

**MCDOWELL COUNTY BOARD OF EDUCATION  
MCDOWELL COUNTY, WEST VIRGINIA**

**MCDOWELL COUNTY ROOF TOP UNITS AND HVAC CONTROLS**

**ADDENDUM #2**

**July 19, 2022**

**THRASHER PROJECT #060-10289**

TO WHOM IT MAY CONCERN:

A Pre-Bid Conference was held on Thursday, July 7, 2022 on the above-referenced project. The following are clarifications and responses to questions posed by contractors for the above reference project.

**A. GENERAL**

1. **THE BID FORM HAS BEEN REVISED. YOU MUST USE THE REVISED BID FORM WHEN PREPARING YOUR BID PACKAGE FOR THIS PROJECT.**

**B. SPECIFICATIONS**

1. Add Section 233112 – Insulated Double Wall Ductwork
2. Add Section 233113 – Metal Ducts
3. Add Section 233300 – Air Duct Accessories
4. Add Section 233713.13 – Air Diffusers

**C. DRAWINGS**

1. Updated FRMD3.01
2. Updated FRM3.01
3. Updated MVM3.01

**D. QUESTIONS AND RESPONSES**

**QUESTION**

1. With Current Lead Times for Rooftop Equipment running approximately 30 to 40 Weeks will the proposed contract duration be extended to accommodate this?

**RESPONSE**

As noted in the pre-bid, no extension will be added, documentation of the equipment order date and proposed receiving date will be sufficient to extend days allowed. As also

stated in the pre bid, contractor can not be held accountable for delays in equipment. However, delays must be documented.

**QUESTION**

2. With Current Lead Times for Rooftop Equipment being so far out should the contractors plan that any work at Southside Elementary being done over summer of 2023? If not and the contractors are able to obtain equipment sooner how many rooms at a time will be allowed to be taken offline for Rooftop Replacement?

**RESPONSE**

Work at Southside Elementary School should be planned for the summer of 2023.

**QUESTION**

3. Will a new Bid form be provided since the project must have separate prices for each school?

**RESPONSE**

Yes, a new Bid form is included in this Addendum.

**QUESTION**

4. If the project is over budget is it possible that certain projects would take priority or be awarded and other schools not be awarded?

**RESPONSE**

Yes.

**QUESTION**

5. Can the following be added as acceptable? Spec Section 237343.16 Outdoor Semi-Custom Air Handling Units - AAON

**RESPONSE**

Yes, AAON is an acceptable manufacturer.

**QUESTION**

6. At Mount View and Fall River it would not be anticipated to receive Rooftop Equipment for approximately 20 to 30 Weeks. Will the contractors be permitted to perform work in the gymnasiums during school session? To Remove the existing MEP and rooftop Equipment and install new the gymnasium would be unusable for an extended time with no provision for heating or cooling?

**RESPONSE**

Contractor shall coordinate work with the Owner to minimize downtime of the gymnasium. Based on lead times, this work should be planned for late spring or early summer.

**QUESTION**

7. It shows (26) new RTU's on the schedule, but on the new work drawing notes it has (7) RTU's using adapter curbs but has no notes for the remaining RTU's. Do the remaining sit on the existing curbs and reuse existing duct?

**RESPONSE**

The note regarding the curb is shown 7 times on the plans. However, it says (typ) at the end of each note meaning this is typical of all units.

**QUESTION**

8. Will we be receiving a revised Bid form that shows breakout pricing for each school?

**RESPONSE**

Yes, a new Bid form is included in this Addendum.

**QUESTION**

9. Is all gym ductwork unlined and unpainted?

**RESPONSE**

All gym ductwork at Fall River shall have 1" sound lining and shall be painted. Gym ductwork at Mount View shall be insulated double wall and painted.

**QUESTION**

10. Confirming that a TAB is required at each school.

**RESPONSE**

Yes, a TAB is required at each school.

**QUESTION**

11. On gym units, are we reusing return drops and duct and return grilles?

**RESPONSE**

No, return duct shall be new. Return will be open ended with wire mesh screen.

**QUESTION**

12. At Mount View, are contractor's responsible for adding glycol to the loops?

**RESPONSE**

Yes, contractors are responsible for adding glycol to the loops.

**QUESTION**

13. Is there glycol in both the HW and CHW loop?

**RESPONSE**

Yes, both loops have glycol.

**E. CLARIFICATIONS**

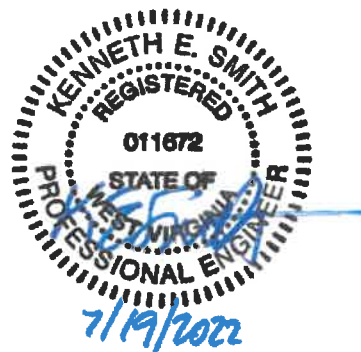
If you have any questions or comments, please feel free to contact me at your earliest convenience. As a reminder, bids will be received until 1:00 p.m. on Thursday, July 21, 2022 at the McDowell County Board of Education located at 900 Mount View High School Road, Welch, WV 24801 Good luck to everyone and thank you for your interest in the project.

Sincerely,

THE THRASHER GROUP, INC.



Kenneth Smith, PE  
Project Manager



## **BID FORM FOR CONSTRUCTION CONTRACT**

The terms used in this Bid with initial capital letters have the meanings stated in the Instructions to Bidders, the General Conditions, and the Supplementary Conditions.

### **ARTICLE 1—OWNER AND BIDDER**

1.01 This Bid is submitted to:

*McDowell County Board of Education  
33 Central Avenue  
Welch, WV 24801*

1.02 The undersigned Bidder proposes and agrees, if this Bid is accepted, to enter into an Agreement with Owner in the form included in the Bidding Documents to perform all Work as specified or indicated in the Bidding Documents for the prices and within the times indicated in this Bid and in accordance with the other terms and conditions of the Bidding Documents.

