System:
  1. Install suspension system in accordance with ASTM C636 and as supplemented in this section.
  2. Install suspension system in accordance with ASTM E580.
  3. Install system capable of supporting imposed loads with maximum deflection of 1/240 maximum.
  4. Locate system on room axis according to reflected plan.
  5. Install after major above ceiling work is complete. Coordinate location of hangers with other work.
  6. Install hanger clips during steel deck erection. Install additional hangers and inserts as required.
  7. Hang suspension system independent of walls, columns, ducts, pipes and conduit. Where carrying members are spliced, avoid visible displacement of face plane of adjacent members.
  8. Where ducts or other equipment prevent regular spacing of hangers, reinforce nearest affected hangers and related carrying channels to span extra distance.
  9. Do not support components on main runners or cross runners when weight causes total dead load to exceed deflection capability. Support fixture loads by supplementary hangers located within 6 inches of each corner; or support components independently.
  10. Do not eccentrically load system or produce rotation of runners.
  11. Perimeter Molding:
    - a. **Install edge molding at intersections of ceiling and vertical surfaces. Caulk any gaps between vertical surface and edge molding.**
    - b. Use longest practical lengths.
    - c. Miter corners.
    - d. Install at junctions with other interruptions.

- B. Acoustic Units:
  - 1. Fit acoustic units in place, free from damaged edges or other defects detrimental to appearance and function.
  - 2. Install units after above ceiling work is complete.
  - 3. Install acoustic units' level, in uniform plane, and free from twist, warp, and dents.
  - 4. Cutting Acoustic Units:
    - a. Cut to fit irregular grid and perimeter edge trim.
    - b. Cut square reveal edges to field cut units.
  - 5. Install hold-down clips to retain panels tight to grid system within 20 feet of exterior door.

### 3.3 TOLERANCES

- A. Section 01 40 00 - Quality Requirements: Tolerances.
- B. Maximum Variation from Flat and Level Surface: 1/8 inch in 10 feet.
- C. Maximum Variation from Plumb of Grid Members Caused by Eccentric Loads: 2 degrees.

END OF SECTION



## SECTION 09 90 00

### PAINTING AND COATING

#### PART 1 GENERAL

##### 1.1 SUMMARY

- A. Section includes surface preparation and field application of paints.

##### 1.2 REFERENCES

- A. ASTM International:
  - 1. ASTM D16 - Standard Terminology Relating to Paint, Varnish, Lacquer, and Related Products.
  - 2. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials.
- B. Green Seal:
  - 1. GC-03 - Anti-Corrosive Paints.
  - 2. GS-11 - Product Specific Environmental Requirements.
- C. National Fire Protection Association:
  - 1. NFPA 255 - Standard Method of Test of Surface Burning Characteristics of Building Materials.
- D. Painting and Decorating Contractors of America:
  - 1. PDCA - Architectural Painting Specification Manual.
- E. South Coast Air Quality Management District:
  - 1. SCAQMD Rule 1113 - Architectural Coatings.
- F. SSPC: The Society for Protective Coatings:
  - 1. SSPC - Steel Structures Painting Manual.
- G. Underwriters Laboratories Inc.:
  - 1. UL 723 - Tests for Surface Burning Characteristics of Building Materials.

##### 1.3 DEFINITIONS

- A. Conform to ASTM D16 for interpretation of terms used in this section.

#### 1.4 SUBMITTALS

- A. Section 01 33 00 - Submittal Procedures: Submittal procedures.
- B. Product Data: Submit data on finishing products and special coatings.
- C. Samples:
  - 1. Submit two paper chip samples illustrating full range of colors available for each surface finishing product scheduled.
- D. Manufacturer's Installation Instructions: Submit special surface preparation procedures, and substrate conditions requiring special attention.

#### 1.5 CLOSEOUT SUBMITTALS

- A. Section 01 70 00 - Execution and Closeout Requirements: Closeout procedures.
- B. Operation and Maintenance Data: Submit data on cleaning, touch-up, and repair of painted and coated surfaces.

#### 1.6 QUALIFICATIONS

- A. Manufacturer: Company specializing in manufacturing products specified in this section with minimum three years' documented experience.
- B. Applicator: Company specializing in performing Work of this section with minimum three years documented experience and approved by manufacturer.

#### 1.7 DELIVERY, STORAGE, AND HANDLING

- A. Section 01 60 00 - Product Requirements: Product storage and handling requirements.
- B. Deliver products to site in sealed and labeled containers; inspect to verify acceptability.
- C. Container Label: Include manufacturer's name, type of paint, brand name, lot number, brand code, coverage, surface preparation, drying time, cleanup requirements, color designation, and instructions for mixing and reducing.
- D. Paint Materials: Store at minimum ambient temperature of 45 degrees F and maximum of 90 degrees F, in ventilated area, and as required by manufacturer's instructions.

#### 1.8 ENVIRONMENTAL REQUIREMENTS

- A. Section 01 60 00 - Product Requirements.
- B. Do not apply materials when surface and ambient temperatures are outside temperature ranges required by paint product manufacturer.

- C. Minimum Application Temperatures for Latex Paints: 45 degrees F for interiors; 50 degrees F for exterior, unless required otherwise by manufacturer's instructions.
- D. Provide lighting level of 80-foot candle measured mid-height at substrate surface.

## 1.9 SEQUENCING

- A. Section 01 10 00 - Summary: Work sequence.
- B. Verify existing conditions and requirements of other trades before starting Work.
- C. Sequence application to the following:
  - 1. Do not apply finish coats until paintable sealant is applied.

## PART 2 PRODUCTS

### 2.1 PAINTS AND COATINGS

- A. Manufacturers:
  - 1. The Glidden Co.
  - 2. Benjamin Moore.
  - 3. Sherwin-Williams.
  - 4. PPG Pittsburg Paints.

### 2.2 COMPONENTS

- A. Coatings: Ready mixed, except field catalyzed coatings. Prepare coatings:
  - 1. To soft paste consistency, capable of being readily and uniformly dispersed to homogeneous coating.
  - 2. For good flow and brushing properties.
  - 3. Capable of drying or curing free of streaks or sags.
- B. Accessory Materials: Linseed oil, shellac, turpentine, paint thinners and other materials not specifically indicated but required to achieve finishes specified; commercial quality.
- C. Patching Materials: Latex filler.
- D. Fastener Head Cover Materials: Latex filler.

## PART 3 EXECUTION

### 3.1 EXAMINATION

- A. Verify existing conditions and requirements of other trades before starting Work.
- B. Verify surfaces and substrate conditions are ready to receive Work as instructed by product manufacturer.

- C. Examine surfaces scheduled to be finished prior to commencement of Work. Report conditions capable of affecting proper application.
- D. Test shop applied primer for compatibility with subsequent cover materials.
- E. Measure moisture content of surfaces using electronic moisture meter. Do not apply finishes unless moisture content of surfaces is below the following maximums:
  - 1. Plaster and Gypsum Wallboard: 12 percent.

### 3.2 PREPARATION

- A. Surface Appurtenances: Remove electrical plates, hardware, light fixture trim, escutcheons, and fittings prior to preparing surfaces or finishing.
- B. Surfaces: Correct defects and clean surfaces capable of affecting Work of this section. Remove or repair existing coatings exhibiting surface defects.
- C. Marks: Seal with shellac those which may bleed through surface finishes.
- D. Impervious Surfaces: Remove mildew by scrubbing with solution of tri-sodium phosphate and bleach. Rinse with clean water and allow surface to dry.
- E. Gypsum Board Surfaces: Fill minor defects with filler compound. Spot prime defects after repair.
- F. Galvanized Surfaces: Remove surface contamination and oils and wash with solvent. Apply coat of etching primer.
- G. Plaster Surfaces: Fill hairline cracks, small holes, and imperfections with latex patching plaster. Make it smooth and flush with adjacent surfaces. Wash and neutralize high alkali surfaces.
- H. Shop Primed Steel Surfaces: Sand and scrape to remove loose primer and rust. Feather edges to make touch-up patches inconspicuous. Clean surfaces with solvent. Prime bare steel surfaces.
- I. Uncoated Steel and Iron Surfaces: Remove grease, mill scale, weld splatter, dirt, and rust. Where heavy coatings of scale are evident, remove by hand wire brushing or sandblasting; clean by washing with solvent. Apply treatment of phosphoric acid solution, ensuring weld joints, bolts, and nuts are similarly cleaned. Spot prime paint after repairs.

### 3.3 APPLICATION

- A. Do not apply finishes to surfaces that are not dry. Allow applied coats to dry before next coat is applied.
- B. Apply each coat to uniform appearance. Apply each coat of paint slightly darker than preceding coat unless specified otherwise.
- C. Sand metal surfaces lightly between coats to achieve required finish.



- D. Vacuum clean surfaces of loose particles. Use tack cloth to remove dust and particles just prior to applying next coat.
- E. Finishing Mechanical Equipment:
  - 1. Refer to Division 22, Division 23, Division 26, and Division 27 for schedule of color-coding and identification banding of ductwork.
  - 2. Paint shop primed equipment.
  - 3. Prime and paint insulated and exposed ducts, hangers, brackets, collars and supports, except where items are shop finished.
  - 4. Paint interior surfaces of air ducts visible through grilles and louvers with one coat of flat black paint to visible surfaces. Paint dampers exposed behind louvers, and grilles to match face panels.
  - 5. Reinstall electrical cover plates, hardware, light fixture trim, escutcheons, and fittings removed prior to finishing.

### 3.4 FIELD QUALITY CONTROL

- A. Section 01 70 00 - Execution and Closeout Requirements: Field inspecting, testing, adjusting, and balancing.
- B. Inspect and test questionable coated areas.

### 3.5 CLEANING

- A. Section 01 70 00 - Execution and Closeout Requirements: Final cleaning.
- B. Collect waste material which may constitute fire hazard, place in closed metal containers, and remove daily from site.

### 3.6 PROTECTION OF INSTALLED CONSTRUCTION

- A. Protect Work of other trades and surfaces not being painted.
- B. Protect completed Work from damage by other trades.

### 3.7 SCHEDULE - INTERIOR SURFACES

- A. Steel:
  - 1. One coat SW Pro Industrial Pro-Cryl Primer; B66-310 or approved equal.
    - a. Two to four mils dry.
  - 2. Two coats SW ProMar 200 Alkyd Semi-Gloss; B34W200 or approved equal.
    - a. Four mils wet, 1.7 mils dry.
- B. Steel - Galvanized:
  - 1. One coat SW Pro Industrial Pro-Cryl Primer; B66-310 or approved equal.
    - a. Two to four mils dry.
  - 2. Two coats SW ProMar 200 Alkyd Semi-Gloss; B34W200 or approved equal.
    - a. Four mils wet, 1.7 mils dry per coat.

- C. Interior Ferrous Metal (Exposed Structure / Decking) Finish Dry Fall-Out:
  - 1. One coat SW Save-Lite Dry Fall; B47W62 or approved equal.
    - a. Three point two mils wet.
  
- D. Gypsum Board Walls:
  - 1. One coat SW PrepRite 200 Latex Primer; B28W200 or approved equal.
    - a. Four mils wet, 1.2 mils dry.
  - 2. Two coats SW ProMar 200 Latex Semi-Gloss; B300W200 or approved equal.
    - a. Four mils wet, 1.4 mils dry per coat.

END OF SECTION

## Section 23 05 29

### Hangers and Supports for HVAC Piping and Equipment

#### PART 1 GENERAL

##### 1.1 WORK INCLUDES

- A. Contractor to Provide:
  - 1. Pipe hangers and supports.
  - 2. Hanger rods.
  - 3. Inserts.
  - 4. Flashing.
  - 5. Equipment curbs.
  - 6. Sleeves.
  - 7. Mechanical sleeve seals.
  - 8. Formed steel channel.
  - 9. Equipment bases and supports.
  
- B. Related Sections:
  - 1. Section 23 11 23 - Facility Natural-Gas Piping: Execution requirements for placement of hangers and supports specified by this section.
  - 2. Section 23 21 13 - Hydronic Piping: Execution requirements for placement of hangers and supports specified by this section.

##### 1.2 REFERENCES

- A. American Society of Mechanical Engineers:
  - 1. ASME B31.1 - Power Piping.
  - 2. ASME B31.5 - Refrigeration Piping.
  - 3. ASME B31.9 - Building Services Piping.
  
- B. ASTM International:
  - 1. ASTM F708 - Standard Practice for Design and Installation of Rigid Pipe Hangers.
  
- C. American Welding Society:
  - 1. AWS D1.1 - Structural Welding Code - Steel.
  
- D. Manufacturers Standardization Society of the Valve and Fittings Industry:
  - 1. MSS SP 69 - Pipe Hangers and Supports - Selection and Application.

##### 1.3 QUALITY ASSURANCE

- A. Surface Burning Characteristics: Maximum 25/50 flame spread/smoke developed index when tested in accordance with ASTM E84.
  
- B. Perform Work in accordance with AWS D1.1 for welding hanger and support attachments to building structure.

#### 1.4 DELIVERY, STORAGE, AND HANDLING

- A. Accept materials on site in original factory packaging, labeled with manufacturer's identification.
- B. Protect from weather and construction traffic, dirt, water, chemical, and damage, by storing in original packaging.

#### 1.5 ENVIRONMENTAL REQUIREMENTS

- A. Provide ventilation in areas to receive solvent cured materials.

#### 1.6 FIELD MEASUREMENTS

- A. Verify field measurements prior to fabrication.

### PART 2 PRODUCTS

#### 2.1 PIPE HANGERS AND SUPPORTS

- A. Hydronic Piping:
  - 1. Conform to ASME B31.9, ASTM F708, and MSS SP69.
  - 2. Hangers for Pipe Sizes 1/2 to 1-1/2 inch: Carbon steel, adjustable swivel, split ring.
  - 3. Hangers for Cold Pipe Sizes 2 inches and Larger: Carbon steel, adjustable, clevis.
  - 4. Hangers for Hot Pipe Sizes 2 to 4 inches: Carbon steel, adjustable, clevis.
  - 5. Multiple or Trapeze Hangers: Steel channels with welded spacers and hanger rods.
  - 6. Multiple or Trapeze Hangers for Hot Pipe Sizes 6 inches and Larger: Steel channels with welded spacers and hanger rods, cast iron roll.
  - 7. Wall Support for Pipe Sizes 3 inches and Smaller: Cast iron hooks.
  - 8. Wall Support for Pipe Sizes 4 inches and Larger: Welded steel bracket and wrought steel clamp.
  - 9. Vertical Support: Steel riser clamp.
  - 10. Floor Support for Cold Pipe: Cast iron adjustable pipe saddle, lock nut, nipple, floor flange, and concrete pier or steel support.
  - 11. Floor Support for Hot Pipe Sizes 4 Inches and Smaller: Cast iron adjustable pipe saddle, lock nut, nipple, floor flange, and concrete pier or steel support.
  - 12. Copper Pipe Support: Copper-plated, carbon steel ring.
- B. Refrigerant Piping:
  - 1. Conform to ASME B31.5, ASTM F708, and MSS SP69.
  - 2. Hangers for Pipe Sizes 1/2 to 1-1/2 inch: Carbon steel, adjustable swivel, split ring.
  - 3. Hangers for Pipe Sizes 2 inches and Larger: Carbon steel, adjustable, clevis.
  - 4. Multiple or Trapeze Hangers: Steel channels with welded spacers and hanger rods.
  - 5. Wall Support for Pipe Sizes 3 inches and Smaller: Cast iron hook.
  - 6. Wall Support for Pipe Sizes 4 inches and Larger: Welded steel bracket and wrought steel clamp.
  - 7. Vertical Support: Steel riser clamp.
  - 8. Floor Support: Cast iron adjustable pipe saddle, lock nut, nipple, floor flange, and concrete pier or steel support.

9. Copper Pipe Support: Copper-plated carbon-steel ring.

## 2.2 ACCESSORIES

A. Hanger Rods: Mild steel threaded both ends, threaded on one end, or continuous threaded.

## 2.3 INSERTS

A. Inserts: Malleable iron case of galvanized steel shell and expander plug for threaded connection with lateral adjustment, top slot for reinforcing rods, lugs for attaching to forms; size inserts to suit threaded hanger rods.

## 2.4 FLASHING

A. Metal Flashing: 26 gage thick galvanized steel.

B. Metal Counterflashing: 22 gage thick galvanized steel.

C. Lead Flashing:

1. Waterproofing: 5 lb./sq. ft sheet lead.
2. Soundproofing: 1 lb./sq. ft sheet lead.

D. Flexible Flashing: 47 mil thick sheet; compatible with roofing.

E. Caps: Steel, 22 gage minimum; 16 gage at fire resistant elements.

## 2.5 EQUIPMENT CURBS

A. Fabrication: Welded 18 gage galvanized steel shell and base, mitered 3 inch cant, 1 inch thick insulation, factory installed wood nailer.

## 2.6 SLEEVES

A. Sleeves for Pipes Through Non-fire Rated Floors: 18 gage thick galvanized steel.

B. Sleeves for Pipes Through Non-fire Rated Beams, Walls, Footings, and Potentially Wet Floors: Steel pipe or 18 gage thick galvanized steel.

C. Sleeves for Round Ductwork: Galvanized steel.

D. Sleeves for Rectangular Ductwork: Galvanized steel or wood.

E. Sealant: Acrylic.

## 2.7 MECHANICAL SLEEVE SEALS

A. Product Description: Modular mechanical type, consisting of interlocking synthetic rubber links shaped to continuously fill annular space between object and sleeve, connected with bolts and

pressure plates causing rubber sealing elements to expand when tightened, providing watertight seal and electrical insulation.

## 2.8 FORMED STEEL CHANNEL

- A. Product Description: Galvanized 12 gage thick steel. With holes 1-1/2 inches on center.