### **ARTICLE 2—ATTACHMENTS TO THIS BID**

2.01 The following documents are submitted with and made a condition of this Bid:

A. Bid Opening Requirements

### **ARTICLE 3—BASIS OF BID—LUMP SUM BID AND UNIT PRICES**

#### **GENERAL**

The Bidder shall take notice of and shall be responsible for any local or state taxes levied and applicable, and the cost for the same shall be included as part of the submitted Bid.

The total Bid cost stated includes a complete operating installation including furnishing and installation of any and all changes or additions in plans, piping, mechanical work, additional electrical work, accessories, controls, etc. necessary to accommodate alternative equipment systems or materials used in construction.

#### **BID PROPOSAL**

The Bidder agrees to perform all required Work described in the detailed Specifications and as shown on the Plans for the complete construction and placing in satisfactory operation the McDowell County Roof Top Units and HVAC Controls. The Project "Sequence of Construction" has been detailed in the Drawings and Specification Division 1, Project Summary, Section 011000. The Bidder agrees to perform all the Work proposed for the total of the following Bid prices.

3.01 *Lump Sum Bids*

A. Bidder will complete the Work in accordance with the Contract Documents for the lump sum (stipulated) price(s), shown in the bid schedule.

B. Lump Sum Bids may be one of the following:

1. Lump Sum Price (Single Lump Sum)
  2. Lump Sum Price (Base Bid and Alternates)
  3. Lump Sum Price (Sectional Lump Sum Bids)
- C. All specified cash allowance(s) are included in the price(s) set forth in the bid schedule, and have been computed in accordance with Paragraph 3.8 of the General Conditions.
- D. All specified contingency allowances are included in the price(s) set forth in the bid schedule, and have been computed in accordance with Paragraph 3.8 of the General Conditions.

**BID SCHEDULE**

**PROPOSED  
 MCDOWELL COUNTY ROOF TOP UNITS AND HVAC CONTROLS  
 FOR THE**

**MCDOWELL COUNTY BOARD OF EDUCATION  
 MCDOWELL COUNTY, WEST VIRGINIA**

3.02 Total Bid Price Lump Sum

**NOTE: Bid PRICE amounts are to be shown in both words and figures. In case of discrepancy, the amount shown in words will govern. Bids shall include sales tax and all other applicable taxes and fees.**

Item #	Qty.	UNIT	DESCRIPTION	TOTAL PRICE
1	1	LS	Provide all labor, materials, equipment, fees, bonds, insurance and taxes to perform the work as detailed in the plans and specifications and addenda.	
<b>SOUTH SIDE ELEMENTARY SCHOOL</b>				

**TOTAL BID:** \_\_\_\_\_ (\$ \_\_\_\_\_)  
 (Written in Words)

(Amounts are to be shown in both words and figures. In case of discrepancy, the amount shown in words will govern.)

Item #	Qty.	UNIT	DESCRIPTION	TOTAL PRICE
<b>MOUNT VIEW HIGH SCHOOL</b>				
1	1	LS	<i>Provide all labor, materials, equipment, fees, bonds, insurance and taxes to perform the work as detailed in the plans and specifications and addenda.</i>	

**TOTAL BID:** \_\_\_\_\_  
 \_\_\_\_\_ (\$ \_\_\_\_\_)  
 (Written in Words)

(Amounts are to be shown in both words and figures. In case of discrepancy, the amount shown in words will govern.)

Item #	Qty.	UNIT	DESCRIPTION	TOTAL PRICE
<b>FALL RIVER ELEMENTARY SCHOOL</b>				
1	1	LS	<i>Provide all labor, materials, equipment, fees, bonds, insurance and taxes to perform the work as detailed in the plans and specifications and addenda.</i>	

**TOTAL BID:** \_\_\_\_\_  
 \_\_\_\_\_ (\$ \_\_\_\_\_)  
 (Written in Words)

(Amounts are to be shown in both words and figures. In case of discrepancy, the amount shown in words will govern.)



**TOTAL COMBINED BIDS FROM THREE SCHOOLS:** \_\_\_\_\_

(Written in Words) \_\_\_\_\_ (\$ \_\_\_\_\_)

(Amounts are to be shown in both words and figures. In case of discrepancy, the amount shown in words will govern.)

3.02 *Method of Award*

If at the time this contract is to be awarded, the lowest total bid submitted by a qualified, responsive, responsible Bidder does not exceed the amount of funds then estimated by the Owner, as available to finance the contract, the construction contract will be awarded. If such bids exceeds such amount, the owner may reject all bids.

~~ARTICLE 4—BASIS OF BID—COST-PLUS FEE~~

Deleted

~~ARTICLE 5—PRICE-PLUS-TIME-BID~~

Deleted

~~ARTICLE 6—TIME OF COMPLETION~~

6.01 Bidder agrees that the Work will be substantially complete and will be completed and ready for final payment in accordance with Article 8 of the General Conditions on or before the dates or within the number of calendar days indicated in the Agreement.

6.02 Bidder accepts the provisions of the Agreement as to liquidated damages.

~~ARTICLE 7—BIDDER’S ACKNOWLEDGEMENTS: ACCEPTANCE PERIOD, INSTRUCTIONS, AND RECEIPT OF ADDENDA~~

7.01 *Bid Acceptance Period*

A. This Bid will remain subject to acceptance for 90 days after the Bid opening, or for such longer period of time that Bidder may agree to in writing upon request of Owner.

7.02 *Instructions to Bidders*

A. Bidder accepts all of the terms and conditions of the Instructions to Bidders, including without limitation those dealing with the disposition of Bid security.

7.03 *Receipt of Addenda*

A. Bidder hereby acknowledges receipt of the following Addenda:

Addendum Number	Addendum Date

~~ARTICLE 8—BIDDER’S REPRESENTATIONS AND CERTIFICATIONS~~

8.01 *Bidder’s Representations*

A. In submitting this Bid, Bidder represents the following:

1. Bidder has examined and carefully studied the Bidding Documents, including Addenda.

2. Bidder has visited the Site, conducted a thorough visual examination of the Site and adjacent areas, and become familiar with the general, local, and Site conditions that may affect cost, progress, and performance of the Work.
3. Bidder is familiar with all Laws and Regulations that may affect cost, progress, and performance of the Work.
4. Bidder has carefully studied the reports of explorations and tests of subsurface conditions at or adjacent to the Site and the drawings of physical conditions relating to existing surface or subsurface structures at the Site that have been identified in the Supplementary Conditions, with respect to the Technical Data in such reports and drawings.
5. Bidder has carefully studied the reports and drawings relating to Hazardous Environmental Conditions, if any, at or adjacent to the Site that have been identified in the Supplementary Conditions, with respect to Technical Data in such reports and drawings.
6. Bidder has considered the information known to Bidder itself; information commonly known to contractors doing business in the locality of the Site; information and observations obtained from visits to the Site; the Bidding Documents; and the Technical Data identified in the Supplementary Conditions or by definition, with respect to the effect of such information, observations, and Technical Data on (a) the cost, progress, and performance of the Work; (b) the means, methods, techniques, sequences, and procedures of construction to be employed by Bidder, if selected as Contractor; and (c) Bidder's (Contractor's) safety precautions and programs.
7. Based on the information and observations referred to in the preceding paragraph, Bidder agrees that no further examinations, investigations, explorations, tests, studies, or data are necessary for the performance of the Work at the Contract Price, within the Contract Times, and in accordance with the other terms and conditions of the Contract.
8. Bidder is aware of the general nature of work to be performed by Owner and others at the Site that relates to the Work as indicated in the Bidding Documents.
9. Bidder has given Engineer written notice of all conflicts, errors, ambiguities, or discrepancies that Bidder has discovered in the Bidding Documents, and of discrepancies between Site conditions and the Contract Documents, and the written resolution thereof by Engineer is acceptable to Contractor.
10. The Bidding Documents are generally sufficient to indicate and convey understanding of all terms and conditions for performance and furnishing of the Work.
11. The submission of this Bid constitutes an incontrovertible representation by Bidder that without exception the Bid and all prices in the Bid are premised upon performing and furnishing the Work required by the Bidding Documents.

#### 8.02 *Bidder's Certifications*

##### A. The Bidder certifies the following:

1. This Bid is genuine and not made in the interest of or on behalf of any undisclosed individual or entity and is not submitted in conformity with any collusive agreement or rules of any group, association, organization, or corporation.
2. Bidder has not directly or indirectly induced or solicited any other Bidder to submit a false or sham Bid.
3. Bidder has not solicited or induced any individual or entity to refrain from bidding.

4. Bidder has not engaged in corrupt, fraudulent, collusive, or coercive practices in competing for the Contract. For the purposes of this Paragraph 8.02.A:
  - a. Corrupt practice means the offering, giving, receiving, or soliciting of anything of value likely to influence the action of a public official in the bidding process.
  - b. Fraudulent practice means an intentional misrepresentation of facts made (a) to influence the bidding process to the detriment of Owner, (b) to establish bid prices at artificial non-competitive levels, or (c) to deprive Owner of the benefits of free and open competition.
  - c. Collusive practice means a scheme or arrangement between two or more Bidders, with or without the knowledge of Owner, a purpose of which is to establish bid prices at artificial, non-competitive levels.
  - d. Coercive practice means harming or threatening to harm, directly or indirectly, persons or their property to influence their participation in the bidding process or affect the execution of the Contract.

BIDDER hereby submits this Bid as set forth above:

Bidder:

\_\_\_\_\_  
*(typed or printed name of organization)*

By:

\_\_\_\_\_  
*(individual's signature)*

Name:

\_\_\_\_\_  
*(typed or printed)*

Title:

\_\_\_\_\_  
*(typed or printed)*

Date:

\_\_\_\_\_  
*(typed or printed)*

*If Bidder is a corporation, a partnership, or a joint venture, attach evidence of authority to sign.*

Attest:

\_\_\_\_\_  
*(individual's signature)*

Name:

\_\_\_\_\_  
*(typed or printed)*

Title:

\_\_\_\_\_  
*(typed or printed)*

Date:

\_\_\_\_\_  
*(typed or printed)*

Address for giving notices:

\_\_\_\_\_  
\_\_\_\_\_

Bidder's Contact:

Name:

\_\_\_\_\_  
*(typed or printed)*

Title:

\_\_\_\_\_  
*(typed or printed)*

Phone:

Email:

Address:

\_\_\_\_\_  
\_\_\_\_\_

Bidder's Contractor License No.: (if applicable)

\_\_\_\_\_

## SECTION 233112 - INSULATED DOUBLE WALL DUCTWORK

### PART 1 GENERAL

#### 1.1 DESCRIPTION

- A. This selection specifies the construction of acoustically insulated double wall round ductwork for both low pressure (2 inches W.C. or less) installations. Each duct system shall have a single pressure classification, which shall exceed the fan's external static rating listed in the equipment schedules. In cases where an external fan static is not given in the equipment schedules, the pressure classification of the duct system shall exceed the fan's total static rating.
- B. Provide insulated double wall ductwork for the following:
  - 1. All indoor supply ductwork
- C. Include all duct fittings, volume dampers, duct access panels, flexible connections, duct sealing systems, hangers and supports necessary to complete the indicated and specified system and achieve the desired system operation.
- D. Refer to Section 230593 "Testing, Adjusting, and Balancing for HVAC" for testing, adjusting, and balancing requirements for metal ductwork.