## PART 3 EXECUTION

### 3.1 EXAMINATION

- A. Verify openings are ready to receive sleeves.

### 3.2 PREPARATION

- A. Clean substrate surfaces of dirt, dust, grease, oil, loose material, or other matter affecting bond of firestopping material.
- B. Remove incompatible materials affecting bond.
- C. Install backing/damming materials to arrest liquid material leakage.
- D. Do not drill or cut structural members.

### 3.3 INSTALLATION - INSERTS

- A. Install inserts for placement in concrete forms.
- B. Install inserts for suspending hangers from reinforced concrete slabs and sides of reinforced concrete beams.
- C. Provide hooked rod to concrete reinforcement section for inserts carrying pipe 4 inches and larger.
- D. Where concrete slabs form finished ceiling, locate inserts flush with slab surface.
- E. Where inserts are omitted, drill through concrete slab from below and provide through-bolt with recessed square steel plate and nut above slab.

### 3.4 INSTALLATION - PIPE HANGERS AND SUPPORTS

- A. Install in accordance with ASME B31.1, ASME B31.5, ASME 31.9, ASTM F708, MSS SP 58, MSS SP 69, and MSS SP 89.
- B. Support horizontal piping as scheduled.
- C. Install hangers with minimum 1/2 inch space between finished covering and adjacent work.
- D. Place hangers within 12 inches of each horizontal elbow.

- E. Use hangers with 1-1/2 inch minimum vertical adjustment.
- F. Support vertical piping at every floor.
- G. Where piping is installed in parallel and at same elevation, provide multiple pipe or trapeze hangers.
- H. Support riser piping independently of connected horizontal piping.
- I. Provide copper plated hangers and supports for copper piping.
- J. Design hangers for pipe movement without disengagement of supported pipe.
- K. Provide clearance in hangers and from structure and other equipment for installation of insulation. Refer to Section 23 07 00.

### 3.5 INSTALLATION - EQUIPMENT BASES AND SUPPORTS

- A. Provide housekeeping pads of concrete, minimum 3-1/2 inches thick and extending 6 inches beyond supported equipment.
- B. Using templates furnished with equipment, install anchor bolts, and accessories for mounting and anchoring equipment.
- C. Construct supports of steel members/formed steel channel/steel pipe and fittings. Brace and fasten with flanges bolted to structure.
- D. Provide rigid anchors for pipes after vibration isolation components are installed. Refer to Section 23 05 48.

### 3.6 INSTALLATION - FLASHING

- A. Provide flexible flashing and metal Counterflashing where piping and ductwork penetrate weather or waterproofed walls, floors, and roofs.
- B. Provide curbs for roof installations 16 inches minimum high above roofing surface. Flash and counter-flash with sheet metal; seal watertight. Attach Counterflashing to equipment and lap base flashing on roof curbs. Flatten and solder joints.
- C. Adjust storm collars tight to pipe with bolts; caulk around top edge. Use storm collars above roof jacks. Screw vertical flange section to face of curb.

### 3.7 INSTALLATION - SLEEVES

- A. Exterior watertight entries: Seal with mechanical sleeve seals.
- B. Set sleeves in position in forms. Provide reinforcing around sleeves.

- C. Size sleeves large enough to allow for movement due to expansion and contraction. Provide for continuous insulation wrapping.
- D. Extend sleeves through floors 1 inch above finished floor level. Caulk sleeves.
- E. Install chrome plated steel escutcheons at finished surfaces.

### 3.8 INSTALLATION - FIRESTOPPING

- A. Firestopping Materials: Comply with requirements of Division 7.
- B. Fire Rated Surface:
  - 1. Seal opening at floor, wall, and roof as follows:
    - a. Install sleeve through opening and extending beyond minimum of 1 inch on both sides of building element.
    - b. Size sleeve allowing minimum of 1 inch void between sleeve and building element.
    - c. Pack void with backing material.
    - d. Seal ends of sleeve with UL listed fire resistive silicone compound to meet fire rating of structure penetrated.
  - 2. Where wireway, penetrates fire rated surface, install firestopping product in accordance with manufacturer's instructions.
- C. Non-Rated Surfaces:
  - 1. Seal opening through non-fire rated wall, partition, floor, ceiling, and roof opening as follows:
    - a. Install sleeve through opening and extending beyond minimum of 1 inch on both sides of building element.
    - b. Size sleeve allowing minimum of 1 inch void between sleeve and building element.
    - c. Install type of firestopping material recommended by manufacturer.
  - 2. Install escutcheons where conduit, penetrates non-fire rated surfaces in occupied spaces. Occupied spaces include rooms with finished ceilings and where penetration occurs below finished ceiling.
  - 3. Exterior wall openings below grade: Assemble rubber links of mechanical sealing device to size of piping and tighten in place, in accordance with manufacturer's instructions.
  - 4. Interior partitions: Apply sealant to both sides of penetration to completely fill annular space between sleeve and conduit.

### 3.9 PROTECTION OF FINISHED WORK

- A. Protect adjacent surfaces from damage by material installation.

### 3.10 SCHEDULES

- A. Copper and Steel Pipe Hanger Spacing:



PIPE SIZE Inches	COPPER TUBING MAXIMUM HANGER SPACING Feet	STEEL PIPE MAXIMUM HANGER SPACING Feet	COPPER TUBING HANGER ROD DIAMETER Inches	STEEL PIPE HANGER ROD DIAMETER Inches
1/2	5	7	3/8	3/8
3/4	5	7	3/8	3/8
1	6	7	3/8	3/8
1-1/4	7	7	3/8	3/8
1-1/2	8	9	3/8	3/8
2	8	10	3/8	3/8
2-1/2 (Note 2)	9	11	1/2	1/2
3	10	12	1/2	1/2
4	12	14	1/2	5/8
5	13	16	1/2	5/8
6	14	17	5/8	3/4

B. Plastic and Ductile Iron Pipe Hanger Spacing:

PIPE MATERIAL	MAXIMUM HANGER SPACING Feet	HANGER ROD DIAMETER Inches
PVC (All Sizes)	4	3/8

C. Note 1: Refer to manufacturer's recommendations for grooved end piping systems.

D. Note 2: 20 feet maximum spacing, minimum of one hanger for each pipe section close to joint behind bell. Provide hanger at each change of direction and each branch connection. For pipe sizes 6 inches and smaller, subjected to loadings other than weight of pipe and contents, limit span to maximum spacing for water service steel pipe.

END OF SECTION



Section 23 05 48

Vibration and Seismic Controls for HVAC Piping and Equipment

PART 1 GENERAL

1.1 SUMMARY

- A. Section Includes:
  - 1. Vibration isolators.
- B. Related Sections:
  - 1. Section 23 05 29 - Hangers and Supports for HVAC Piping and Equipment: Product requirements for pipe hangers and supports.

1.2 REFERENCES

- A. Air Movement and Control Association International, Inc.:
  - 1. AMCA 300 - Reverberant Room Method for Sound Testing of Fans.
- B. Air-Conditioning and Refrigeration Institute:
  - 1. ARI 575 - Method of Measuring Machinery Sound within Equipment Space.
- C. American Society of Heating, Refrigerating and:
  - 1. ASHRAE 68 - Laboratory Method of Testing In-Duct Sound Power Measurement Procedure for Fans.
  - 2. ASHRAE Handbook - HVAC Applications.
- D. ASTM International:
  - 1. ASTM E90 - Standard Test Method for Laboratory Measurement of Airborne Sound Transmission Loss of Building Partitions and Elements.
  - 2. ASTM E477 - Standard Test Method for Measuring Acoustical and Airflow Performance of Duct Liner Materials and Prefabricated Silencers.
  - 3. ASTM E596 - Standard Test Method for Laboratory Measurement of the Noise Reduction of Sound-Isolating Enclosures.
- E. Sheet Metal and Air Conditioning Contractors':
  - 1. SMACNA - HVAC Duct Construction Standard - Metal and Flexible.

1.3 PERFORMANCE REQUIREMENTS

- A. Provide vibration isolation on motor driven equipment over 0.5 hp, plus connected piping and ductwork.
- B. Provide minimum static deflection of isolators for equipment as follows:

Basement, Under 20 hp	Basement, Over 20 hp	Upper Floors, Normal	Upper Floors, Critical
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600 - 800 rpm:	0.5 inch	1 inch	2 inches	3.5 inches
800 - 900 rpm:	0.2 inch	0.5 inch	1 inch	2 inches
1100 - 1500 rpm:	0.14 inch	0.2 inch	0.5 inch	1 inch
Over 1500 rpm:	0.1 inch	0.15 inch	0.2 inch	0.5 inch

#### 1.4 SUBMITTALS

- A. Product Data: Submit schedule of vibration isolator type with location and load on each. Submit catalog information indicating, materials, dimensional data, pressure losses, and acoustical performance for standard sound attenuation products.

#### 1.5 FIELD MEASUREMENTS

- A. Verify field measurements prior to fabrication.

### PART 2 PRODUCTS

#### 2.1 VIBRATION ISOLATORS

- A. Manufacturers:
  1. BRD Noise & Vibration Control, Inc.
  2. California Dynamics Corporation
  3. Isolation Technology, Inc.
  4. Kinetics Noise Control, Inc.
  5. Mason Industries, Inc.
  6. Vibration Isolation.
  7. Vibro-Acoustics.
- B. Open Spring Isolators:
  1. Spring Isolators:
    - a. For Exterior and Humid Areas: Furnish hot dipped galvanized housings and neoprene coated springs.
    - b. Code: Color code springs for load carrying capacity.
  2. Springs: Minimum horizontal stiffness equal to 75 percent vertical stiffness, with working deflection between 0.3 and 0.6 of maximum deflection.
  3. Spring Mounts: Furnish with leveling devices, minimum 0.25 inch thick neoprene sound pads, and zinc chromate plated hardware.
  4. Sound Pads: Size for minimum deflection of 0.05 inch; meet requirements for neoprene pad isolators.
- C. Restrained Spring Isolators:
  1. Spring Isolators:
    - a. For Exterior and Humid Areas: Furnish hot dipped galvanized housings and neoprene coated springs.

- b. Code: Color code springs for load carrying capacity.
  - 2. Springs: Minimum horizontal stiffness equal to 75 percent vertical stiffness, with working deflection between 0.3 and 0.6 of maximum deflection.
  - 3. Spring Mounts: Furnish with leveling devices, minimum 0.25 inch thick neoprene sound pads, and zinc chromate plated hardware.
  - 4. Sound Pads: Size for minimum deflection of 0.05 inch; meet requirements for neoprene pad isolators.
  - 5. Restraint: Furnish mounting frame and limit stops.
- D. Closed Spring Isolators:
  - 1. Spring Isolators:
    - a. For Exterior and Humid Areas: Furnish hot dipped galvanized housings and neoprene coated springs.
    - b. Code: Color code springs for load carrying capacity.
  - 2. Type: Closed spring mount with top and bottom housing separated with neoprene rubber stabilizers.
  - 3. Springs: Minimum horizontal stiffness equal to 75 percent vertical stiffness, with working deflection between 0.3 and 0.6 of maximum deflection.
  - 4. Housings: Incorporate neoprene isolation pad meeting requirements for neoprene pad isolators, and neoprene side stabilizers with minimum 0.25 inch clearance.
- E. Restrained Closed Spring Isolators:
  - 1. Spring Isolators:
    - a. For Exterior and Humid Areas: Furnish hot dipped galvanized housings and neoprene coated springs.
    - b. Code: Color code springs for load carrying capacity.
  - 2. Type: Closed spring mount with top and bottom housing separated with neoprene rubber stabilizers.
  - 3. Springs: Minimum horizontal stiffness equal to 75 percent vertical stiffness, with working deflection between 0.3 and 0.6 of maximum deflection.
  - 4. Housings: Incorporate neoprene isolation pad meeting requirements for neoprene pad isolators, and neoprene side stabilizers with minimum 0.25 inch clearance and limit stops.
- F. Spring Hanger:
  - 1. Spring Isolators:
    - a. For Exterior and Humid Areas: Furnish hot dipped galvanized housings and neoprene coated springs.
    - b. Code: Color code springs for load carrying capacity.
  - 2. Springs: Minimum horizontal stiffness equal to 75 percent vertical stiffness, with working deflection between 0.3 and 0.6 of maximum deflection.
  - 3. Housings: Incorporate neoprene isolation pad meeting requirements for neoprene pad isolators/rubber hanger with threaded insert.
  - 4. Misalignment: Capable of 20 degree hanger rod misalignment.
- G. Rubber Mount or Hanger: Molded rubber designed for 0.5 inches deflection with threaded insert.
- H. Glass Fiber Pads: Neoprene jacketed pre-compressed molded glass fiber.
- I. Seismic Snubbers:

1. Type: Non-directional and double acting unit consisting of interlocking steel members restrained by neoprene elements.
2. Neoprene Elements: Replaceable, minimum of 0.75 inch thick.
3. Capacity: 4 times load assigned to mount groupings at 0.4 inch deflection.
4. Attachment Points and Fasteners: Capable of withstanding 3 times rated load capacity of seismic snubber.

J. Restrained Spring Isolation Curbs (RSC):

1. Curb mounted rooftop equipment shall be flexibly connected and isolated as follows:
  - a. Each unit shall be supported by a spring isolation curb. The lower member shall consist of a specially formed steel section or a rectangular steel tube containing adjustable and removable steel springs that support the upper floating section. The upper frame shall provide continuous support for the equipment and shall be captive so as to resiliently resist wind and seismic forces. All directional neoprene snubber bushings shall be a minimum 1/4" thick; steel springs shall have a minimum deflection of 3.0" and rest on 1/4" neoprene acoustical pads. Hardware shall be cadmium or zinc electroplated and the springs provided with an approved rust-resistant finish.
  - b. The curb's waterproofing shall consist of continuous galvanized flexible counterflashing nailed over the lower curb's waterproofing and joined at the corners by EPDM bellows. All spring locations shall have access windows with removable waterproof covers. The lower curb section shall have provision for field supplied 2" insulation. Complete installation instructions shall be provided by the spring isolation curb manufacturer.

## PART 3 EXECUTION

### 3.1 EXAMINATION

- A. Verify equipment, ductwork and piping is installed before work in this section is started.

### 3.2 EXISTING WORK

- A. Provide access to existing piping and ductwork and other installations remaining active and requiring access.

### 3.3 INSTALLATION

- A. Install isolation for motor driven equipment.
- B. Bases:
  1. Set steel bases for 1 inch clearance between housekeeping pad and base.
  2. Set concrete inertia bases for 2 inch clearance between housekeeping pad and base.
- C. Adjust equipment level.
- D. Install spring hangers without binding.

- E. On closed spring isolators, adjust so side stabilizers are clear under normal operating conditions.
- F. Prior to making piping connections to equipment with operating weights substantially different from installed weights, block up equipment with temporary shims to final height. When full load is applied, adjust isolators to load to allow shim removal.
- G. Support piping connections to isolated equipment resiliently as follows:
  1. Up to 4 inch Diameter: First three points of support.
  2. Select three hangers closest to vibration source for minimum 1.0 inch static deflection or static deflection of isolated equipment. Select remaining isolators for minimum 1.0 inch static deflection or 1/2 static deflection of isolated equipment.

3.4 SCHEDULES

A. Pipe Isolation Schedule:

Pipe Size Inch	Isolated Distance from Equipment diameters
1	120
2	90 diameters
3	80 diameters
4	75 diameters

B. Equipment Isolation Schedule:

Isolated Equipment	Base		Isolator	
	Type	Thickness	Type	Deflection
Packaged Roof Top Air Conditioning Units	MASON RSC SEISMIC SPRING ISOLATION CURB 24" TALL CURB			

END OF SECTION





## Section 23 05 53

### Identification for HVAC Piping and Equipment

#### PART 1 GENERAL

##### 1.1 SUMMARY

- A. Section Includes:
  - 1. Nameplates.
  - 2. Tags.
  - 3. Pipe markers.
  - 4. Ceiling tacks.
  - 5. Labels.

##### 1.2 REFERENCES

- A. American Society of Mechanical Engineers:
  - 1. ASME A13.1 - Scheme for the Identification of Piping Systems.

##### 1.3 SUBMITTALS

- A. Product Data: Submit manufacturers catalog literature for each product required.
- B. Shop Drawings: Submit list of wording, symbols, letter size, and color coding for mechanical identification and valve chart and schedule, including valve tag number, location, function, and valve manufacturer's name and model number.

##### 1.4 CLOSEOUT SUBMITTALS

- A. Project Record Documents: Record actual locations of tagged valves; include valve tag numbers.

##### 1.5 QUALITY ASSURANCE

- A. Conform to ASME A13.1 for color scheme for identification of piping systems and accessories.

##### 1.6 FIELD MEASUREMENTS

- A. Verify field measurements prior to fabrication.

#### PART 2 PRODUCTS

##### 2.1 NAMEPLATES

- A. Product Description: Laminated three-layer plastic with engraved black letters on light contrasting background color.

## 2.2 TAGS

### A. Plastic Tags:

1. Laminated three-layer plastic with engraved black letters on light contrasting background color. Tag size minimum 1-1/2 inches square.

### B. Metal Tags:

1. Aluminum with stamped letters; tag size minimum 1-1/2 inches square with finished edges.

## 2.3 PIPE MARKERS

### A. Color and Lettering: Conform to ASME A13.1.

### B. Plastic Pipe Markers:

1. Factory fabricated, flexible, semi-rigid plastic, preformed to fit around pipe or pipe covering. Larger sizes may have maximum sheet size with spring fastener.