#### 1.2 QUALITY ASSURANCE

- A. The listed standards are referenced for the contractor to follow for the construction of acoustically insulated double wall ductwork items not specifically addressed in this specification. This specification takes precedence over the referenced standards.
- B. Standards:
  - 1. American Society of Heating, Refrigerating and Air Conditioning Engineers (ASHRAE), Sheet Metal and Air Conditioning Contractors National Association (SMACNA), National Fire Protection Association (NFPA), and Underwriters' Laboratories (UL).
  - 2. SMACNA "HVAC Duct Construction Standards Metal and Flexible" 1985 edition. Construct ductwork to meet all functional criteria defined in the 1985 SMACNA standards except where noted otherwise. Note: Duct constructions compliant with other editions of the SMACNA standards that do not meet or exceed the 1985 SMACNA standard are unacceptable.
  - 3. SMACNA "Round and Rectangular Industrial duct Construction Standards." This is to be used for return duct subject to negative pressures greater than 4 inches W.C. Construct ductwork to meet all functional criteria defined in the 1985 SMACNA standards except where noted otherwise. Note: Duct constructions compliant with other editions of the SMACNA standards that do not meet or exceed the 1985 SMACNA standard are unacceptable.
  - 4. SMACNA "HVAC Air Duct Leakage Test Manual" latest edition.

### 1.3 SUBMITTALS

- A. Submit ductwork fabrication and layout shop drawings. Coordinate the detailed fabrication drawings with all trades. Coordinate size and location of ductwork with structure, piping, lighting, equipment, conduit, bus ducts, ceiling construction and clear height above ceilings and other items which may present a potential conflict.
- B. Layout drawings shall be at 1/4 inch = 1 foot scale on reproducible media with enlarged sections, elevations, plan drawings, and mechanical room drawings as necessary to ensure a coordinated installation.
- C. Written program outlining protection of ductwork from contamination with dirt and procedures for cleaning contaminated ductwork.

### 1.4 DUCT DIMENSIONS

- A. The dimensions indicated on the contract drawings are the net inside clear dimensions available for air flow.

## PART 2 PRODUCTS

### 2.1 DOUBLE WALL DUCTWORK AND FITTINGS

- A. All double wall ductwork and fittings shall be constructed with an outer aluminum wall and a solid inner galvanized liner.
  - 1. Ductwork will be spiral seam construction made from G-90 or better galvanized steel conforming to ASTM A653/A653M and A924/A924M Standards, Lock-Forming Quality (LFQ).
  - 2. Provide a 1 inch fiberglass insulation material between the inner liner and the outer wall, wrapped in a mylar lining. The insulation material shall have a maximum thermal conductivity of 0.27 (BTU-in/hr. sq. ft. degree F) and shall meet the UL flame spread rating of 25 and smoke development rating of 50.
- B. Elbows shall be welded seam, standing seam, or gored construction.
- C. Diverging and converging flow fittings shall be constructed with radiused entrances without any projections into the air flow area of the main or branch duct.
- D. Flange connections are to be used for round ductwork sizes 36 inches or greater.

### 2.2 DUCT GAUGES FOR DOUBLE WALL DUCTWORK

- A. Provide minimum outer wall duct construction gauges for round and rectangular duct systems with pressures up to 2 inches W.C., matching those listed for single wall ducts in Section 233113, "Metal Ducts" as included in these Specifications. Use the actual outer wall dimensions to determine construction requirements.

- B. Provide 26 gauge solid wall liner for ducts with inner liner dimensions of 24 inches or less. Provide 22 gauge solid wall liner for ducts with inner liner dimensions of 25 inches or greater.

### 2.3 ROUND DOUBLE WALL DUCT FITTING GAUGES

- A. Provide minimum outer wall duct fitting construction gauges for round duct systems with pressures up to 2 inches W.C., as listed in Section 233113, "Metal Ducts" as included in these Specifications. Use the actual outer wall diameter to determine construction requirements. Provide 22 gauge perforated liner material for fittings with inner liner dimensions of 58 inches or less. Provide 20-gauge perforated liner material for ducts with inner liner dimensions of 59 inches up to 84 inches.

### 2.4 RECTANGULAR DOUBLE WALL DUCT FITTINGS

- A. Provide rectangular double wall inner and outer duct fitting gauges the same or greater than the rectangular straight duct thicknesses as indicated in these Specifications.
- B. Provide square-throat elbows to be provided with factory-installed, double-wall, hollow turning vanes in accordance with SMACNA recommendations.
  1. Turning vanes shall be double wall with every sixth vane welded to the runner.
  2. Turning vanes shall be Harper double wall turning vanes fabricated from the same material as the duct.
  3. Turning vane front and back panels shall be securely locked together with adequate crimping to prevent twisting of vane. Vane shall be capable of withstanding 250 pounds of tensile load when secured according to the manufacturer's instructions.
  4. Rails for mounting turning vanes shall have self locking, friction fit tabs designed to facilitate proper alignment of vanes.

### 2.5 DUCT SEALS

- A. All duct transverse joints and longitudinal seams shall be sealed against a 10 inch static pressure and shall not exceed the leakage rate specified in other sections of this specification. Surfaces are to be clean and free from oil, dust, dirt, rust, moisture, or any substance which would interfere with bonding of sealant.
- B. Duct Sealant: Liquid seal for joints and seams. Surfaces are to be clean and free from oil, dust, dirt, rust, moisture, or any substance which would interfere with bonding of sealant. Where metal clearances exceed 1/16 inch, several applications are required.
  1. McGill AirSeal Corporation "United Duct Sealer – Water Based"
  2. Hardcast "Duct-Seal 321"
  3. Ductmate "Proseal"
  4. Products with documented VOC-emission rates meeting LEED guidelines by Dow Corning, Miracle Adhesives, Ductmate Industries, or Surebond, Inc.
- C. Provide soft elastomer butyl gaskets with adhesive backing to seal flanged joints.



## 2.6 FLEXIBLE CONNECTIONS

- A. Flexible duct connector shall be used where ductwork connects to fans of apparatus, or apparatus casing to fans to isolate vibration transfer. Connectors shall be attached in such a manner as to provide an airtight and waterproof seal. Connectors will comply with NFPA 90A, "Installation of Air Conditioning & Ventilation Systems" and NFPA 90B, "Installation of Warm Air Heating & Air Conditioning Systems."
- B. Indoor installations shall be of a UL 214 listed, fire retardant Vinyl coated woven nylon or Neoprene coated woven fiberglass fabric. Minimum density of Vinyl is 20 ounces per square yard and rated to 200 degrees F. Minimum density of Neoprene is 30 ounces per square yard and rated to 200 degrees F.
- C. Outdoor installations shall be of a UL 214 listed UV-resistant Hypalon coated woven-fiberglass fabric. Minimum density is 24 ounces per square yard and rated to 250 degrees F.

## PART 3 EXECUTION

### 3.1 INSTALLATION

- A. All duct installations and duct construction shall comply with all requirements of this specification and meet or exceed SMACNA standards and recommendations for construction and installation.
- B. Seal all seams and joints.
- C. Provide a minimum 3 inch flexible connection where ductwork connects to motor driven equipment. Do not bulge or install on a bind.
- D. Provide volume dampers as needed to balance system to air flow indicated on the drawings.
- E. Provide duct access doors at all duct smoke detector locations. Coordinate locations with the Electrical Contractor.

### 3.2 DUCT CLEAN OUT

- A. Clean and blow out complete duct system before any connections to equipment are made. Inspect ductwork for debris before starting any fans.
- B. Interior surfaces shall be free of dust and debris prior to initial start up. Protect equipment which may be harmed by excessive dirt with filters, or bypass during cleaning. Provide adequate access into ductwork for cleaning purposes. Any cleaning of duct systems shall comply with recommendations of NAIMA and NADCA.
- C. When internally cleaning duct work prior to installation or shipment to the jobsite, cover all duct ends and openings with a dual polyethylene protective film. Securely affix the film to protect against dirt and debris. Film must be translucent to facilitate inspection of interior surfaces without removing film. Film must have a minimum elongation of 600%, contain

no VOC and leave no residue on duct after removal. Ductmate Industries "ProGuard" or approved equal.

- D. Clean external surfaces of foreign substances that might cause corrosion, deterioration of the metal, or where ductwork is to be painted.

### 3.3 CLEANLINESS REQUIREMENTS

- A. Construction Indoor Air Quality:
  - 1. Follow control measures of SMACNA IAQ Guidelines for Occupied Buildings Under Construction, Chapter 3, latest edition and as described below.
  - 2. Protect stored on-site or installed absorptive materials from moisture damage.
  - 3. Cap/seal supply, return, and exhaust air duct openings immediately after fabrication or cleaning. Schedule deliveries to the job site to match installation to avoid excessive storage at the job site. Store ductwork at the job site in closed trailers or in the immediate area in which it will be installed. Any ducts at the site that have any opening seals perforated are to be cleaned (if required). Maintain caps/seals on all openings of installed ducts. If openings of installed ducts have their seals perforated, clean contaminated duct sections. Demonstrate the cleanliness quality control to the Construction Manager. The duct cleanliness shall meet the advanced level of the SMACNA New Construction Guidelines.

END OF SECTION

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## SECTION 233113 - METAL DUCTS

### PART 1 - GENERAL

#### 1.1 RELATED DOCUMENTS

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

#### 1.2 SUMMARY

- A. Section Includes:

1. Single-wall rectangular ducts and fittings.
2. Single-wall round ducts and fittings.
3. Sheet metal materials.
4. Duct liner.
5. Sealants and gaskets.
6. Hangers and supports.

- B. Related Sections:

1. Section 230593 "Testing, Adjusting, and Balancing for HVAC" for testing, adjusting, and balancing requirements for metal ducts.
2. Section 233300 "Air Duct Accessories" for dampers, sound-control devices, duct-mounting access doors and panels, turning vanes, and flexible ducts.

#### 1.3 ACTION SUBMITTALS

- A. Product Data: For each type of the following products:

1. Liners and adhesives.
2. Sealants and gaskets.

- B. Sustainable Design Submittals:

1. Product Data: For adhesives, indicating VOC content.
2. Laboratory Test Reports: For adhesives, indicating compliance with requirements for low-emitting materials.
3. Product Data: For sealants, indicating VOC content.
4. Laboratory Test Reports: For sealants, indicating compliance with requirements for low-emitting materials.
5. Laboratory Test Reports: For antimicrobial coatings, indicating compliance with requirements for low-emitting materials.

- C. Shop Drawings:

1. Fabrication, assembly, and installation, including plans, elevations, sections, components, and attachments to other work.
2. Factory- and shop-fabricated ducts and fittings.
3. Duct layout indicating sizes, configuration, liner material, and static-pressure classes.
4. Elevation of top and bottom of ducts.
5. Dimensions of main duct runs from building grid lines.
6. Fittings.
7. Reinforcement and spacing.
8. Seam and joint construction.
9. Penetrations through fire-rated and other partitions.
10. Equipment installation based on equipment being used on Project.
11. Locations for duct accessories, including dampers, turning vanes, and access doors and panels.
12. Hangers and supports, including methods for duct and building attachment and vibration isolation.

D. Delegated-Design Submittal:

1. Sheet metal thicknesses.
2. Joint and seam construction and sealing.
3. Reinforcement details and spacing.
4. Materials, fabrication, assembly, and spacing of hangers and supports.

1.4 INFORMATIONAL SUBMITTALS

- A. Coordination Drawings: A single set of plans or BIM model, drawn to scale, showing the items described in this Section, and coordinated with all building trades.
- B. Welding certificates.
- C. Field quality-control reports.