### C. Plastic Tape Pipe Markers:

1. Flexible, vinyl film tape with pressure sensitive adhesive backing and printed markings.

## 2.4 CEILING TACKS

### A. Description: Steel with 3/4 inch diameter color-coded head.

### B. Color code as follows:

1. HVAC equipment: Yellow.
2. Fire dampers/smoke dampers: Red.
3. Heating/cooling valves: Blue.

## 2.5 LABELS

### A. Description: Aluminum, size 1.9 x 0.75 inches, adhesive backed with printed identification.

## PART 3 EXECUTION

### 3.1 PREPARATION

- A. Degrease and clean surfaces to receive adhesive for identification materials.
- B. Prepare surfaces in accordance with Section 09 90 00 for stencil painting.

### 3.2 INSTALLATION

- A. Install identifying devices after completion of coverings and painting.
- B. Install plastic nameplates with corrosive-resistant mechanical fasteners, or adhesive.

- C. Install labels with sufficient adhesive for permanent adhesion and seal with clear lacquer. For unfinished canvas covering, apply paint primer before applying labels.
- D. Install tags using corrosion resistant chain. Number tags consecutively by location.
- E. Identify air handling units, pumps, heat transfer equipment, tanks, and water treatment devices with plastic nameplates. Identify in-line pumps and other small devices with tags.
- F. Identify control panels and major control components outside panels with plastic nameplates.
- G. Identify valves in main and branch piping with tags.
- H. Identify air terminal units and radiator valves with numbered tags.
- I. Tag automatic controls, instruments, and relays. Key to control schematic.
- J. Identify piping, concealed or exposed, with plastic tape pipe markers. Use tags on piping 3/4 inch diameter and smaller. Identify service, flow direction, and pressure. Install in clear view and align with axis of piping. Locate identification not to exceed 20 feet on straight runs including risers and drops, adjacent to each valve and tee, at each side of penetration of structure or enclosure, and at each obstruction.
- K. For exposed natural gas lines other than steel pipe, attach yellow pipe labels with "GAS" in black lettering, at maximum 5 foot spacing.

END OF SECTION



## Section 23 05 93

### Testing, Adjusting, and Balancing for HVAC

#### PART 1 GENERAL

##### 1.1 SUMMARY

- A. Section Includes:
  - 1. Testing adjusting, and balancing of air systems.
  - 2. Testing adjusting, and balancing of hydronic and refrigerating systems.
- B. Related Sections:
  - 1. Section 23 09 23 - Direct-Digital Control System for HVAC: Requirements for coordination between DDC system and testing, adjusting, and balancing work.
  - 2. Section 23 09 93 - Sequence of Operations for HVAC Controls: Sequences of operation for HVAC equipment.

##### 1.2 REFERENCES

- A. Associated Air Balance Council:
  - 1. AABC MN-1 - National Standards for Testing and Balancing Heating, Ventilating, and Air Conditioning Systems.
- B. American Society of Heating, Refrigerating and Air-Conditioning Engineers:
  - 1. ASHRAE 111 - Practices for Measurement, Testing, Adjusting and Balancing of Building Heating, Ventilation, Air-Conditioning and Refrigeration Systems.
- C. Natural Environmental Balancing Bureau:
  - 1. NEBB - Procedural Standards for Testing, Adjusting, and Balancing of Environmental Systems.
- D. Testing Adjusting and Balancing Bureau:
  - 1. TABB - International Standards for Environmental Systems Balance.

##### 1.3 SUBMITTALS

- A. Prior to commencing Work, submit proof of latest calibration date of each instrument.
- B. Test Reports: Indicate data on AABC MN-1 National Standards for Total System Balance forms, NEBB Report forms or TABB Report Forms.
- C. Field Reports: Indicate deficiencies preventing proper testing, adjusting, and balancing of systems and equipment to achieve specified performance.
- D. Submit draft copies of report for review prior to final acceptance of Project.

- E. Furnish reports in binder manuals, complete with table of contents page and indexing tabs, with cover identification at front and side. Include set of reduced drawings with air outlets and equipment identified to correspond with data sheets, and indicating thermostat locations.

#### 1.4 CLOSEOUT SUBMITTALS

- A. Project Record Documents: Record actual locations of flow measuring stations and balancing valves and rough setting.
- B. Operation and Maintenance Data: Furnish final copy of testing, adjusting, and balancing report inclusion in operating and maintenance manuals.

#### 1.5 QUALITY ASSURANCE

- A. Perform Work in accordance with AABC MN-1 National Standards for Field Measurement and Instrumentation, Total System Balance, NEBB Procedural Standards for Testing, Balancing and Adjusting of Environmental Systems or TABB International Quality Assurance program.

#### 1.6 SEQUENCING

- A. Sequence balancing between completion of systems tested and Date of Substantial Completion.

### PART 2 PRODUCTS

Not Used.

### PART 3 EXECUTION

#### 3.1 EXAMINATION

- A. Verify systems are complete and operable before commencing work. Verify the following:
  1. Systems are started and operating in safe and normal condition.
  2. HVAC control systems are installed complete and operable.
  3. Proper thermal overload protection is in place for electrical equipment.
  4. Final filters are clean and in place. If required, install temporary media in addition to final filters.
  5. Duct systems are clean of debris.
  6. Fans are rotating correctly.
  7. Air coil fins are cleaned and combed.
  8. Access doors are closed and duct end caps are in place.
  9. Air outlets are installed and connected.
  10. Duct system leakage is minimized.
  11. Hydronic systems are flushed, filled, and vented.
  12. Pumps are rotating correctly.
  13. Proper strainer baskets are clean and in place or in normal position.
  14. Service and balancing valves are open.

### 3.2 PREPARATION

- A. Furnish instruments required for testing, adjusting, and balancing operations.
- B. Make instruments available to Architect/Engineer to facilitate spot checks during testing.

### 3.3 INSTALLATION TOLERANCES

- A. Air Handling Systems: Adjust to within plus or minus 10 percent of design.
- B. Air Outlets and Inlets: Adjust total to within plus 10 percent and minus 10 percent of design to space. Adjust outlets and inlets in space to within plus or minus 10 percent of design.
- C. Hydronic Systems: Adjust to within plus or minus 10 percent of design.

### 3.4 ADJUSTING

- A. Verify recorded data represents actual measured or observed conditions.
- B. Permanently mark settings of valves, dampers, and other adjustment devices allowing settings to be restored. Set and lock memory stops.
- C. After adjustment, take measurements to verify balance has not been disrupted. If disrupted, verify correcting adjustments have been made.
- D. Report defects and deficiencies noted during performance of services, preventing system balance.
- E. Leave systems in proper working order, replacing belt guards, closing access doors, closing doors to electrical switch boxes, and restoring thermostats to specified settings.

### 3.5 AIR SYSTEM PROCEDURE

- A. Adjust air handling and distribution systems to obtain required or design supply, return, and exhaust air quantities.
- B. Make air flow rate measurements in main ducts by Pitot tube traverse of entire cross sectional area of duct.
- C. Measure air quantities at air inlets and outlets.
- D. Adjust distribution system to obtain:
  - 1. Space temperatures within 2 degrees F.
  - 2. Minimal objectionable drafts.
- E. Use volume control devices to regulate air quantities only to extent adjustments do not create objectionable air motion or sound levels. Effect volume control by using volume dampers located in ducts.

- F. Vary total system air quantities by adjustment of fan speeds. Provide sheave drive changes to vary fan speed. Vary branch air quantities by damper regulation.
- G. Provide system schematic with required and actual air quantities recorded at each outlet or inlet.
- H. Measure static air pressure conditions on air supply units, including filter and coil pressure drops, and total pressure across fan. Make allowances for 50 percent loading of filters.
- I. Adjust outside air automatic dampers, outside air, return air, and exhaust dampers for design conditions.
- J. Measure temperature conditions across outside air, return air, and exhaust dampers to check leakage.
- K. At modulating damper locations, take measurements and balance at extreme conditions. Balance variable volume systems at maximum airflow rate, full cooling, and at minimum airflow rate, full heating.

### 3.6 WATER SYSTEM PROCEDURE

- A. Adjust water systems, after air balancing, to obtain design quantities.
- B. Use calibrated Venturi tubes, orifices, or other metered fittings and pressure gauges to determine flow rates for system balance. Where flow-metering devices are not installed, base flow balance on temperature difference across various heat transfer elements in system.
- C. Confirm air bleeds indicate system is full of water.
- D. Adjust systems to obtain specified pressure drops and flows through heat transfer elements prior to thermal testing. Perform balancing by measurement of temperature differential in conjunction with air balancing.
- E. Perform system balance with automatic control valves fully open triple duty valves fully open, and pump VFDs at 100 percent speed.
- F. Confirm pump rotation and differential pressure at full flow.
- G. Perform adjustment of water distribution systems by the following measures:
  - 1. Reduce total system flow rate first by reducing speed of VFD.
  - 2. Use balancing cocks, valves, and fittings.
- H. Do not use service or shut-off valves for balancing unless designed for balancing and shut-off functions. Where available pump capacity is less than total flow requirements or individual system parts, simulate full flow in one part by temporary restriction of flow to other parts.

### 3.7 SCHEDULES

- A. Equipment Requiring Testing, Adjusting, and Balancing:
  - 1. HVAC Pumps.



2. Packaged Roof Top Heating/Cooling Units.
3. Air Cooled Refrigerant Condensers (VRF/Heat Pump & Mini-Split).
4. Boilers.
5. Unit Ventilators.
6. Fan Coil Units.
7. Electric/Air Coils
8. Air Handling Units.
9. Fans.
10. Air Inlets and Outlets.

B. Report Forms

1. Title Page:
  - a. Name of Testing, Adjusting, and Balancing Agency
  - b. Address of Testing, Adjusting, and Balancing Agency
  - c. Telephone and facsimile numbers of Testing, Adjusting, and Balancing Agency
  - d. Project name
  - e. Project location
  - f. Project Architect
  - g. Project Engineer
  - h. Project Contractor
  - i. Project altitude
  - j. Report date
2. Summary Comments:
  - a. Design versus final performance
  - b. Notable characteristics of system
  - c. Description of systems operation sequence
  - d. Summary of outdoor and exhaust flows to indicate building pressurization
  - e. Nomenclature used throughout report
  - f. Test conditions
3. Instrument List:
  - a. Instrument
  - b. Manufacturer
  - c. Model number
  - d. Serial number
  - e. Range
  - f. Calibration date
4. Electric Motors:
  - a. Manufacturer
  - b. Model/Frame
  - c. HP/BHP and kW
  - d. Phase, voltage, amperage; nameplate, actual, no load
  - e. RPM
  - f. Service factor
  - g. Starter size, rating, heater elements
  - h. Sheave Make/Size/Bore
5. V-Belt Drive:
  - a. Identification/location
  - b. Required driven RPM
  - c. Driven sheave, diameter and RPM

- d. Belt, size and quantity
  - e. Motor sheave diameter and RPM
  - f. Center to center distance, maximum, minimum, and actual
6. Pump Data:
- a. Identification/number
  - b. Manufacturer
  - c. Size/model
  - d. Impeller
  - e. Service
  - f. Design flow rate, pressure drop, BHP and kW
  - g. Actual flow rate, pressure drop, BHP and kW
  - h. Discharge pressure
  - i. Suction pressure
  - j. Total operating head pressure
  - k. Shut off, discharge and suction pressures
  - l. Shut off, total head pressure
7. Combustion Test:
- a. Manufacturer
  - b. Model number
  - c. Serial number
  - d. Firing rate
  - e. Overfire draft
  - f. Gas meter timing dial size
  - g. Gas meter time per revolution
  - h. Gas pressure at meter outlet
  - i. Gas flow rate
  - j. Heat input
  - k. Burner manifold gas pressure
  - l. Percent carbon monoxide (CO)
  - m. Percent carbon dioxide (CO<sub>2</sub>)
  - n. Percent oxygen (O<sub>2</sub>)
  - o. Percent excess air
  - p. Flue gas temperature at outlet
  - q. Ambient temperature
  - r. Net stack temperature
  - s. Percent stack loss
  - t. Percent combustion efficiency
  - u. Heat output
8. Air Cooled Condenser:
- a. Identification/number
  - b. Location
  - c. Manufacturer
  - d. Model number
  - e. Serial number
  - f. Entering DB air temperature, design and actual
  - g. Leaving DB air temperature, design and actual
  - h. Number of compressors
9. Cooling Coil Data:

- a. Identification/number
  - b. Location
  - c. Service
  - d. Manufacturer
  - e. Air flow, design and actual
  - f. Entering air DB temperature, design and actual
  - g. Entering air WB temperature, design and actual
  - h. Leaving air DB temperature, design and actual
  - i. Leaving air WB temperature, design and actual
  - j. Water flow, design and actual
  - k. Water pressure drop, design and actual
  - l. Entering water temperature, design and actual
  - m. Leaving water temperature, design and actual
  - n. Saturated suction temperature, design and actual
  - o. Air pressure drop, design and actual
10. Heating Coil Data:
- a. Identification/number
  - b. Location
  - c. Service
  - d. Manufacturer
  - e. Air flow, design and actual
  - f. Water flow, design and actual
  - g. Water pressure drop, design and actual
  - h. Entering water temperature, design and actual
  - i. Leaving water temperature, design and actual
  - j. Entering air temperature, design and actual
  - k. Leaving air temperature, design and actual
  - l. Air pressure drop, design and actual
11. Unit Ventilator and Fan Coil Data:
- a. Manufacturer
  - b. Identification/number
  - c. Location
  - d. Model number
  - e. Size
  - f. Air flow, design and actual
  - g. Water flow, design and actual
  - h. Water pressure drop, design and actual
  - i. Entering water temperature, design and actual
  - j. Leaving water temperature, design and actual
  - k. Entering air temperature, design and actual
  - l. Leaving air temperature, design and actual
12. Air Moving Equipment:
- a. Location
  - b. Manufacturer
  - c. Model number
  - d. Serial number
  - e. Arrangement/Class/Discharge
  - f. Air flow, specified and actual

- g. Return air flow, specified and actual
  - h. Outside air flow, specified and actual
  - i. Total static pressure (total external), specified and actual
  - j. Inlet pressure
  - k. Discharge pressure
  - l. Sheave Make/Size/Bore
  - m. Number of Belts/Make/Size
  - n. Fan RPM
13. Return Air/Outside Air Data:
- a. Identification/location
  - b. Design air flow
  - c. Actual air flow
  - d. Design return air flow
  - e. Actual return air flow
  - f. Design outside air flow
  - g. Actual outside air flow
  - h. Return air temperature
  - i. Outside air temperature
  - j. Required mixed air temperature
  - k. Actual mixed air temperature
  - l. Design outside/return air ratio
  - m. Actual outside/return air ratio
14. Exhaust Fan Data:
- a. Location
  - b. Manufacturer
  - c. Model number
  - d. Serial number
  - e. Air flow, specified and actual
  - f. Total static pressure (total external), specified and actual
  - g. Inlet pressure
  - h. Discharge pressure
  - i. Sheave Make/Size/Bore
  - j. Number of Belts/Make/Size
  - k. Fan RPM
15. Duct Traverse:
- a. System zone/branch
  - b. Duct size
  - c. Area
  - d. Design velocity
  - e. Design air flow
  - f. Test velocity
  - g. Test air flow
  - h. Duct static pressure
  - i. Air temperature
  - j. Air correction factor
16. Air Distribution Test Sheet:
- a. Air terminal number
  - b. Room number/location

- c. Terminal Type
- d. Terminal Size
- e. Area Factor
- f. Design Velocity
- g. Design air flow
- h. Test (final) air velocity
- i. Test (final) air flow
- j. Perfect of design air flow

END OF SECTION



## SECTION 23 07 00

### HVAC INSULATION

#### PART 1 GENERAL

##### 1.1 SUMMARY

###### A. Section Includes:

1. HVAC piping insulation, jackets and accessories.
2. HVAC ductwork insulation, jackets, and accessories.

##### 1.2 REFERENCES

###### A. ASTM International:

1. ASTM C195 - Standard Specification for Mineral Fiber Thermal Insulating Cement.
2. ASTM C449/C449M - Standard Specification for Mineral Fiber Hydraulic-Setting Thermal Insulating and Finishing Cement.
3. ASTM C450 - Standard Practice for Fabrication of Thermal Insulating Fitting Covers for NPS Piping, and Vessel Lagging.
4. ASTM C534 - Standard Specification for Preformed Flexible Elastomeric Cellular Thermal Insulation in Sheet and Tubular Form.
5. ASTM C547 - Standard Specification for Mineral Fiber Pipe Insulation.
6. ASTM C553 - Standard Specification for Mineral Fiber Blanket Thermal Insulation for Commercial and Industrial Applications.
7. ASTM C585 - Standard Practice for Inner and Outer Diameters of Rigid Thermal Insulation for Nominal Sizes of Pipe and Tubing (NPS System).
8. ASTM C921 - Standard Practice for Determining the Properties of Jacketing Materials for Thermal Insulation.
9. ASTM C1136 - Standard Specification for Flexible, Low Permeance Vapor Retarders for Thermal Insulation.
10. ASTM C1290 - Standard Specification for Flexible Fibrous Glass Blanket Insulation Used to Externally Insulate HVAC Ducts.
11. ASTM E96/E96M - Standard Test Methods for Water Vapor Transmission of Materials.
12. ASTM E162 - Standard Test Method for Surface Flammability of Materials Using a Radiant Heat Energy Source.

###### B. Sheet Metal and Air Conditioning Contractors':

1. SMACNA - HVAC Duct Construction Standard - Metal and Flexible.

##### 1.3 SUBMITTALS

- ###### A. Product Data: Submit product description, thermal characteristics and list of materials and thickness for each service, and location.

##### 1.4 QUALITY ASSURANCE

- ###### A. Test pipe insulation for maximum flame spread index of 25 and maximum smoke developed index of not exceeding 50 in accordance with ASTM E84.