1.5 QUALITY ASSURANCE

- A. Welding Qualifications: Qualify procedures and personnel in accordance with the following:
  1. AWS D1.1/D1.1M, "Structural Welding Code - Steel," for hangers and supports.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. Delegated Duct Design: Duct construction, including sheet metal thicknesses, seam and joint construction, reinforcements, and hangers and supports, shall comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible" and with performance requirements and design criteria indicated in "Duct Schedule" Article.

- B. Structural Performance: Duct hangers and supports shall withstand the effects of gravity loads and stresses within limits and under conditions described in SMACNA's "HVAC Duct Construction Standards - Metal and Flexible."
- C. Airstream Surfaces: Surfaces in contact with airstream shall comply with requirements in ASHRAE 62.1.
- D. ASHRAE Compliance: Applicable requirements in ASHRAE 62.1, Section 5 - "Systems and Equipment," and Section 7 - "Construction and System Startup."
- E. ASHRAE/IES Compliance: Applicable requirements in ASHRAE/IES 90.1, Section 6.4.4 - "HVAC System Construction and Insulation."
- F. Duct Dimensions: Unless otherwise indicated, all duct dimensions indicated on Drawings are inside clear dimensions and do not include insulation or duct wall thickness.

## 2.2 SINGLE-WALL RECTANGULAR DUCTS AND FITTINGS

- A. General Fabrication Requirements: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible" based on indicated static-pressure class unless otherwise indicated.
  - 1. Construct ducts of galvanized sheet steel unless otherwise indicated.
  - 2. For ducts exposed to weather, construct of Type 304 stainless steel indicated by manufacturer to be suitable for outdoor installation.
- B. Transverse Joints: Fabricate joints in accordance with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 2-1, "Rectangular Duct/Transverse Joints," for static-pressure class, applicable sealing requirements, materials involved, duct-support intervals, and other provisions in SMACNA's "HVAC Duct Construction Standards - Metal and Flexible."
  - 1. For ducts with longest side less than 36 inches, select joint types in accordance with Figure 2-1.
  - 2. For ducts with longest side 36 inches or greater, use flange joint connector Type T-22, T-24, T-24A, T-25a, or T-25b. Factory-fabricated flanged duct connection system may be used if submitted and approved by engineer of record.
- C. Longitudinal Seams: Select seam types and fabricate in accordance with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 2-2, "Rectangular Duct/Longitudinal Seams," for static-pressure class, applicable sealing requirements, materials involved, duct-support intervals, and other provisions in SMACNA's "HVAC Duct Construction Standards - Metal and Flexible."
- D. Elbows, Transitions, Offsets, Branch Connections, and Other Duct Construction: Select types and fabricate in accordance with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Ch. 4, "Fittings and Other Construction," for static-pressure class, applicable sealing requirements, materials involved, duct-support intervals, and other provisions in SMACNA's "HVAC Duct Construction Standards - Metal and Flexible."

### 2.3 SINGLE-WALL ROUND DUCTS AND FITTINGS

- A. General Fabrication Requirements: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Ch. 3, "Round, Oval, and Flexible Duct," based on indicated static-pressure class unless otherwise indicated.
  - 1. Construct ducts of galvanized sheet steel unless otherwise indicated.
  - 2. For ducts exposed to weather, construct of Type 304 stainless steel indicated by manufacturer to be suitable for outdoor installation.
- B. Transverse Joints: Select joint types and fabricate in accordance with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 3-1, "Round Duct Transverse Joints," for static-pressure class, applicable sealing requirements, materials involved, duct-support intervals, and other provisions in SMACNA's "HVAC Duct Construction Standards - Metal and Flexible."
  - 1. Transverse Joints in Ducts Larger Than 60 Inches in Diameter: Flanged.
- C. Longitudinal Seams: Select seam types and fabricate in accordance with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 3-2, "Round Duct Longitudinal Seams," for static-pressure class, applicable sealing requirements, materials involved, duct-support intervals, and other provisions in SMACNA's "HVAC Duct Construction Standards - Metal and Flexible."
  - 1. Fabricate round ducts larger than 90 inches in diameter with butt-welded longitudinal seams.
- D. Tees and Laterals: Select types and fabricate in accordance with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 3-5, "90 Degree Tees and Laterals," and Figure 3-6, "Conical Tees," for static-pressure class, applicable sealing requirements, materials involved, duct-support intervals, and other provisions in SMACNA's "HVAC Duct Construction Standards - Metal and Flexible."

### 2.4 SHEET METAL MATERIALS

- A. General Material Requirements: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible" for acceptable materials, material thicknesses, and duct construction methods unless otherwise indicated. Sheet metal materials shall be free of pitting, seam marks, roller marks, stains, discolorations, and other imperfections.
- B. Galvanized Sheet Steel: Comply with ASTM A653/A653M.
  - 1. Galvanized Coating Designation: G60.
  - 2. Finishes for Surfaces Exposed to View: Mill phosphatized.
- C. Carbon-Steel Sheets: Comply with ASTM A1008/A1008M, with oiled, matte finish for exposed ducts.

- D. Stainless-Steel Sheets: Comply with ASTM A480/A480M, Type 304 or 316, as indicated in "Duct Schedule" Article; cold rolled, annealed, sheet. Exposed surface finish shall be No. 2B, No. 2D, No. 3, or No. 4 as indicated in "Duct Schedule" Article.
- E. Aluminum Sheets: Comply with ASTM B209 Alloy 3003, H14 temper; with mill finish for concealed ducts, and standard, one-side bright finish for duct surfaces exposed to view.
- F. Factory- or Shop-Applied Antimicrobial Coating:
  - 1. Apply to the surface of sheet metal that will form the interior surface of the duct. An untreated clear coating shall be applied to the exterior surface.
  - 2. Antimicrobial compound shall be tested for efficacy by an NRTL and registered by the EPA for use in HVAC systems.
  - 3. Coating containing the antimicrobial compound shall have a hardness of 2H, minimum, when tested in accordance with ASTM D3363.
  - 4. Surface-Burning Characteristics: Maximum flame-spread index of 25 and maximum smoke-developed index of 50 when tested in accordance with UL 723; certified by an NRTL.
  - 5. Shop-Applied Coating Color: Black.
  - 6. Antimicrobial coating on sheet metal is not required for duct containing liner treated with antimicrobial coating.
- G. Reinforcement Shapes and Plates: ASTM A36/A36M, steel plates, shapes, and bars; black and galvanized.
  - 1. Where black- and galvanized-steel shapes and plates are used to reinforce aluminum ducts, isolate the different metals with butyl rubber, neoprene, or EPDM gasket materials.
- H. Tie Rods: Galvanized steel, 1/4-inch-minimum diameter for lengths 36 inches or less; 3/8-inch-minimum diameter for lengths longer than 36 inches.

## 2.5 DUCT LINER

- A. Fibrous-Glass Duct Liner: Comply with ASTM C1071, NFPA 90A, or NFPA 90B; and with NAIMA AH124, "Fibrous Glass Duct Liner Standard."
  - 1. Maximum Thermal Conductivity:
    - a. Type I, Flexible: 0.27 Btu x in./h x sq. ft. x deg F at 75 deg F mean temperature.
    - b. Type II, Rigid: 0.23 Btu x in./h x sq. ft. x deg F at 75 deg F mean temperature.
  - 2. Antimicrobial Erosion-Resistant Coating: Apply to the surface of the liner that will form the interior surface of the duct to act as a moisture repellent and erosion-resistant coating. Antimicrobial compound shall be tested for efficacy by an NRTL and registered by the EPA for use in HVAC systems.
  - 3. Water-Based Liner Adhesive: Comply with NFPA 90A or NFPA 90B and with ASTM C916.
    - a. Adhesive shall have a VOC content of 80 g/L or less.
    - b. Adhesive shall comply with the testing and product requirements of the California Department of Public Health's "Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers."



- B. Flexible Elastomeric Duct Liner: Preformed, cellular, closed-cell, sheet materials complying with ASTM C534/C534M, Type II, Grade 1; and with NFPA 90A or NFPA 90B.
1. Surface-Burning Characteristics: Maximum flame-spread index of 25 and maximum smoke-developed index of 50 when tested in accordance with UL 723; certified by an NRTL.
  2. Liner Adhesive: As recommended by insulation manufacturer and complying with NFPA 90A or NFPA 90B.
    - a. Adhesive shall have a VOC content of 80 g/L or less.
    - b. Adhesive shall comply with the testing and product requirements of the California Department of Public Health's "Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers."
- C. Insulation Pins and Washers:
1. Cupped-Head, Capacitor-Discharge-Weld Pins: Copper- or zinc-coated steel pin, fully annealed for capacitor-discharge welding, 0.106-inch- diameter shank, length to suit depth of insulation indicated with integral 1-1/2-inch galvanized carbon-steel washer.
  2. Insulation-Retaining Washers: Self-locking washers formed from 0.016-inch- thick galvanized steel; with beveled edge sized as required to hold insulation securely in place, but not less than 1-1/2 inches in diameter.
- D. Shop Application of Duct Liner: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 7-11, "Flexible Duct Liner Installation."
1. Adhere a single layer of indicated thickness of duct liner with at least 90 percent adhesive coverage at liner contact surface area. Attaining indicated thickness with multiple layers of duct liner is prohibited.
  2. Apply adhesive to transverse edges of liner facing upstream that do not receive metal nosing.
  3. Butt transverse joints without gaps, and coat joint with adhesive.
  4. Fold and compress liner in corners of rectangular ducts or cut and fit to ensure butted-edge overlapping.
  5. Do not apply liner in rectangular ducts with longitudinal joints, except at corners of ducts, unless duct size and dimensions of standard liner make longitudinal joints necessary.
  6. Apply adhesive coating on longitudinal seams in ducts with air velocity of 2500 fpm or greater.
  7. Secure liner with mechanical fasteners 4 inches from corners and at intervals not exceeding 12 inches transversely; at 3 inches from transverse joints and at intervals not exceeding 18 inches longitudinally.
  8. Secure transversely oriented liner edges facing the airstream with metal nosings that have either channel or "Z" profiles or are integrally formed from duct wall. Fabricate edge facings at the following locations:
    - a. Fan discharges.
    - b. Intervals of lined duct preceding unlined duct.
    - c. Upstream edges of transverse joints in ducts where air velocities are higher than 2500 fpm or where indicated.
  9. Secure insulation between perforated sheet metal inner duct of same thickness as specified for outer shell. Use mechanical fasteners that maintain inner duct at uniform distance from outer shell without compressing insulation.
    - a. Sheet Metal Inner Duct Perforations: 3/32-inch diameter, with an overall open area of 23 percent.

10. Terminate inner ducts with buildouts attached to fire-damper sleeves, dampers, turning vane assemblies, or other devices. Fabricated buildouts (metal hat sections) or other buildout means are optional; when used, secure buildouts to duct walls with bolts, screws, rivets, or welds.