- B. Pipe insulation manufactured in accordance with ASTM C585 for inner and outer diameters.
- C. Factory fabricated fitting covers manufactured in accordance with ASTM C450.
- D. Duct insulation, Coverings, and Linings: Maximum 25/50 flame spread/smoke developed index, when tested in accordance with ASTM E84, using specimen procedures and mounting procedures of ASTM E 2231.

#### 1.5 DELIVERY, STORAGE, AND HANDLING

- A. Accept materials on site in original factory packaging, labeled with manufacturer's identification, including product density and thickness.
- B. Protect insulation from weather and construction traffic, dirt, water, chemical, and damage, by storing in original wrapping.

#### 1.6 ENVIRONMENTAL REQUIREMENTS

- A. Install insulation only when ambient temperature and humidity conditions are within range recommended by manufacturer.
- B. Maintain temperature before, during, and after installation for minimum period of 24 hours.

#### 1.7 FIELD MEASUREMENTS

- A. Verify field measurements prior to fabrication.

### PART 2 PRODUCTS

#### 2.1 MANUFACTURER

- A. Manufacturers for Glass Fiber and Mineral Fiber Insulation Products:
  - 1. CertainTeed.
  - 2. Knauf.
  - 3. Johns Manville.
  - 4. Owens-Corning.
  - 5. 3M.
- B. Manufacturers for Closed Cell Elastomeric Insulation Products:
  - 1. Aeroflex. Aerocell.
  - 2. Armacell, LLC. Armaflex.
  - 3. Nomaco. K-flex.

#### 2.2 PIPE INSULATION

- A. TYPE P-1: ASTM C547, molded glass fiber pipe insulation.
  - 1. Thermal Conductivity: 0.23 at 75 degrees F.
  - 2. Operating Temperature Range: 0 to 850 degrees F.



3. Vapor Barrier Jacket: ASTM C1136, Type I, factory applied reinforced foil kraft with self-sealing adhesive joints.
  4. Jacket Temperature Limit: minus 20 to 150 degrees F.
- B. TYPE P-5: ASTM C534, Type I, flexible, closed cell elastomeric insulation, tubular.
1. Thermal Conductivity: 0.27 at 75 degrees F.
  2. Operating Temperature Range: Range: Minus 70 to 180 degrees F.

### 2.3 PIPE INSULATION JACKETS

- A. Vapor Retarder Jacket:
1. ASTM C921, white Kraft paper with glass fiber yarn, bonded to aluminized film.
  2. Water Vapor Permeance: ASTM E96/E96M; 0.02 perms.
- B. PVC Plastic Pipe Jacket:
1. Product Description: ASTM D1785, One piece molded type fitting covers and sheet material, off-white color.
  2. Thickness: 15 mil.
  3. Connections: Tacks.
- C. Aluminum Pipe Jacket:
1. Thickness: 0.016 inch thick sheet.
  2. Finish: Embossed.
  3. Joining: Longitudinal slip joints and 2 inch laps.
  4. Fittings: 0.016 inch thick die shaped fitting covers with factory attached protective liner.
  5. Metal Jacket Bands: 1/2 inch wide; 0.015 inch thick aluminum. 0.010 inch thick stainless steel.

### 2.4 PIPE INSULATION ACCESSORIES

- A. Vapor Retarder Lap Adhesive: Compatible with insulation.
- B. Covering Adhesive Mastic: Compatible with insulation.
- C. Piping 1-1/2 inches diameter and smaller: Galvanized steel insulation protection shield. MSS SP-69, Type 40. Length: Based on pipe size and insulation thickness.
- D. Piping 2 inches diameter and larger: Wood insulation saddle, hard maple. Inserts length: not less than 6 inches long, matching thickness and contour of adjoining insulation.
- E. Closed Cell Elastomeric Insulation Pipe Hanger: Polyurethane insert with aluminum single piece construction with self-adhesive closure. Thickness to match pipe insulation.
- F. Insulating Cement: ASTM C195; hydraulic setting on mineral wool.
- G. Adhesives: Compatible with insulation.

## 2.5 DUCTWORK INSULATION

- A. TYPE D-1: ASTM C1290, Type III, flexible glass fiber, commercial grade with factory applied reinforced aluminum foil jacket meeting ASTM C1136, Type II.
  - 1. Thermal Conductivity: 0.25 at 75 degrees F.
  - 2. Maximum Operating Temperature: 250 degrees F.
  - 3. Density: 1.5 pound per cubic foot.

## 2.6 DUCTWORK INSULATION JACKETS

- A. Aluminum Duct Jacket
  - 1. ASTM B209
  - 2. Thickness: 0.016 inch thick sheet.
  - 3. Finish: Smooth.
  - 4. Joining: Longitudinal slip joints and 2 inch laps.
  - 5. Fittings: 0.016 inch thick die shaped fitting covers with factory attached protective liner.

## 2.7 DUCTWORK INSULATION ACCESSORIES

- A. Vapor Retarder Tape:
  - 1. Kraft paper reinforced with glass fiber yarn and bonded to aluminized film, with pressure sensitive rubber based adhesive.
- B. Vapor Retarder Lap Adhesive: Compatible with insulation.
- C. Adhesive: Waterproof , ASTM E162 fire-retardant type.
- D. Impale Anchors: Galvanized steel, 12 gage self-adhesive pad.
- E. Adhesives: Compatible with insulation.

## PART 3 EXECUTION

### 3.1 EXAMINATION

- A. Verify piping and ductwork has been tested before applying insulation materials.
- B. Verify surfaces are clean and dry, with foreign material removed.

### 3.2 INSTALLATION - PIPING SYSTEMS

- A. Piping Exposed to View in Finished Spaces: Locate insulation and cover seams in least visible locations.
- B. Continue insulation through penetrations of building assemblies or portions of assemblies having fire resistance rating of one hour or less. Piping Systems Conveying Fluids Below Ambient Temperature:
  - 1. Insulate entire system including fittings, valves, unions, flanges, strainers, flexible connections, and expansion joints.

2. Furnish factory-applied or field-applied vapor retarder jackets. Secure factory-applied jackets with pressure sensitive adhesive self-sealing longitudinal laps and butt strips. Secure field-applied jackets with outward clinch expanding staples and seal staple penetrations with vapor retarder mastic.
  3. Insulate fittings, joints, and valves with molded insulation of like material and thickness as adjacent pipe. Finish with glass cloth and vapor retarder adhesive or PVC fitting covers.
- C. Hot Piping Systems greater than 140 degrees F:
1. Furnish factory-applied or field-applied standard jackets. Secure with outward clinch expanding staples or pressure sensitive adhesive system on standard factory-applied jacket and butt strips or both.
  2. Insulate fittings, joints, and valves with insulation of like material and thickness as adjoining pipe. Finish with glass cloth and adhesive or PVC fitting covers.
  3. Insulate flanges and unions at equipment.
- D. Inserts and Shields:
1. Piping 1-1/2 inches Diameter and Smaller: Install galvanized steel shield between pipe hanger and insulation.
  2. Piping 2 inches Diameter and Larger: Install insert between support shield and piping and under finish jacket.
    - a. Insert Configuration: Minimum 6 inches long, of thickness and contour matching adjoining insulation; may be factory fabricated.
    - b. Insert Material: Compression resistant insulating material suitable for planned temperature range and service.
  3. Piping Supported by Roller Type Pipe Hangers: Install galvanized steel shield between roller and inserts.
- E. Insulation Terminating Points:
1. Coil Branch Piping 1 inch and Smaller: Terminate hot water piping at union upstream of the coil control valve.
  2. Chilled Water Coil Branch Piping: Insulate chilled water piping and associated components up to coil connection.
  3. Condensate Piping: Insulate entire piping system and components to prevent condensation.
- F. Closed Cell Elastomeric Insulation:
1. Push insulation on to piping.
  2. Miter joints at elbows.
  3. Seal seams and butt joints with manufacturer's recommended adhesive.
  4. When application requires multiple layers, apply with joints staggered.
  5. Insulate fittings and valves with insulation of like material and thickness as adjacent pipe.
- G. Pipe Exposed in Mechanical Equipment Rooms or Finished Spaces (less than 10 feet above finished floor): Finish with PVC jacket and fitting covers.
- H. Piping Exterior to Building: Provide vapor retarder jacket. Insulate fittings, joints, and valves with insulation of like material and thickness as adjoining pipe, and finish with glass mesh reinforced vapor retarder cement. **Cover with aluminum jacket with seams located at 3 or 9 o'clock position on side of horizontal piping with overlap facing down to shed water or on bottom side of horizontal piping.**

### 3.3 INSTALLATION - DUCTWORK SYSTEMS

- A. Duct dimensions indicated on Drawings are finished inside dimensions.
- B. Insulated ductwork conveying air below ambient temperature:
  1. Provide insulation with vapor retarder jackets.
  2. Finish with tape and vapor retarder jacket.
  3. Continue insulation through walls, sleeves, hangers, and other duct penetrations.
  4. Insulate entire system including fittings, joints, flanges, fire dampers, flexible connections, and expansion joints.
- C. Insulated ductwork conveying air above ambient temperature:
  1. Provide with or without standard vapor retarder jacket.
  2. Insulate fittings and joints. Where service access is required, bevel and seal ends of insulation.
- D. External Glass Fiber Duct Insulation:
  1. Secure insulation with vapor retarder with wires and seal jacket joints with vapor retarder adhesive or tape to match jacket.
  2. Secure insulation without vapor retarder with staples, tape, or wires.
  3. Install without sag on underside of ductwork. Use adhesive or mechanical fasteners where necessary to prevent sagging. Lift ductwork off trapeze hangers and insert spacers.
  4. Seal vapor retarder penetrations by mechanical fasteners with vapor retarder adhesive.
  5. Stop and point insulation around access doors and damper operators to allow operation without disturbing wrapping.
- E. Ducts Exterior to Building:
  1. Install insulation according to external duct insulation paragraph above.
  2. Provide external 3" thick elastomer cell insulation with vapor retarder jacket. Cover with outdoor jacket finished as specified in Section with caulked aluminum jacket with seams located on bottom side of horizontal duct section.
  3. Finish with aluminum duct jacket.
  4. Calk seams at flanges and joints. Located major longitudinal seams on bottom side of horizontal duct sections.

### 3.4 SCHEDULES

- A. Cooling Services Piping Insulation Schedule:

PIPING SYSTEM	INSULATION TYPE	PIPE SIZE	INSULATION THICKNESS inches
Condensate Piping from Cooling Coils	P-5	All sizes	0.5
Refrigerant Suction (Aluminum Jacket)	P-5	All sizes	0.5

Refrigerant Hot Gas (Aluminum Jacket)	P-5	All sizes	0.5
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B. Heating Services Piping Insulation Schedule:

PIPING SYSTEM	INSULATION TYPE	PIPE SIZE	INSULATION THICKNESS inches
Heating Water Supply and Return	P-1	3 inches and smaller	1.0
		4 inches and larger	1.5

C. Ductwork Insulation Schedule:

DUCTWORK SYSTEM	INSULATION TYPE	INSULATION THICKNESS inches
Supply Ducts (externally insulated) Thickness indicated is installed thickness.	D-1	2.0
Return Ducts (externally insulated) Thickness indicated is installed thickness.	D-1	2.0

END OF SECTION



## Section 23 21 13

### Hydronic Piping

#### PART 1 GENERAL

##### 1.1 SUMMARY

###### A. Section Includes:

1. Heating water piping, above ground.
2. Equipment drains and over flows.
3. Unions and flanges.
4. Valves.

###### B. Related Sections:

1. Section 23 05 29 - Hangers and Supports for HVAC Piping and Equipment: Product requirements for pipe hangers and supports, sleeves, and firestopping for placement by this section.
2. Section 23 05 48 - Vibration and Seismic Controls for HVAC Piping and Equipment: Product requirements for Vibration Isolation for placement by this section.
3. Section 23 05 53 - Identification for HVAC Piping and Equipment: Product requirements for pipe identification for placement by this section.
4. Section 23 07 00 - HVAC Insulation: Product requirements for Piping Insulation for placement by this section.
5. Section 23 21 16 - Hydronic Piping Specialties: Product and execution requirements for piping specialties used in heating and cooling piping systems.
6. Section 23 21 23 - Hydronic Pumps: Product and execution requirements for pumps used in heating and cooling piping systems.
7. Section 23 25 00 - HVAC Water Treatment: Product and execution requirements for cleaning and chemical treatment of heating and cooling piping systems.

##### 1.2 REFERENCES

###### A. American Society of Mechanical Engineers:

1. ASME B16.3 - Malleable Iron Threaded Fittings.
2. ASME B16.4 - Gray Iron Threaded Fittings.
3. ASME B16.18 - Cast Copper Alloy Solder Joint Pressure Fittings.
4. ASME B16.22 - Wrought Copper and Copper Alloy Solder Joint Pressure Fittings.
5. ASME B31.9 - Building Services Piping.
6. ASME Section IX - Boiler and Pressure Vessel Code - Welding and Brazing Qualifications.

###### B. ASTM International:

1. ASTM A234/A234M - Standard Specification for Piping Fittings of Wrought Carbon Steel and Alloy Steel for Moderate and High Temperature Service.
2. ASTM A395/A395M - Standard Specification for Ferritic Ductile Iron Pressure-Retaining Castings for Use at Elevated Temperatures.
3. ASTM A536 - Standard Specification for Ductile Iron Castings.
4. ASTM B32 - Standard Specification for Solder Metal.
5. ASTM B88 - Standard Specification for Seamless Copper Water Tube.

6. ASTM B584 - Standard Specification for Copper Alloy Sand Castings for General Applications.
  7. ASTM F708 - Standard Practice for Design and Installation of Rigid Pipe Hangers.
- C. American Welding Society:
1. AWS A5.8 - Specification for Filler Metals for Brazing and Braze Welding.
  2. AWS D1.1 - Structural Welding Code - Steel.
- D. Manufacturers Standardization Society of the Valve and Fittings Industry:
1. MSS SP 67 - Butterfly Valves.
  2. MSS SP 69 - Pipe Hangers and Supports - Selection and Application.
  3. MSS SP 71 - Cast Iron Swing Check Valves, Flanged and Threaded Ends.
  4. MSS SP 110 - Ball Valves Threaded, Socket-Welding, Solder Joint, Grooved and Flared Ends.

### 1.3 SYSTEM DESCRIPTION

- A. Where more than one piping system material is specified, provide compatible system components and joints. Use non-conducting dielectric connections whenever jointing dissimilar metals in open systems.
- B. Provide flanges, union, and couplings at locations requiring servicing. Use unions, flanges, and couplings downstream of valves and at equipment or apparatus connections. Do not use direct welded or threaded connections to valves, equipment or other apparatus.
- C. Provide pipe hangers and supports in accordance with ASME B31.9, ASTM F708, MSS SP 58, MSS SP 69.
- D. Use ball or butterfly valves for shut-off and to isolate equipment, part of systems, or vertical risers.
- E. Use ball or butterfly valves for throttling, bypass, or manual flow control services.
- F. Use plug valves for throttling service. Use non-lubricated plug valves only when shut-off or isolating valves are also provided.
- G. Use 3/4 inch ball valves with cap for drains at main shut-off valves, low points of piping, bases of vertical risers, and at equipment. Pipe to nearest floor drain.

### 1.4 SUBMITTALS

- A. Product Data:
  1. Piping: Submit data on pipe materials, fittings, and accessories. Submit manufacturers catalog information.
  2. Valves: Submit manufacturers catalog information with valve data and ratings for each service.

### 1.5 CLOSEOUT SUBMITTALS

- A. Project Record Documents: Record actual locations of valves, equipment and accessories.



- B. Operation and Maintenance Data: Submit instructions for installation and changing components, spare parts lists, exploded assembly views.

## 1.6 QUALITY ASSURANCE

- A. Perform Work in accordance with ASME B31.9 code for installation of piping systems and ASME Section IX for welding materials and procedures.
- B. Perform Work in accordance with AWS D1.1 for welding hanger and support attachments to building structure.

## 1.7 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 systems from entry of foreign materials by temporary covers, completing sections of the Work, and isolating parts of completed system.

## 1.8 FIELD MEASUREMENTS

- A. Verify field measurements prior to fabrication.

## PART 2 PRODUCTS

### 2.1 HEATING WATER PIPING, ABOVE GROUND

- A. Steel Pipe: ASTM A53/A53M, Schedule 40, 0.375 inch wall for sizes 12 inch and larger, black.
  - 1. Fittings: ASME B16.3, malleable iron or ASTM A234/A234M, forged steel welding type.
  - 2. Joints: Threaded for pipe 2 inch and smaller; welded for pipe 2-1/2 inches and larger.
- B. Copper Tubing: ASTM B88, Type L, drawn.
  - 1. Fittings: ASME B16.18, cast brass, or ASME B16.22 solder wrought copper.
  - 2. Joints: Solder, lead free, ASTM B32, 95-5 tin-antimony, or tin and silver, with melting range 430 to 535 degrees F. Braze, AWS A5.8 BCuP silver/phosphorus/copper alloy with melting range 1190 to 1480 degrees F.

### 2.2 EQUIPMENT DRAINS AND OVERFLOWS

- A. Copper Tubing: ASTM B88, Type DWV, drawn.
  - 1. Fittings: ASME B16.18, cast brass, or ASME B16.22 solder wrought copper.
  - 2. Joints: Solder, lead free, ASTM B32, 95-5 tin-antimony, or tin and silver, with melting range 430 to 535 degrees F.

### 2.3 UNIONS AND FLANGES

- A. Unions for Pipe 2 inches and Smaller:
  - 1. Ferrous Piping: Class 150, malleable iron, threaded.

2. Copper Piping: Class 150, bronze unions with soldered or brazed joints.
3. Dielectric Connections: Union with galvanized or plated steel threaded end, copper solder end, water impervious isolation barrier.

B. Flanges for Pipe 2-1/2 inches and Larger:

1. Ferrous Piping: Class 150, forged steel, slip-on flanges.
2. Copper Piping: Class 150, slip-on bronze flanges.
3. PVC Piping: PVC flanges.
4. CPVC Piping: CPVC flanges.
5. Gaskets: 1/16 inch thick preformed neoprene gaskets.

C. PVC Pipe Materials: For connections to equipment and valves with threaded connections, furnish solvent-weld socket to screwed joint adapters and unions, or ASTM D2464, Schedule 80, threaded, PVC pipe.

## 2.4 BALL VALVES

- A. 4 inches and Smaller: MSS SP 110, Class 150, bronze, two piece body, chrome plated bronze ball, full port, teflon seats, blow-out proof stem, solder or threaded ends, lever handle.

## 2.5 BUTTERFLY VALVES

A. 2-1/2 inches and Larger: MSS SP 67, Class 150.

1. Body: Cast or ductile iron, wafer or lug ends, stainless steel stem, extended neck.
2. Disc: Nickel-plated ductile iron.
3. Seat: Resilient replaceable Buna N.
4. Handle and Operator: 10 position lever handle.

## 2.6 CHECK VALVES

A. Horizontal Swing Check Valves:

1. 2 inches and Smaller: MSS SP 80, Class 150, bronze body and cap, bronze seat, Buna-N disc, solder or threaded ends.
2. 2-1/2 inches and Larger: MSS SP 71, Class 125, cast iron body, bolted cap, bronze or cast iron disc, renewable disc seal and seat, flanged ends.

B. Spring Loaded Check Valves:

1. 2 inches and Smaller: MSS SP 80, Class 250, bronze body, in-line spring lift check, silent closing, Buna-N disc, integral seat, solder or threaded ends.
2. 2-1/2 inches and Larger: MSS SP 71, Class 125, wafer style, cast iron body, bronze seat, center guided bronze disc, stainless steel spring and screws, flanged ends.

## 2.7 PIPE HANGERS AND SUPPORTS

A. Conform to ASME 31.9, ASTM F708, MSS SP 69.

B. Hangers for Pipe Sizes 1/2 to 1-1/2 inch: Carbon steel, adjustable swivel, split ring.

C. Hangers for Cold Pipe Sizes 2-1/2 inches and Larger: Carbon steel, adjustable, clevis.

- D. Hangers for Hot Pipe Sizes 2 to 4 inches: Carbon steel, adjustable, clevis.
- E. Multiple or Trapeze Hangers: Steel channels with welded spacers and hanger rods.
- F. Multiple or Trapeze Hangers for Hot Pipe Sizes 6 inches and Larger: Steel channels with welded spacers and hanger rods, cast iron roll.
- G. Wall Support for Pipe Sizes 3 inches and Smaller: Cast iron hooks.
- H. Wall Support for Pipe Sizes 4 inches and Larger: Welded steel bracket and wrought steel clamp.
- I. Vertical Support: Steel riser clamp.
- J. Floor Support for Cold Pipe: Cast iron adjustable pipe saddle, lock nut, nipple, floor flange, and concrete pier or steel support.
- K. Floor Support for Hot Pipe 4 inches and Smaller: Cast iron adjustable pipe saddle, lock nut, nipple, floor flange, and concrete pier or steel support.
- L. Copper Pipe Support: Carbon steel rings, adjustable, copper plated.
- M. Hanger Rods: Mild steel threaded both ends, threaded one end, or continuous threaded.
- N. Inserts: Malleable iron case of galvanized steel shell and expander plug for threaded connection with lateral adjustment, top slot for reinforcing rods, lugs for attaching to forms; size inserts to suit threaded hanger rods.

## PART 3 EXECUTION

### 3.1 PREPARATION

- A. Ream pipe and tube ends. Remove burrs. Bevel plain end ferrous pipe.
- B. Remove scale and dirt on inside and outside before assembly.
- C. Prepare piping connections to equipment with flanges or unions.
- D. Keep open ends of pipe free from scale and dirt. Protect open ends with temporary plugs or caps.
- E. After completion, fill, clean, and treat systems. Refer to Section 23 25 00.

### 3.2 INSTALLATION - INSERTS

- A. Provide inserts for placement in concrete forms.
- B. Provide inserts for suspending hangers from reinforced concrete slabs and sides of reinforced concrete beams.
- C. Provide hooked rod to concrete reinforcement section for inserts carrying pipe 4 inches and larger.

- D. Where concrete slabs form finished ceiling, locate inserts flush with slab surface.
- E. Where inserts are omitted, drill through concrete slab from below and provide through-bolt with recessed square steel plate and nut above slab.

### 3.3 INSTALLATION - PIPE HANGERS AND SUPPORTS

- A. Install in accordance with ASME B31.9, ASTM F708, and MSS SP 89.
- B. Support horizontal piping as scheduled.
- C. Install hangers to provide minimum 1/2 inch space between finished covering and adjacent work.
- D. Place hangers within 12 inches of each horizontal elbow.
- E. Use hangers with 1-1/2 inch minimum vertical adjustment. Design hangers for pipe movement without disengagement of supported pipe.
- F. Support vertical piping at every other floor. Support riser piping independently of connected horizontal piping.
- G. Where installing several pipes in parallel and at same elevation, provide multiple pipe hangers or trapeze hangers.
- H. Provide copper plated hangers and supports for copper piping.
- I. Prime coat exposed steel hangers and supports. Hangers and supports located in crawl spaces, pipe shafts, and suspended ceiling spaces are not considered exposed.
- J. Provide clearance in hangers and from structure and other equipment for installation of insulation and access to valves and fittings.
- K. Install pipe hangers and supports in accordance with Section 23 05 29.

### 3.4 INSTALLATION - ABOVE GROUND PIPING SYSTEMS

- A. Install heating water piping in accordance with ASME B31.9.
- B. Route piping parallel to building structure and maintain gradient.
- C. Install piping to conserve building space, and not interfere with use of space.
- D. Group piping whenever practical at common elevations.
- E. Sleeve pipe passing through partitions, walls and floors. Refer to Section 23 05 29.
- F. Install pipe identification in accordance with Section 23 05 53.
- G. Install piping to allow for expansion and contraction without stressing pipe, joints, or connected equipment.

- H. Provide access where valves and fittings are not exposed.
- I. Slope hydronic piping and arrange systems to drain at low points. Use eccentric reducers to maintain top of pipe aligned.
- J. Where pipe support members are welded to structural building framing, scrape, brush clean, and apply one coat of zinc rich primer to welds.
- K. Prepare unfinished pipe, fittings, supports, and accessories, ready for finish painting.
- L. Install valves with stems upright or horizontal, not inverted.
- M. Insulate piping; refer to Section 23 07 00.

### 3.5 FIELD QUALITY CONTROL

- A. Test heating water piping system in accordance with ASME B31.9.

END OF SECTION



## Section 23 21 16

### Hydronic Piping Specialties

#### PART 1 GENERAL

##### 1.1 SUMMARY

###### A. Section Includes:

1. Pressure gages.
2. Pressure gage taps.
3. Thermometers.
4. Thermometer supports.
5. Test plugs.
6. Flexible connectors.
7. Air vents.
8. Strainers.
9. Combination pump discharge valves.
10. Flow controls.
11. Relief valves.

###### B. Related Sections:

1. Section 23 21 13 - Hydronic Piping: Execution requirements for piping connections to products specified by this section.
2. Section 23 21 23 - Hydronic Pumps: Execution requirements for piping connections to products specified by this section.

##### 1.2 REFERENCES

###### A. American Society of Mechanical Engineers:

1. ASME B40.1 - Gauges - Pressure Indicating Dial Type - Elastic Element.
2. ASME Section VIII - Boiler and Pressure Vessel Code - Pressure Vessels.

###### B. ASTM International:

1. ASTM E1 - Standard Specification for ASTM Thermometers.
2. ASTM E77 - Standard Test Method for Inspection and Verification of Thermometers.

##### 1.3 PERFORMANCE REQUIREMENTS

- ###### A. Flexible Connectors: Provide at or near pumps where piping configuration does not absorb vibration.

##### 1.4 SUBMITTALS

###### A. Product Data: Submit for manufactured products and assemblies used in this Project.

1. Manufacturer's data indicating use, operating range, total range, accuracy, and location for manufactured components.
2. Submit product description, model, dimensions, component sizes, rough-in requirements, service sizes, and finishes.
3. Submit schedule indicating manufacturer, model number, size, location, rated capacity, load served, and features for each piping specialty.

4. Submit electrical characteristics and connection requirements.

## 1.5 CLOSEOUT SUBMITTALS

- A. Project Record Documents: Record actual locations of actual locations of components and instrumentation, flow controls-
- B. Operation and Maintenance Data: Submit instructions for calibrating instruments, installation instructions, assembly views, servicing requirements, lubrication instruction, and replacement parts list.

## 1.6 DELIVERY, STORAGE, AND HANDLING

- A. Accept piping specialties on site in shipping containers with labeling in place. Inspect for damage.
- B. Provide temporary protective coating on cast iron and steel valves.
- C. Protect systems from entry of foreign materials by temporary covers, caps and closures, completing sections of the work, and isolating parts of completed system until installation.

## 1.7 ENVIRONMENTAL REQUIREMENTS

- A. Do not install instruments when areas are under construction, except rough in, taps, supports and test plugs.

## 1.8 FIELD MEASUREMENTS

- A. Verify field measurements before fabrication.

## PART 2 PRODUCTS

### 2.1 PRESSURE GAGES

- A. Gage: ASME B40.1, with bourdon tube, rotary brass movement, brass socket, front calibration adjustment, black scale on white background.
  1. Case: Stainless steel.
  2. Bourdon Tube: Brass.
  3. Dial Size: 3-1/2 inch diameter.
  4. Mid-Scale Accuracy: One percent.
  5. Scale: Psi.

### 2.2 PRESSURE GAGE TAPS

- A. Needle Valve: Steel, 1/4 inch NPT for minimum 300 psi.
- B. Ball Valve: Stainless Steel, 1/4 inch NPT for 250 psi.
- C. Pulsation Damper: Pressure snubber, brass with 1/4 inch NPT connections.
- D. Siphon: Steel, Schedule 40, 1/4 inch NPT angle or straight pattern.



## 2.3 STEM TYPE THERMOMETERS

- A. Thermometer: ASTM E1, red appearing mercury, lens front tube, cast aluminum case with enamel finish.
  - 1. Size: 7-inch scale.
  - 2. Window: Clear glass.
  - 3. Stem: Brass, 3/4 inch NPT, 3-1/2 inch long.
  - 4. Accuracy: 2 percent.
  - 5. Calibration: Degrees F.

## 2.4 THERMOMETER SUPPORTS

- A. Socket: Brass separable sockets for thermometer stems with or without extensions, and with cap and chain.
- B. Flange: 3 inch outside diameter reversible flange, designed to fasten to sheet metal air ducts, with brass perforated stem.

## 2.5 TEST PLUGS

- A. 1/4 inch NPT or 1/2 inch NPT stainless steel fitting and cap for receiving 1/8 inch outside diameter pressure or temperature probe with:
  - 1. Neoprene core for temperatures up to 200 degrees F.
  - 2. Nordel core for temperatures up to 350 degrees F.
  - 3. Viton core for temperatures up to 400 degrees F.

## 2.6 FLEXIBLE CONNECTORS

- A. Corrugated stainless steel hose with single layer of stainless steel exterior braiding, minimum 9 inches long with copper tube ends; for maximum working pressure 300 psig.

## 2.7 AIR VENTS

- A. Manual Type: Short vertical sections of 2 inch diameter pipe to form air chamber, with 1/8 inch brass needle valve at top of chamber.
- B. Float Type:
  - 1. Brass or semi-steel body, copper, polypropylene, or solid non-metallic float, stainless steel valve and valve seat; suitable for system operating temperature and pressure; with isolating valve.
- C. Washer Type:
  - 1. Brass with hydroscopic fiber discs, vent ports, adjustable cap for manual shut-off, and integral spring loaded ball check valve.

## 2.8 STRAINERS

- A. Size 2 inch and Smaller:
  - 1. Screwed brass or iron body for 175 psig working pressure, Y pattern with 1/32 inch stainless steel perforated screen.
- B. Size 2-1/2 inch to 4 inch:

1. Flanged iron body for 175 psig working pressure, Y pattern with 3/64 inch stainless steel perforated screen.
- C. Size 5 inch and Larger:
  1. Flanged iron body for 175 psig working pressure, basket pattern with 1/8 inch stainless steel perforated screen.

## 2.9 FLOW CONTROLS

- A. Construction: Brass or bronze body with union on inlet and outlet, temperature and pressure test plug on inlet and outlet combination blow-down and back-flush drain.
- B. Calibration: Control within 5 percent of design flow over entire operating pressure.
- C. Control Mechanism: Stainless steel or nickel plated brass piston or regulator cup, operating against stainless steel helical or wave formed spring.
- D. Accessories: In-line strainer on inlet and ball valve on outlet.

## PART 3 EXECUTION

### 3.1 INSTALLATION - THERMOMETERS AND GAGES

- A. Install one pressure gage for each pump, locate taps before strainers and on suction and discharge of pump; pipe to gage.
- B. Install gage taps in piping
- C. Install pressure gages with pulsation dampers. Provide needle valve or ball valve to isolate each gage. Extend nipples to allow clearance from insulation.
- D. Install thermometers in piping systems in sockets in short couplings. Enlarge pipes smaller than 2-1/2 inches for installation of thermometer sockets. Allow clearance from insulation.
- E. Install thermometer sockets adjacent to controls systems thermostat, transmitter, or sensor sockets.
- F. Coil and conceal excess capillary on remote element instruments.
- G. Provide instruments with scale ranges selected according to service with largest appropriate scale.
- H. Install gages and thermometers in locations where they are easily read from normal operating level. Install vertical to 45 degrees off vertical.
- I. Adjust gages and thermometers to final angle, clean windows and lenses, and calibrate to zero.

### 3.2 INSTALLATION - HYDRONIC PIPING SPECIALTIES

- A. Locate test plugs adjacent to thermometers and thermometer sockets.
- B. Where large air quantities accumulate, provide enlarged air collection standpipes.

- C. Install manual air vents at system high points.
- D. For automatic air vents in ceiling spaces or other concealed locations, install vent tubing to nearest drain.

### 3.3 PROTECTION OF INSTALLED CONSTRUCTION

- A. Do not install hydronic pressure gauges until after systems are pressure tested.

END OF SECTION



## Section 23 25 00

### HVAC Water Treatment

#### PART 1 GENERAL

##### 1.1 SUMMARY

- A. Section Includes:
  - 1. System cleaner.
  - 2. Closed system treatment (water).
  - 3. Chemical feeder equipment including associated feeders, pumps, tanks, controls, meters and valves.
  - 4. Test equipment.

##### 1.2 REFERENCES

- A. National Electrical Manufacturers Association:
  - 1. NEMA 250 - Enclosures for Electrical Equipment (1000 Volts Maximum).

##### 1.3 SUBMITTALS

- A. Shop Drawings: Indicate system schematic, equipment locations, and controls schematics, electrical characteristics and connection requirements.
- B. Product Data: Submit chemical treatment materials, chemicals, and equipment including electrical characteristics and connection requirements.
- C. Manufacturer's Installation Instructions: Submit placement of equipment in systems, piping configuration, and connection requirements.
- D. Manufacturers Field Reports: Indicate start-up of treatment systems when completed and operating properly. Indicate analysis of system water after cleaning and after treatment.

##### 1.4 CLOSEOUT SUBMITTALS

- A. Project Record Documents: Record actual locations of equipment and piping, including sampling points and location of chemical injectors.
- B. Operation and Maintenance Data: Submit data on chemical feed pumps, agitators, and other equipment including spare parts lists, procedures, and treatment programs. Include step by step instructions on test procedures including target concentrations.

##### 1.5 FIELD MEASUREMENTS

- A. Verify field measurements prior to fabrication.

## PART 2 PRODUCTS

### 2.1 SYSTEM CLEANER

- A. Product Description: Liquid alkaline compound with emulsifying agents and detergents to remove grease and petroleum products; sodium tri-Poly phosphate and sodium molybdate.
- B. Biocide; chlorine release agents including sodium hypochlorite or calcium hypochlorite, or microbiocides including quaternary ammonia compounds, tributyl tin oxide, methylene bis (thiocyanate), or isothiazolones.

### 2.2 TEST EQUIPMENT

- A. Furnish white enamel test cabinet with local and fluorescent light, capable of accommodating 4 - 10 ml zeroing titration burettes and associated reagents.
- B. Furnish following test kits:
  - 1. Alkalinity titration test kit.
  - 2. Chloride titration test kit.
  - 3. Sulphite titration test kit.
  - 4. Total hardness titration test kit.
  - 5. Low phosphate test kit.
  - 6. Conductivity bridge, range 0 - 10,000 micro-ohms.
  - 7. Creosol red pH slide, complete with reagent.
  - 8. Portable electronic conductivity meter.
  - 9. High nitrite test kit.

## PART 3 EXECUTION

### 3.1 PREPARATION

- A. Operate, fill, start and vent systems prior to cleaning. Use water meter to record capacity in each system. Place terminal control valves in open position during cleaning.

### 3.2 CLEANING

- A. Concentration:
  - 1. As recommended by manufacturer.
  - 2. One pound per 100 gallons of water contained in the system.
  - 3. One pound per 100 gallons of water for hot systems and one pound per 50 gallons of water for cold systems.
- B. Hot Water Heating Systems:
  - 1. Apply heat while circulating, slowly raising temperature to 160 degrees F and maintain for 12 hours minimum.
  - 2. Remove heat and circulate to 100 degrees F or less; drain systems as quickly as possible and refill with clean water.
  - 3. Circulate for 6 hours at design temperatures, then drain.
  - 4. Refill with clean water and repeat until system cleaner is removed.

- C. Use neutralizer agents on recommendation of system cleaner supplier and acceptance of Architect/Engineer.
- D. Remove, clean, and replace strainer screens.
- E. Inspect, remove sludge, and flush low points with clean water after cleaning process is completed. Include disassembly of components as required.

### 3.3 CLOSED SYSTEM TREATMENT

- A. Introduce closed system treatment through bypass feeder when required or indicated by test.

END OF SECTION





## Section 23 31 00

### HVAC Ducts and Casings

#### PART 1 GENERAL

##### 1.1 SUMMARY

- A. Section Includes:
  - 1. Duct Materials.
  - 2. Insulated flexible ducts.
  - 3. Single wall spiral round ducts.
  - 4. Double wall spiral insulated round ducts.
  - 5. Double wall spiral insulated flat oval ducts.
  - 6. Ductwork fabrication.
  
- B. Related Sections:
  - 1. Section 23 05 29 - Hangers and Supports for HVAC Piping and Equipment: Product requirements for hangers, supports and sleeves for placement by this section.
  - 2. Section 23 33 00 - Air Duct Accessories: Product requirements for duct accessories for placement by this section.

##### 1.2 REFERENCES

- A. ASTM International:
  - 1. ASTM A36/A36M - Standard Specification for Carbon Structural Steel.
  - 2. ASTM A90/A90M - Standard Test Method for Weight Mass of Coating on Iron and Steel Articles with Zinc or Zinc-Alloy Coatings.
  - 3. ASTM A240/A240M - Standard Specification for Chromium and Chromium-Nickel Stainless Steel Plate, Sheet, and Strip for Pressure Vessels and for General Applications.
  - 4. ASTM A666 - Standard Specification for Annealed or Cold-Worked Austenitic Stainless Steel Sheet, Strip, Plate, and Flat Bar.
  - 5. ASTM A568/A568M - Standard Specification for Steel, Sheet, Carbon, and High-Strength, Low-Alloy, Hot-Rolled and Cold-Rolled, General Requirements for.
  - 6. ASTM A653/A653M - Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process.
  - 7. ASTM A1008/A1008M - Standard Specification for Steel, Sheet, Cold-Rolled, Carbon, Structural, High-Strength Low-Alloy and High-Strength Low-Alloy with Improved Formability.
  - 8. A1011/A1011M-07 Standard Specification for Steel, Sheet and Strip, Hot-Rolled, Carbon, Structural, High-Strength Low-Alloy, High-Strength Low-Alloy with Improved Formability, and Ultra-High Strength
  - 9. ASTM B209 - Standard Specification for Aluminum and Aluminum-Alloy Sheet and Plate.
  - 10. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials.
  
- B. National Fire Protection Association:
  - 1. NFPA 90A - Standard for the Installation of Air Conditioning and Ventilating Systems.

2. NFPA 90B - Standard for the Installation of Warm Air Heating and Air Conditioning Systems.

C. Sheet Metal and Air Conditioning Contractors:

1. SMACNA - Fibrous Glass Duct Construction Standards.
2. SMACNA - HVAC Air Duct Leakage Test Manual.
3. SMACNA - HVAC Duct Construction Standard - Metal and Flexible.

D. Underwriters Laboratories Inc.:

1. UL 181 - Factory-Made Air Ducts and Connectors.

### 1.3 PERFORMANCE REQUIREMENTS

A. Variation of duct configuration or sizes other than those of equivalent or lower loss coefficient is not permitted except by written permission. Size round ducts installed in place of rectangular ducts in accordance with ASHRAE table of equivalent rectangular and round ducts.

### 1.4 SUBMITTALS

A. Product Data: Submit data for duct materials.

### 1.5 CLOSEOUT SUBMITTALS

A. Project Record Documents: Record actual locations of ducts and duct fittings. Record changes in fitting location and type. Show additional fittings used.

### 1.6 QUALITY ASSURANCE

A. Perform Work in accordance with SMACNA - HVAC Duct Construction Standards - Metal and flexible.

B. Construct ductwork to NFPA 90A and NFPA 96 standards.

### 1.7 ENVIRONMENTAL REQUIREMENTS

A. Do not install duct sealant when temperatures are less than those recommended by sealant manufacturers.

B. Maintain temperatures during and after installation of duct sealant.

### 1.8 FIELD MEASUREMENTS

A. Verify field measurements prior to fabrication.

## PART 2 PRODUCTS

### 2.1 DUCT MATERIALS

- A. Galvanized Steel Ducts: ASTM A653/A653M galvanized steel sheet, lock-forming quality, having G60 zinc coating of in conformance with ASTM A90/A90M.
- B. Steel Ducts: ASTM A1008/A1008M /A1011/A1011M/A568/A568M.
- C. Stainless Steel Ducts: ASTM A240/A240M or ASTM A666, Type 316.
- D. Fasteners: Rivets, bolts, or sheet metal screws.
- E. Hanger Rod: ASTM A36/A36M; steel, galvanized; threaded both ends, threaded one end, or continuously threaded.

### 2.2 INSULATED FLEXIBLE DUCTS

- A. Product Description: Black polymer film supported by helical-wound spring steel wire; fiberglass insulation; aluminized vapor barrier film.
  - 1. Pressure Rating: 4 inches wg positive and 0.5 inches wg negative.
  - 2. Maximum Velocity: 4000 fpm.
  - 3. Temperature Range: -20 degrees F to 175 degrees F.
  - 4. Thermal Resistance: 4.2 square feet-hour-degree F per BTU.

### 2.3 SINGLE WALL SPIRAL ROUND DUCTS

- A. Product Description: UL 181, Class 1, round spiral lockseam duct constructed of galvanized steel.
- B. Construct duct with the following minimum gages:

Diameter	Gauge
3 inches to 14 inches	26

- C. Construct fittings with the following minimum gages:

Diameter	Gauge
3 inches to 14 inches	24

### 2.4 DOUBLE WALL SPIRAL INSULATED ROUND DUCTS

- A. Product Description: Machine made from round spiral lockseam duct with light reinforcing corrugations, galvanized steel outer wall, 2 inch thick glass fiber insulation, solid galvanized steel inner wall; fittings manufactured with solid inner wall.
- B. Construct round duct with the following minimum gages:

Diameter	Gauge
3 inches to 14 inches	26
15 inches to 26 inches	24
28 inches to 36 inches	22
38 inches to 50 inches	20
52 inches to 84 inches	18

- C. Construct round fittings with the following minimum gages:

Diameter	Gauge
3 inches to 14 inches	24
15 inches to 26 inches	22
28 inches to 36 inches	20
38 inches to 50 inches	20
52 inches to 60 inches	18
62 inches to 84 inches	16

## 2.5 DOUBLE WALL SPIRAL INSULATED FLAT OVAL DUCTS

- A. Product Description: Machine made from round spiral lockseam duct with light reinforcing corrugations, galvanized steel outer wall, 2 inch thick glass fiber insulation, solid galvanized steel inner wall; fittings manufactured with solid inner wall.
- B. Construct flat oval duct with the following minimum gauges:

Major Axis Dimension	Gauge
7 inches to 24 inches	24
25 inches to 48 inches	22
50 inches to 70 inches	20
72 inches to 82 inches	18
84 inches and larger	16

- C. Construct flat oval fittings with the following minimum gauges:

Major Axis Fitting Dimension	Gauge
7 inches to 36 inches	20
37 inches to 60 inches	18
62 inches and larger	16

## 2.6 DUCTWORK FABRICATION

- A. Fabricate and support rectangular ducts in accordance with SMACNA HVAC Duct Construction Standards - Metal and Flexible and as indicated on Drawings. Provide duct material, gages, reinforcing, and sealing for operating pressures indicated.
- B. Fabricate and support round ducts with longitudinal seams in accordance with SMACNA HVAC Duct Construction Standards - Metal and Flexible (Round Duct Construction Standards), and as indicated on Drawings. Provide duct material, gages, reinforcing, and sealing for operating pressures indicated.
- C. Construct T's, bends, and elbows with minimum radius 1-1/2 times centerline duct width. Where not possible and where rectangular elbows are used, provide airfoil turning vanes. Where acoustical lining is indicated, furnish turning vanes of perforated metal with glass fiber insulation.
- D. Increase duct sizes gradually, not exceeding 15 degrees divergence wherever possible; maximum 30 degrees divergence upstream of equipment and 45 degrees convergence downstream.
- E. Fabricate continuously welded round and oval duct fittings two gages heavier than duct gages indicated in SMACNA Standard. Minimum 4 inch cemented slip joint, brazed or electric welded. Prime coat welded joints.
- F. Provide standard 45-degree lateral wye takeoffs. When space does not allow 45-degree lateral wye takeoff, use 90-degree conical tee connections.
- G. Seal joints between duct sections and duct seams with welds, gaskets, mastic adhesives, mastic plus embedded fabric systems, or tape.
  - 1. Sealants, Mastics and Tapes: Conform to UL 181A. Provide products bearing appropriate UL 181A markings.
  - 2. Do not provide sealing products not bearing UL approval markings.

## PART 3 EXECUTION

### 3.1 EXAMINATION

- A. Verify sizes of equipment connections before fabricating transitions.

### 3.2 INSTALLATION

- A. Install and seal ducts in accordance with SMACNA HVAC Duct Construction Standards - Metal and Flexible.
- B. Install glass fiber ducts in accordance with SMACNA Fibrous Glass Duct Construction Standards. Obtain manufacturer's inspection and acceptance of fabrication and installation at beginning of installation.

- C. During construction, install temporary closures of metal or taped polyethylene on open ductwork to prevent construction dust from entering ductwork system.
- D. Use crimp joints with or without bead or beaded sleeve couplings for joining round duct sizes 8 inch and smaller.
- E. Install duct hangers and supports in accordance with Section 23 05 29.
- F. Use double nuts and lock washers on threaded rod supports.
- G. Connect flexible ducts to metal ducts with draw bands.
- H. Exhaust Outlet Locations:
  1. Minimum Distance from Property Lines: 3 feet.
  2. Minimum Distance from Building Openings: 3 feet.
  3. Minimum Distance from Outside Air Intakes: 10 feet.

### 3.3 INTERFACE WITH OTHER PRODUCTS

- A. Install openings in ductwork where required to accommodate thermometers and controllers. Install pitot tube openings for testing of systems. Install pitot tube complete with metal can with spring device or screw to prevent air leakage. Where openings are provided in insulated ductwork, install insulation material inside metal ring.
- B. Connect diffusers or light troffer boots to low pressure ducts directly or with 5 feet maximum length of flexible duct held in place with strap or clamp.
- C. Connect air outlets and inlets to supply ducts directly or with five foot maximum length of flexible duct. Do not use flexible duct to change direction.

### 3.4 SCHEDULES

- A. Ductwork Material Schedule:

AIR SYSTEM	MATERIAL
Supply	Steel or Fabric (as indicated)
Return and Relief	Steel

- B. Ductwork Pressure Class Schedule:

AIR SYSTEM	PRESSURE CLASS
Supply	1 inch wg regardless of velocity.
Return and Relief	1 inch wg regardless of velocity.

END OF SECTION

Section 23 33 00

Air Duct Accessories

PART 1 GENERAL

1.1 SUMMARY

- A. Section Includes:
  - 1. Back-draft dampers.
  - 2. Duct access doors.
  - 3. Volume control dampers.
  - 4. Flexible duct connections.
  
- B. Related Sections:
  - 1. Section 23 31 00 - HVAC Ducts and Casings: Requirements for duct construction and pressure classifications.

1.2 REFERENCES

- A. Air Movement and Control Association International, Inc.:
  - 1. AMCA 500 - Test Methods for Louvers, Dampers, and Shutters.
  
- B. National Fire Protection Association:
  - 1. NFPA 90A - Standard for the Installation of Air Conditioning and Ventilating Systems.
  
- C. Sheet Metal and Air Conditioning Contractors:
  - 1. SMACNA - HVAC Duct Construction Standard - Metal and Flexible.
  
- D. Underwriters Laboratories Inc.:
  - 1. UL 555 - Standard for Safety for Fire Dampers.

1.3 SUBMITTALS

- A. Product Data: Submit for the following. Include where applicable electrical characteristics and connection requirements.
  - 1. Fire dampers including locations and ratings.
  - 2. Flexible duct connections.
  - 3. Volume control dampers.
  
- B. Product Data: For fire dampers submit the following:
  - 1. Include UL ratings, dynamic ratings, leakage, pressure drop and maximum pressure data.
  - 2. Indicate materials, construction, dimensions, and installation details.
  - 3. Damper pressure drop ratings based on tests and procedures performed in accordance with AMCA 500.
  
- C. Manufacturer's Installation Instructions: Submit for Fire and Combination Smoke and Fire Dampers.

#### 1.4 CLOSEOUT SUBMITTALS

- A. Operation and Maintenance Data: Submit for Fire Dampers.

#### 1.5 QUALITY ASSURANCE

- A. Dampers tested, rated and labeled in accordance with the latest UL requirements.
- B. Damper pressure drop ratings based on tests and procedures performed in accordance with AMCA 500.

#### 1.6 DELIVERY, STORAGE, AND HANDLING

- A. Protect dampers from damage to operating linkages and blades.
- B. Delivery: Deliver materials to site in manufacturer's original, unopened containers and packaging, with labels clearly indicating manufacturer and material.
- C. Storage: Store materials in a dry area indoor, protected from damage.
- D. Handling: Handle and lift dampers in accordance with manufacturer's instructions. Protect materials and finishes during handling and installation to prevent damage.

#### 1.7 FIELD MEASUREMENTS

- A. Verify field measurements prior to fabrication.

### PART 2 PRODUCTS

#### 2.1 BACK-DRAFT DAMPERS

- A. Product Description: Multi-Blade, back-draft dampers: Parallel-action, gravity-balanced, Galvanized 16 gage thick steel or extruded aluminum. Blades, maximum 6 inch width, center pivoted, with felt or flexible vinyl sealed edges. Blades linked together in rattle-free manner with 90-degree stop, steel ball bearings, and plated steel pivot pin. Furnish dampers with adjustment device to permit setting for varying differential static pressure.

#### 2.2 DUCT ACCESS DOORS

- A. Fabricate in accordance with SMACNA HVAC Duct Construction Standards - Metal and Flexible.
- B. Fabrication: Rigid and close fitting of galvanized steel with sealing gaskets and quick fastening locking devices. For insulated ductwork, furnish minimum 1 inch thick insulation with sheet metal cover.
  - 1. Less than 12 inches square, secure with sash locks.
  - 2. Up to 18 inches Square: Furnish two hinges and two sash locks.
  - 3. Up to 24 x 48 inches: Three hinges and two compression latches.



4. Larger Sizes: Furnish additional hinge.
5. Access panels with sheet metal screw fasteners are not acceptable.

### 2.3 VOLUME CONTROL DAMPERS

- A. Fabricate in accordance with SMACNA HVAC Duct Construction Standards - Metal and Flexible.
- B. Multi-Blade Damper: Fabricate of opposed blade pattern with maximum blade sizes 8 x 72 inch. Assemble center and edge crimped blades in prime coated or galvanized frame channel with suitable hardware.
- C. End Bearings: Except in round ductwork 12 inches and smaller, furnish end bearings. On multiple blade dampers, furnish oil-impregnated nylon or sintered bronze bearings. Furnish closed end bearings on ducts having pressure classification over 2 inches wg.
- D. Quadrants:
  1. Furnish locking, indicating quadrant regulators on single and multi-blade dampers.
  2. On insulated ducts mount quadrant regulators on standoff mounting brackets, bases, or adapters.
  3. Where rod lengths exceed 30 inches furnish regulator at both ends.

### 2.4 FLEXIBLE DUCT CONNECTIONS

- A. Fabricate in accordance with SMACNA HVAC Duct Construction Standards - Metal and Flexible.
- B. Connector: Fabric crimped into metal edging strip.
  1. Fabric: UL listed fire-retardant neoprene coated woven glass fiber fabric conforming to NFPA 90A, minimum density 30 oz per sq yd.
  2. Net Fabric Width: Approximately 2 inches wide.
  3. Metal: 3 inch wide, 24 gage galvanized steel.
- C. Leaded Vinyl Sheet: Minimum 0.55 inch thick, 0.87 lbs. per sq ft, 10 dB attenuation in 10 to 10,000 Hz range.

## PART 3 EXECUTION

### 3.1 EXAMINATION

- A. Verify ducts and equipment installation are ready for accessories.
- B. Check location of air outlets and inlets and make necessary adjustments in position to conform to architectural features, symmetry, and lighting arrangement.

### 3.2 INSTALLATION.

- A. Install in accordance with NFPA 90A, and follow SMACNA HVAC Duct Construction Standards - Metal and Flexible. Refer to Section 23 31 00 for duct construction and pressure class.
- B. Install back-draft dampers on exhaust fans or exhaust ducts nearest to outside and where indicated on Drawings.
- C. Access Doors: Install access doors at the following locations and as indicated on Drawings:
  - 1. Spaced every 50 feet of straight duct.
  - 2. Upstream of each elbow.
  - 3. Before and after each balancing damper.
- D. Access Door Sizes: Install minimum 8 x 8 inch size for hand access, 18 x 18 inch size for shoulder access, and as indicated on Drawings. Install 4 x 4 inch for balancing dampers only. Review locations prior to fabrication.

END OF SECTION

## Section 23 37 00

### Air Outlets and Inlets

#### PART 1 GENERAL

##### 1.1 SUMMARY

- A. Section Includes:
  - 1. Diffusers.
  - 2. Registers
  - 3. Grilles.
- B. Related Sections:
  - 1. Section 23 33 00 - Air Duct Accessories: Volume dampers for inlets and outlets.

##### 1.2 REFERENCES

- A. Air Movement and Control Association International, Inc.:
  - 1. AMCA 500 - Test Methods for Louvers, Dampers, and Shutters.
- B. American Society of Heating, Refrigerating and Air-Conditioning Engineers:
  - 1. ASHRAE 70 - Method of Testing for Rating the Performance of Air Outlets and Inlets.
- C. Sheet Metal and Air Conditioning Contractors:
  - 1. SMACNA - HVAC Duct Construction Standard - Metal and Flexible.

##### 1.3 SUBMITTALS

- A. Product Data: Submit sizes, finish, and type of mounting. Submit schedule of outlets and inlets showing type, size, location, application, and noise level.

##### 1.4 CLOSEOUT SUBMITTALS

- A. Project Record Documents: Record actual locations of air outlets and inlets.

##### 1.5 QUALITY ASSURANCE

- A. Test and rate diffuser, register, and grille performance in accordance with ASHRAE 70.

#### PART 2 PRODUCTS

##### 2.1 RECTANGULAR CEILING DIFFUSERS

- A. Manufacturers:
  - 1. Krueger.
  - 2. Titus.

3. Price.

- B. Type: Square, stamped, multi-louvered diffuser to discharge air in four-way pattern.
- C. Frame: As scheduled and per plans.
- D. Fabrication: Steel with baked enamel off-white finish.
- E. Accessories: Radial opposed-blade/Butterfly damper and multi-louvered equalizing grid with damper adjustable from diffuser face.

2.2 DUCT MOUNTED SUPPLY GRILLES

- A. Manufacturers:
  - 1. Price.
  - 2. Krueger.
  - 3. Titus.
- B. Type: Streamlined and individually adjustable blades, 3/4 inch minimum depth, 3/4 inch maximum spacing with spring or other device to set blades, vertical face, double deflection.
- C. Fabrication: Steel with 20 gage minimum frames and 22 gage minimum blades, steel and aluminum with 20 gage minimum frame, or aluminum extrusions, with factory off-white enamel finish.
- D. Damper: Include damper/air extractor on supply grilles.

2.3 CEILING RETURN REGISTERS/GRILLES

- A. Manufacturers:
  - 1. Krueger.
  - 2. Titus.
  - 3. Price.
- B. Type: Streamlined blades, 3/4 inch minimum depth, 3/4 inch maximum spacing, with blades set at 45 degrees, horizontal face.
- C. Frame: 1 inch margin with concealed mounting.
- D. Fabrication: Steel with 20 gage minimum frames and 22 gage minimum blades, steel and aluminum with 20 gage minimum frame, or aluminum extrusions, with factory off-white enamel finish.
- E. Damper: Integral, gang-operated, opposed blade type with removable key operator, operable from face where not individually connected to exhaust fans.
- F. Gymnasiums: Furnish front pivoted or welded in place blades, securely fastened to be immobile.

## 2.4 WALL SUPPLY REGISTERS/GRILLES

- A. Manufacturers:
  - 1. Krueger.
  - 2. Titus.
  - 3. Price.
- B. Type: Streamlined and individually adjustable blades, 3/4 inch minimum depth, 3/4 inch maximum spacing with spring or other device to set blades, vertical face, double deflection.
- C. Frame: 1 inch margin with concealed mounting and gasket.
- D. Fabrication: Steel with 20 gage minimum frames and 22 gage minimum blades, steel and aluminum with 20 gage minimum frame, or aluminum extrusions, with factory off-white enamel finish.
- E. Damper: Integral, gang-operated opposed blade type with removable key operator, operable from face.

## PART 3 EXECUTION

### 3.1 EXAMINATION

- A. Verify inlet and outlet locations.
- B. Verify ceiling/wall systems are ready for installation.

### 3.2 INSTALLATION

- A. Install diffusers to ductwork with airtight connection.
- B. Install balancing dampers on duct take-off to diffusers, grilles, and registers, whether or not dampers are furnished as part of diffuser, grille, and register assembly. Refer to Section 23 33 00.
- C. Paint visible portion of ductwork behind air outlets and inlets matte black.
- D. Do not locate air registers, diffusers or grilles in floors of toilet or bathing rooms.

### 3.3 INTERFACE WITH OTHER PRODUCTS

- A. Check location of outlets and inlets and make necessary adjustments in position to conform to architectural features, symmetry, and lighting arrangement.

END OF SECTION



## Section 23 81 03

### Packaged Rooftop Air Conditioning Units – Small Capacity

#### PART 1 GENERAL

##### 1.1 SUMMARY

- A. Section Includes:
  - 1. Packaged rooftop air conditioning unit.
- B. Related Sections:
  - 1. Section 23 05 48 - Vibration and Seismic Controls for HVAC Piping and Equipment: Vibration isolators.
  - 2. Section 23 33 00 - Air Duct Accessories: Flexible connections.

##### 1.2 REFERENCES

- A. Air-Conditioning and Refrigeration Institute:
  - 1. ARI 210/240 - Unitary Air-Conditioning and Air-Source Heat Pump Equipment.
  - 2. ARI 270 - Sound Rating of Outdoor Unitary Equipment.
  - 3. ARI 340/360 - Commercial and Industrial Unitary Air-Conditioning and Heat Pump Equipment.
- B. Air Movement and Control Association International, Inc.:
  - 1. AMCA 500 - Test Methods for Louvers, Dampers, and Shutters.
- C. American Society of Heating, Refrigerating and Air-Conditioning Engineers:
  - 1. ASHRAE 52.1 - Gravimetric and Dust-Spot Procedures for Testing Air-Cleaning Devices Used in General Ventilation for Removing Particulate Matter.
  - 2. ASHRAE 62 - Ventilation for Acceptable Indoor Air Quality.
  - 3. ASHRAE 90.1 - Energy Standard for Buildings Except Low-Rise Residential Buildings.
- D. ASTM International:
  - 1. ASTM B117 - Standard Practice for Operating Salt Spray (Fog) Apparatus.
- E. National Fire Protection Association:
  - 1. NFPA 54 - National Fuel Gas Code.
  - 2. NFPA 90A - Standard for the Installation of Air Conditioning and Ventilating Systems.

##### 1.3 DEFINITIONS

- A. Energy Efficiency Ratio (EER) - Ratio of net cooling capacity in Btuh to total rate of electric input in watts under designated operating conditions.

- B. Seasonal Energy Efficiency Ratio (SEER) - Total cooling output of an air conditioner during its normal annual usage period for cooling (in Btu) divided by total electric energy input during the same period (in Wh).

#### 1.4 SUBMITTALS

- A. Section 01 33 00 - Submittal Procedures: Submittal procedures.
- B. Product Data: Submit data indicating:
  - 1. Cooling and heating capacities.
  - 2. Dimensions.
  - 3. Weights.
  - 4. Rough-in connections and connection requirements.
  - 5. Duct connections.
  - 6. Electrical requirements with electrical characteristics and connection requirements.
  - 7. Controls.
  - 8. Accessories.
- C. Manufacturer's Installation Instructions: Submit assembly, support details, connection requirements, and include start-up instructions.

#### 1.5 CLOSEOUT SUBMITTALS

- A. Project Record Documents: Record actual locations of controls installed remotely from units.
- B. Operation and Maintenance Data: Submit manufacturer's descriptive literature, operating instructions, installation instructions, and maintenance and repair data.

#### 1.6 QUALITY ASSURANCE

- A. Cooling Capacity: Rate in accordance with ARI 210/240.
- B. Sound Rating: Measure in accordance with ARI 270.
- C. Insulation and adhesives: Meet requirements of NFPA 90A.
- D. Performance Requirements: Conform to minimum EER/SEER prescribed by ASHRAE 90.1 when tested in accordance with ARI 210/240.
- E. Outside Air Damper Leakage: Test in accordance with AMCA 500.

#### 1.7 DELIVERY, STORAGE, AND HANDLING

- A. Accept units on site. Inspect for damage.
- B. Protect units from damage by storing off roof until roof mounting curbs are in place.



## 1.8 COORDINATION

- A. Coordinate installation of roof curbs with roof structure, roof deck and roof membrane installation.

## 1.9 WARRANTY

- A. Furnish five year manufacturers warranty for compressors.
- B. Furnish ten year manufacturers warranty for heat exchangers.

## 1.10 MAINTENANCE SERVICE

- A. Furnish service and maintenance of equipment for one year from Date of Substantial Completion. Include maintenance items as shown in manufacturer's operating and maintenance data, including filter replacements, fan belt replacement, and controls checkout and adjustments.

## PART 2 PRODUCTS

### 2.1 ROOFTOP AIR CONDITIONING UNITS

- A. Manufacturers:
  - 1. The Trane Company.
  - 2. As approved prior to bidding – minimum of 10 days prior to bid date.
- B. Product Description: Self-contained, packaged, factory assembled and wired, consisting of cabinet, supply fan, refrigerant cooling coil, compressor, refrigeration circuit, condenser, gas-fired heating section, air filters, mixed air casing, controls, and accessories.
- C. Configuration: As indicated on Drawings.
- D. Roof Mounting Curb: Refer to Section 23 05 48.
- E. Cabinet:
  - 1. Designed for outdoor installation with weatherproof construction.
  - 2. Panels: Constructed of steel/galvanized steel with baked enamel finish meeting salt spray test in accordance with ASTM B117. Furnish access doors or removable access panels.
  - 3. Insulation: Factory applied to exposed vertical and horizontal panels. One inch thick neoprene coated/aluminum foil faced glass fiber with edges protected from erosion.
- F. Supply Fan: Forward curved centrifugal type, resiliently mounted with direct drive/V-belt drive, high efficiency motor. Motor permanently lubricated with built-in thermal overload protection.
- G. Evaporator Coil: Constructed of copper tubes expanded onto aluminum fins. Galvanized drain pan with piping connection. Factory leak tested under water.

- H. Compressor: Hermetically sealed, resiliently mounted with positive lubrication, and internal motor overload protection. Furnish internal vibration isolators, external vibration isolators, short cycle protection.
- I. Refrigeration circuit: Furnish the following for each circuit: thermal expansion valve, filter-drier, suction, discharge, and liquid line service valves with gauge ports, high and low pressure safety controls. Dehydrate and factory charge each circuit with oil and refrigerant.
- J. Condenser:
  - 1. Coil: Copper tube aluminum fin coil assembly with subcooling rows and coil guard. Factory leak tested under water.
  - 2. Condenser Fan: Direct drive propeller fans statically and dynamically balanced. Wired to operate with compressor. Motor permanently lubricated with built-in thermal overload protection. Furnish high efficiency fan motors.
- K. Air Filters: 2 inch thick glass fiber disposable media in metal frames. 25 to 30 percent efficiency based on ASHRAE 52.1.
- L. Mixed Air Casing:
  - 1. Economizer: Factory installed fully modulating motorized outside air and return air dampers controlled by differential enthalpy controller with minimum position setting. Outside air damper normally closed and return air damper normally open. Furnish barometric relief damper capable of closing by gravity/Furnish barometric relief damper with powered exhaust. Furnish rain hood with screen. Provide economizer components and controls in accordance with ICC IECC.
- M. Controls:
  - 1. Furnish low limit thermostat in supply air to close outside air damper and stop supply fan.
  - 2. Furnish terminal strip on unit for connection of operating controls to remote panel.
  - 3. All capable equipment to utilize local wi-fi programable thermostat. Otherwise furnish 7 day programmable electronic space thermostat with minimum 4 stage heating and 2 stage cooling with automatic changeover and heating setback and cooling setup capability. Furnish system selector switch off-heat-auto-cool and fan control switch, auto-on.
  - 4. Furnish interface to Direct Digital Control System specified in Section 23 09 23.
  - 5. Microprocessor Based Controls:
    - a. Factory mounted with the following features:
      - 1) Monitor each mode of operation.
      - 2) Evaporator fan status.
      - 3) Filter status.
      - 4) Indoor air quality.
      - 5) Supply air temperature.
      - 6) Outdoor air temperature.
    - b. Diagnostics for thermostat commands for staged heating, staged cooling, fan operation, and economizer operation.
- N. Accessories:
  - 1. As scheduled.

## 2.2 ELECTRICAL CHARACTERISTICS AND COMPONENTS

- A. Electrical Characteristics: As scheduled.
- B. Disconnect Switch: Factory mounted, non-fused type, interlocked with access door, accessible from outside unit, with power lockout capability.

## PART 3 EXECUTION

### 3.1 EXAMINATION

- A. Verify roof curbs are installed and dimensions are as shown on shop drawings.

### 3.2 PREPARATION

- A. Furnish roof curbs to Section 23 05 48 for installation.

### 3.3 INSTALLATION

- A. Install units on vibration isolators. Refer to Section 23 05 48.
- B. Connect units to supply and return ductwork with flexible connections. Refer to Section 23 33 00.
- C. Install condensate piping with trap and route from drain pan to concrete splash block on roof.
- D. Install components furnished loose for field mounting.
- E. Install electrical devices furnished loose for field mounting.
- F. Install control wiring between unit and field installed accessories.
- G. Remove from roof and dispose off-site panels removed from units during installation of economizer.

### 3.4 MANUFACTURER'S FIELD SERVICES

- A. Furnish initial start-up and shutdown during first year of operation, including routine servicing and checkout.

### 3.5 CLEANING

- A. Vacuum clean coils and inside of unit cabinet.
- B. Install new throwaway filters in units at Substantial Completion.

3.6 DEMONSTRATION

- A. Demonstrate unit operation and maintenance.
- B. Furnish services of manufacturer's technical representative for one 8 hour day to instruct Owner's personnel in operation and maintenance of units. Schedule training with Owner, provide at least 7 days notice to Architect/Engineer of training date.

END OF SECTION

26 05 19

## Low-Voltage Electrical Power Conductors and Cables

### PART 1 GENERAL

#### 1.1 SUMMARY

- A. Section includes building wire and cable and wiring connectors and connections.

#### 1.2 REFERENCES

- A. International Electrical Testing Association:
1. NETA ATS - Acceptance Testing Specifications for Electrical Power Distribution Equipment and Systems.
- B. National Fire Protection Association:
1. NFPA 70 - National Electrical Code (2020 Edition).
  2. NFPA 262 - Standard Method of Test for Flame Travel and Smoke of Wires and Cables for Use in Air-Handling Spaces.
- C. Underwriters Laboratories, Inc.:
1. UL 1277 - Standard for Safety for Electrical Power and Control Tray Cables with Optional Optical-Fiber Members.

#### 1.3 SYSTEM DESCRIPTION

- A. Product Requirements: Provide products as follows:
1. Solid conductor for feeders and branch circuits 10 AWG and smaller.
  2. Stranded conductors for control circuits.
  3. Conductor not smaller than 12 AWG for power and lighting circuits.
  4. Conductor not smaller than 16 AWG for control circuits.
  5. Increase wire size in branch circuits to limit voltage drop to a maximum of 3 percent.
- B. Wiring Methods: Provide the following wiring methods:
1. Concealed Dry Interior Locations: Use only building wire, Type THHN/THWN XHHW insulation, in raceway.
  2. Exposed Dry Interior Locations: Use only building wire, Type THHN/THWN XHHW insulation, in raceway.
  3. Above Accessible Ceilings: Use only building wire, Type THHN/THWN XHHW insulation, in raceway.
  4. Wet or Damp Interior Locations: Use only building wire, Type THHN/THWN XHHW insulation, in raceway.
  5. Exterior Locations: Use only building wire, Type THHN/THWN XHHW insulation, in raceway.

#### 1.4 DESIGN REQUIREMENTS

- A. Conductor sizes are based on copper.

#### 1.5 SUBMITTALS

- A. Division 01 - Submittal Procedures: Requirements for submittals.
- B. Product Data: Submit for building wire and each cable assembly type.
- C. Design Data: Indicate voltage drop and ampacity calculations for aluminum conductors substituted for copper conductors.
- D. Test Reports: Indicate procedures and values obtained.

#### 1.6 CLOSEOUT SUBMITTALS

- A. Project Record Documents: Record actual locations of components and circuits.

#### 1.7 QUALITY ASSURANCE

- A. Provide wiring materials located in plenums with peak optical density not greater than 0.5, average optical density not greater than 0.15, and flame spread not greater than 5 feet (1.5 m) when tested in accordance with NFPA 262.
- B. Maintain one copy of each document on site.

#### 1.8 FIELD MEASUREMENTS

- A. Verify field measurements are as indicated on Drawings.

#### 1.9 COORDINATION

- A. Where wire and cable destination is indicated and routing is not shown, determine routing and lengths required.
- B. Wire and cable routing indicated is approximate unless dimensioned. Include wire and cable lengths within 25 ft of length shown.

### PART 2 PRODUCTS

#### 2.1 BUILDING WIRE

- A. Manufacturers:
  - 1. AETNA
  - 2. American Insulated Wire Corp.
  - 3. Colonial Wire
  - 4. Encore Wire

5. General Cable Co.
6. Republic Wire
7. Rome Cable
8. Service Wire Co.
9. Southwire
10. Superior Essex

- B. Product Description: Single conductor insulated wire.
- C. Conductor: Copper.
- D. Insulation Voltage Rating: 600 volts.
- E. Insulation Temperature Rating: 75 degrees C.
- F. Insulation Material: Thermoplastic

## 2.2 TERMINATIONS

- A. Terminal Lugs for Wires 6 AWG and Smaller: Solderless, compression type copper.
- B. Lugs for Wires 4 AWG and Larger: Color keyed, compression type copper, with insulating sealing collars.

## PART 3 EXECUTION

### 3.1 EXAMINATION

- A. Verify mechanical work likely to damage wire and cable has been completed.
- B. Verify raceway installation is complete and supported.

### 3.2 PREPARATION

- A. Completely and thoroughly swab raceway before installing wire.
- B. Route wire and cable to meet Project conditions.
- C. Neatly train and lace wiring inside boxes, equipment, and panelboards.
- D. Special Techniques--Building Wire in Raceway:
  1. Pull conductors into raceway at same time.
- E. Special Techniques - Wiring Connections:
  1. Clean conductor surfaces before installing lugs and connectors.
  2. Make splices, taps, and terminations to carry full ampacity of conductors with no perceptible temperature rise.

3. Tape uninsulated conductors and connectors with electrical tape to 150 percent of insulation rating of conductor.
  4. Install split bolt connectors for copper conductor splices and taps, 6 AWG and larger.
  5. Install insulated spring wire connectors with plastic caps for copper conductor splices and taps, 10 AWG and smaller.
- F. Size lugs in accordance with manufacturer's recommendations terminating wire sizes. Install 2-hole type lugs to connect wires 4 AWG and larger to copper bus bars.

### 3.3 WIRE COLOR

- A. General:
1. For wire sizes 8 AWG and larger, identify wire with colored tape at terminals, splices and boxes. Colors are as follows:
    - a. Black, red, and blue for circuits at 120/208 volts single or three phase.
- B. Neutral Conductors: White. When two or more neutrals are located in one conduit, individually identify each with proper circuit number.
- C. Branch Circuit Conductors: Install three or four wire home runs with each phase uniquely color coded.
- D. Feeder Circuit Conductors: Uniquely color code each phase.
- E. Ground Conductors:
1. For 6 AWG and smaller: Green.
  2. For 4 AWG and larger: Identify with green tape at both ends and visible points including junction boxes.

### 3.4 FIELD QUALITY CONTROL

- A. Inspect and test in accordance with NETA ATS, except Section 4.
- B. Perform inspections and tests listed in NETA ATS, Section 7.3.1.

END OF SECTION



## Grounding and Bonding for Electrical Systems

### PART 1 GENERAL

#### 1.1 SUMMARY

- A. Section Includes:
  - 1. Wire.
  - 2. Mechanical connectors.

#### 1.2 REFERENCES

- A. Institute of Electrical and Electronics Engineers:
  - 1. IEEE 142 - Recommended Practice for Grounding of Industrial and Commercial Power Systems.
  - 2. IEEE 1100 - Recommended Practice for Powering and Grounding Electronic Equipment.
- B. International Electrical Testing Association:
  - 1. NETA ATS - Acceptance Testing Specifications for Electrical Power Distribution Equipment and Systems.
- C. National Fire Protection Association:
  - 1. NFPA 70 - National Electrical Code.

### PART 2 PRODUCTS

#### 2.1 WIRE

- A. Material: Stranded copper.
- B. Grounding Electrode Conductor: Copper conductor bare.
- C. Bonding Conductor: Copper conductor bare.

#### 2.2 MECHANICAL CONNECTORS

- A. Manufacturers:
  - 1. Erico, Inc.
  - 2. ILSCO Corporation
  - 3. O-Z Gedney Co.
  - 4. Thomas & Betts, Electrical
- B. Description: Bronze connectors, suitable for grounding and bonding applications, in configurations required for particular installation.

## PART 3 EXECUTION

### 3.1 PREPARATION

- A. Remove paint, rust, mill oils, surface contaminants at connection points.

### 3.2 EXISTING WORK

- A. Modify existing grounding system to maintain continuity to accommodate renovations.
- B. Extend existing grounding system using materials and methods compatible with existing electrical installations, or as specified.

### 3.3 INSTALLATION

- A. Install in accordance with IEEE 142 & 1100
- B. Equipment Grounding Conductor: Install separate, insulated conductor within each feeder and branch circuit raceway. Terminate each end on suitable lug, bus, or bushing.
- C. Permanently attach equipment and grounding conductors prior to energizing equipment.

END OF SECTION

## Hangers and Supports for Electrical Systems

### PART 1 GENERAL

#### 1.1 SUMMARY

- A. Section Includes:
  - 1. Conduit supports.
  - 2. Formed steel channel.
  - 3. Spring steel clips.

#### 1.2 REFERENCES

- A. National Fire Protection Association:
  - 1. NFPA 70 - National Electrical Code.

#### 1.3 SUBMITTALS

- A. Division 01 - Submittal Procedures: Requirements for submittals.
- B. Shop Drawings: Indicate system layout with location and detail of trapeze hangers.
- C. Product Data:
  - 1. Hangers and Supports: Submit manufacturers catalog data including load capacity.
- D. Design Data: Indicate load carrying capacity of trapeze hangers and hangers and supports.
- E. Manufacturer's Installation Instructions:
  - 1. Hangers and Supports: Submit special procedures and assembly of components.
- F. Manufacturer's Certificate: Certify products meet or exceed specified requirements.

#### 1.4 DELIVERY, STORAGE, AND HANDLING

- A. Accept materials on site in original factory packaging, labeled with manufacturer's identification.
- B. Protect from weather and construction traffic, dirt, water, chemical, and mechanical damage, by storing in original packaging.

### PART 2 PRODUCTS

#### 2.1 CONDUIT SUPPORTS

- A. Manufacturers:

1. Allied Tube & Conduit Corp.
  2. Electroline Manufacturing Company
  3. O-Z Gedney Co.
- B. Hanger Rods: Threaded high tensile strength galvanized carbon steel with free running threads.
- C. Beam Clamps: Malleable Iron, with tapered hole in base and back to accept either bolt or hanger rod. Set screw: hardened steel.
- D. Conduit clamps for trapeze hangers: Galvanized steel, notched to fit trapeze with single bolt to tighten.
- E. Conduit clamps - general purpose: One hole malleable iron for surface mounted conduits.
- F. Cable Ties: High strength nylon temperature rated to 185 degrees F. Self locking.

## 2.2 FORMED STEEL CHANNEL

- A. Manufacturers:
1. Allied Tube & Conduit Corp.
  2. B-Line Systems
  3. Midland Ross Corporation, Electrical Products Division
  4. Unistrut Corp.
- B. Product Description: Galvanized 12 gage thick steel. With holes 1-1/2 inches on center.

## 2.3 SPRING STEEL CLIPS

- A. Product Description: Mounting hole and screw closure.

# PART 3 EXECUTION

## 3.1 PREPARATION

- A. Do not drill or cut structural members.

## 3.2 INSTALLATION - HANGERS AND SUPPORTS

- A. Anchors and Fasteners:
1. Concrete Structural Elements: Provide precast inserts, expansion anchors, powder actuated anchors and preset inserts.
  2. Steel Structural Elements: Provide beam clamps, spring steel clips, steel ramset fasteners, and welded fasteners.
  3. Concrete Surfaces: Provide self-drilling anchors and expansion anchors.
  4. Hollow Masonry, Plaster, and Gypsum Board Partitions: Provide toggle bolts and hollow wall fasteners.
  5. Solid Masonry Walls: Provide expansion anchors and preset inserts.
  6. Sheet Metal: Provide sheet metal screws.
  7. Wood Elements: Provide wood screws.

- B. Inserts:
  - 1. Install inserts for placement in concrete forms.
  - 2. Install inserts for suspending hangers from reinforced concrete slabs and sides of reinforced concrete beams.
  - 3. Provide hooked rod to concrete reinforcement section for inserts carrying pipe over 4 inches.
  - 4. Where concrete slabs form finished ceiling, locate inserts flush with slab surface.
  - 5. Where inserts are omitted, drill through concrete slab from below and provide through-bolt with recessed square steel plate and nut above flush with top of recessed into and grouted flush with slab.
- C. Install conduit and raceway support and spacing in accordance with NEC.
- D. Do not fasten supports to pipes, ducts, mechanical equipment, or conduit.
- E. Install multiple conduit runs on common hangers.
- F. Supports:
  - 1. Fabricate supports from structural steel or formed steel channel. Install hexagon head bolts to present neat appearance with adequate strength and rigidity. Install spring lock washers under nuts.
  - 2. Install surface mounted cabinets and panelboards with minimum of four anchors.
  - 3. In wet and damp locations install steel channel supports to stand cabinets and panelboards 1 inch off wall.
  - 4. Support vertical conduit at every other floor.

### 3.3 PROTECTION OF FINISHED WORK

- A. Protect adjacent surfaces from damage by material installation.

END OF SECTION



## Raceway and Boxes for Electrical Systems

### PART 1 GENERAL

#### 1.1 SUMMARY

- A. Conduit and tubing, outlet boxes, pull and junction boxes, and handholes.
- B. Related Sections:
  - 1. Section 26 05 26 - Grounding and Bonding for Electrical Systems.
  - 2. Section 26 05 29 - Hangers and Supports for Electrical Systems.

#### 1.2 REFERENCES

- A. National Electrical Manufacturers Association:
  - 1. NEMA 250 - Enclosures for Electrical Equipment (1000 Volts Maximum).
  - 2. NEMA FB 1 - Fittings, Cast Metal Boxes, and Conduit Bodies for Conduit and Cable Assemblies.
  - 3. NEMA OS 1 - Sheet Steel Outlet Boxes, Device Boxes, Covers, and Box Supports.

#### 1.3 SYSTEM DESCRIPTION

- A. Raceway and boxes located as indicated on Drawings, and at other locations required for splices, taps, wire pulling, equipment connections, and compliance with regulatory requirements. Raceway and boxes are shown in approximate locations unless dimensioned. Provide raceway to complete wiring system.
- B. Concealed Dry Locations: Provide electrical metallic tubing. Provide sheet-metal boxes. Provide flush mounting outlet box in finished areas. Provide hinged enclosure for large pull boxes.
- C. Exposed Dry Locations: Provide electrical metallic tubing. Provide sheet-metal boxes. Provide flush mounting outlet box in finished areas. Provide hinged enclosure for large pull boxes.

#### 1.4 DESIGN REQUIREMENTS

- A. Minimum Raceway Size:  $\frac{1}{2}$  if 4 or fewer conductors, 4 conductors or more minimum size  $\frac{3}{4}$ " inch unless otherwise specified.

#### 1.5 DELIVERY, STORAGE, AND HANDLING

- A. Protect conduit from corrosion and entrance of debris by storing above grade. Provide appropriate covering.

## PART 2 PRODUCTS

### 2.1 LIQUIDTIGHT FLEXIBLE METAL CONDUIT

- A. Product Description: Interlocked steel aluminum construction with PVC jacket.
- B. Fittings: NEMA FB 1.

### 2.2 ELECTRICAL METALLIC TUBING (EMT)

- A. Product Description: ANSI C80.3; galvanized tubing.
- B. Fittings and Conduit Bodies: NEMA FB 1; steel or malleable iron, compression set screw indenter type.

### 2.3 PULL AND JUNCTION BOXES

- A. Sheet Metal Boxes: NEMA OS 1, galvanized steel.
- B. Surface Mounted Cast Metal Box: NEMA 250, Type 4; flat-flanged, surface mounted junction box:
  - 1. Material: Galvanized cast iron or Cast aluminum.
  - 2. Cover: Furnish with ground flange, neoprene gasket, and stainless steel cover screws.

## PART 3 EXECUTION

### 3.1 INSTALLATION

- A. Ground and bond raceway and boxes in accordance with Section 26 05 26.
- B. Fasten raceway and box supports to structure and finishes in accordance with Section 26 05 29.
- C. Arrange raceway and boxes to maintain headroom and present neat appearance.

### 3.2 INSTALLATION - RACEWAY

- A. Raceway routing is shown in approximate locations unless dimensioned. Route to complete wiring system.
- B. Arrange raceway supports to prevent misalignment during wiring installation.
- C. Support raceway using coated steel or malleable iron straps, lay-in adjustable hangers, clevis hangers, and split hangers.
- D. Group related raceway; support using conduit rack. Construct rack using steel channel specified in Section 26 05 29; provide space on each for 25 percent additional raceways.



- E. Do not support raceway with wire or perforated pipe straps. Remove wire used for temporary supports
- F. Do not attach raceway to ceiling support wires or other piping systems.
- G. Route exposed raceway parallel and perpendicular to walls.
- H. Route raceway installed above accessible ceilings parallel and perpendicular to walls.
- I. Maintain clearance between raceway and piping for maintenance purposes.
- J. Maintain 12 inch clearance between raceway and surfaces with temperatures exceeding 104 degrees F.
- K. Cut conduit square using saw or pipe cutter; de-burr cut ends.
- L. Bring conduit to shoulder of fittings; fasten securely.
- M. Install no more than equivalent of three 90 degree bends between boxes. Install conduit bodies to make sharp changes in direction, as around beams. Install hydraulic one-shot bender to fabricate factory elbows for bends in metal conduit larger than 2 inch size.
- N. Avoid moisture traps; install junction box with drain fitting at low points in conduit system.
- O. Install fittings to accommodate expansion and deflection where raceway crosses seismic, control and expansion joints.

### 3.3 INTERFACE WITH OTHER PRODUCTS

- A. Route conduit through roof openings for piping and ductwork or through suitable roof jack with pitch pocket. Coordinate location with roofing installation specified.

END OF SECTION



Panelboards

PART 1 GENERAL

1.1 SUMMARY

- A. Section includes branch circuit panelboards.
- B. Related Sections:
  - 1. Section 26 05 26 - Grounding and Bonding for Electrical Systems.

1.2 REFERENCES

- A. Institute of Electrical and Electronics Engineers:
  - 1. IEEE C62.41 - Recommended Practice on Surge Voltages in Low-Voltage AC Power Circuits.
- B. National Electrical Manufacturers Association:
  - 1. NEMA AB 1 - Molded Case Circuit Breakers and Molded Case Switches.
  - 2. NEMA FU 1 - Low Voltage Cartridge Fuses.
  - 3. NEMA ICS 2 - Industrial Control and Systems: Controllers, Contactors, and Overload Relays, Rated Not More Than 2000 Volts AC or 750 Volts DC.
  - 4. NEMA ICS 5 - Industrial Control and Systems: Control Circuit and Pilot Devices.
  - 5. NEMA KS 1 - Enclosed and Miscellaneous Distribution Equipment Switches (600 Volts Maximum).
  - 6. NEMA PB 1 - Panelboards.
  - 7. NEMA PB 1.1 - General Instructions for Proper Installation, Operation, and Maintenance of Panelboards Rated 600 Volts or Less.
- C. International Electrical Testing Association:
  - 1. NETA ATS - Acceptance Testing Specifications for Electrical Power Distribution Equipment and Systems.
- D. National Fire Protection Association:
  - 1. NFPA 70 - National Electrical Code.
- E. Underwriters Laboratories Inc.:
  - 1. UL 67 - Safety for Panelboards.
  - 2. UL 1283 - Electromagnetic Interference Filters.
  - 3. UL 1449 - Transient Voltage Surge Suppressors.

1.3 SUBMITTALS

- A. Division 01 - Submittal Procedures: Requirements for submittals.

- B. Shop Drawings: Indicate outline and support point dimensions, voltage, main bus ampacity, integrated short circuit ampere rating, circuit breaker and fusible switch arrangement and sizes.
- C. Product Data: Submit catalog data showing specified features of standard products.

#### 1.4 MAINTENANCE MATERIALS

- A. Furnish two of each panelboard key. Panelboards keyed alike to Owner's current keying system.

### PART 2 PRODUCTS

#### 2.1 BRANCH CIRCUIT PANELBOARDS (400A & Less)

- A. Manufacturers:
  - 1. GE Electrical
  - 2. Siemens
  - 3. Square D
  - 4. Cutler Hammer/Eaton
- B. Product Description: NEMA PB1, circuit breaker type, lighting and appliance branch circuit panelboard.
- C. Panelboard Bus: Copper, current carrying components, ratings as indicated on Drawings. Furnish copper ground bus in each panelboard.
- D. Minimum Integrated Short Circuit Rating: 22,000.
- E. Molded Case Circuit Breakers: NEMA AB 1, bolt-on type thermal magnetic trip circuit breakers, with common trip handle for all poles, listed as Type SWD for lighting circuits, Type HACR for air conditioning equipment circuits, Class A ground fault interrupter circuit breakers as indicated on Drawings. Do not use tandem circuit breakers.
- F. Enclosure: NEMA PB 1, Type 1.
- G. Cabinet Box: 6 inches deep, 20 inches wide for 208 volt and less panelboards.
- H. Cabinet Front: Cabinet front with concealed trim clamps, concealed hinge, metal directory frame, and flush lock keyed alike. Finish in manufacturer's standard gray enamel.

### PART 3 EXECUTION

#### 3.1 INSTALLATION

- A. Install panelboards in accordance with NEMA PB 1.1.

- B. Install panelboards plumb.
- C. Height: 6 feet to top of panelboard and load center; install panelboards taller than 6 feet with bottom no more than 4 inches above floor.
- D. Install filler plates for unused spaces in panelboards.
- E. Provide typed circuit directory for each branch circuit panelboard and load center. Revise directory to reflect circuiting changes to balance phase loads.
- F. Install engraved plastic nameplates on panelboards.
- G. Ground and bond panelboard enclosure according to Section 26 05 26. Connect equipment ground bars of panels in accordance with NFPA 70.
- H. Verify final sizes of all breakers with specific loads served and coordinate with equipment to be used.

### 3.2 FIELD QUALITY CONTROL

- A. Inspect and test in accordance with NETA ATS, except Section 4.
- B. Perform circuit breaker inspections and tests listed in NETA ATS, Section 7.6.

END OF SECTION