## 2.6 SEALANT AND GASKETS

- A. General Sealant and Gasket Requirements: Surface-burning characteristics for sealants and gaskets shall be a maximum flame-spread index of 25 and a maximum smoke-developed index of 50 when tested in accordance with UL 723; certified by an NRTL.
- B. Two-Part Tape Sealing System:
  1. Tape: Woven cotton fiber impregnated with mineral gypsum and modified acrylic/silicone activator to react exothermically with tape to form hard, durable, airtight seal.
  2. Tape Width: 3 inches.
  3. Sealant: Modified styrene acrylic.
  4. Water resistant.
  5. Mold and mildew resistant.
  6. Maximum Static-Pressure Class: 10-inch wg, positive and negative.
  7. Service: Indoor and outdoor.
  8. Service Temperature: Minus 40 to plus 200 deg F.
  9. Substrate: Compatible with galvanized sheet steel (both PVC coated and bare), stainless steel, or aluminum.
  10. Sealant shall have a VOC content of 420 g/L or less.
  11. Sealant shall comply with the testing and product requirements of the California Department of Public Health's "Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers."
- C. Water-Based Joint and Seam Sealant:
  1. Application Method: Brush on.
  2. Solids Content: Minimum 65 percent.
  3. Shore A Hardness: Minimum 20.
  4. Water resistant.
  5. Mold and mildew resistant.
  6. VOC: Maximum 75 g/L (less water).
  7. Maximum Static-Pressure Class: 10-inch wg, positive and negative.
  8. Service: Indoor or outdoor.
  9. Substrate: Compatible with galvanized sheet steel (both PVC coated and bare), stainless steel, or aluminum sheets.
  10. Sealant shall have a VOC content of 420 g/L or less.
  11. Sealant shall comply with the testing and product requirements of the California Department of Public Health's "Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers."
  12. Maximum Static-Pressure Class: 10-inch wg, positive or negative.
  13. Service: Indoor or outdoor.

14. Substrate: Compatible with galvanized sheet steel (both PVC coated and bare), stainless steel, or aluminum sheets.
- D. Flanged Joint Sealant: Comply with ASTM C920.
1. General: Single-component, acid-curing, silicone, elastomeric.
  2. Type: S.
  3. Grade: NS.
  4. Class: 25.
  5. Use: O.
  6. Sealant shall have a VOC content of 420 g/L or less.
  7. Sealant shall comply with the testing and product requirements of the California Department of Public Health's "Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers."
- E. Flange Gaskets: Butyl rubber, neoprene, or EPDM polymer with polyisobutylene plasticizer.
- F. Round Duct Joint O-Ring Seals:
1. Seal shall provide maximum leakage class of 3 cfm/100 sq. ft. at 1-inch wg and shall be rated for 10-inch wg static-pressure class, positive or negative.
  2. EPDM O-ring to seal in concave bead in coupling or fitting spigot.
  3. Double-lipped, EPDM O-ring seal, mechanically fastened to factory-fabricated couplings and fitting spigots.

## 2.7 HANGERS AND SUPPORTS

- A. Hanger Rods for Noncorrosive Environments: Galvanized-steel rods and nuts.
- B. Hanger Rods for Corrosive Environments: Electrogalvanized, all-thread rods or galvanized rods with threads painted with zinc-chromate primer after installation.
- C. Strap and Rod Sizes: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Table 5-1, "Rectangular Duct Hangers Minimum Size," and Table 5-2, "Minimum Hanger Sizes for Round Duct."
- D. Steel Cables for Galvanized-Steel Ducts: Galvanized steel complying with ASTM A603.
- E. Steel Cables for Stainless-Steel Ducts: Stainless steel complying with ASTM A492.
- F. Steel Cable End Connections: Galvanized-steel assemblies with brackets, swivel, and bolts designed for duct hanger service; with an automatic-locking and clamping device.
- G. Duct Attachments: Sheet metal screws, blind rivets, or self-tapping metal screws; compatible with duct materials.
- H. Trapeze and Riser Supports:
1. Supports for Galvanized-Steel Ducts: Galvanized-steel shapes and plates.
  2. Supports for Stainless-Steel Ducts: Stainless-steel shapes and plates.

3. Supports for Aluminum Ducts: Aluminum or galvanized steel coated with zinc chromate.

## PART 3 - EXECUTION

### 3.1 DUCT INSTALLATION

- A. Drawing plans, schematics, and diagrams indicate general location and arrangement of duct system. Indicated duct locations, configurations, and arrangements were used to size ducts and calculate friction loss for air-handling equipment sizing and for other design considerations. Install duct systems as indicated unless deviations to layout are approved on Shop Drawings and coordination drawings.
- B. Install ducts in accordance with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible" unless otherwise indicated.
- C. Install ducts in maximum practical lengths with fewest possible joints.
- D. Install factory- or shop-fabricated fittings for changes in direction, size, and shape and for branch connections.
- E. Unless otherwise indicated, install ducts vertically and horizontally, and parallel and perpendicular to building lines.
- F. Install ducts close to walls, overhead construction, columns, and other structural and permanent enclosure elements of building.
- G. Install ducts with a clearance of 1 inch, plus allowance for insulation thickness.
- H. Route ducts to avoid passing through transformer vaults and electrical equipment rooms and enclosures.
- I. Where ducts pass through non-fire-rated interior partitions and exterior walls and are exposed to view, cover the opening between the partition and duct or duct insulation with sheet metal flanges of same metal thickness as the duct. Overlap openings on four sides by at least 1-1/2 inches.
- J. Install fire, combination fire/smoke, and smoke dampers where indicated on Drawings and as required by code, and by local authorities having jurisdiction. Comply with requirements in Section 233300 "Air Duct Accessories" for fire and smoke dampers and specific installation requirements of the damper UL listing.
- K. Install heating coils, cooling coils, air filters, dampers, and all other duct-mounted accessories in air ducts where indicated on Drawings.
- L. Protect duct interiors from moisture, construction debris and dust, and other foreign materials both before and after installation.
- M. Elbows: Use long-radius elbows wherever they fit.
  1. Fabricate 90-degree rectangular mitered elbows to include turning vanes.

2. Fabricate 90-degree round elbows with a minimum of three segments for 12 inches and smaller and a minimum of five segments for 14 inches and larger.

N. Branch Connections: Use lateral or conical branch connections.

### 3.2 INSTALLATION OF EXPOSED DUCTWORK

- A. Protect ducts exposed in finished spaces from being dented, scratched, or damaged.
- B. Trim duct sealants flush with metal. Create a smooth and uniform exposed bead. Do not use two-part tape sealing system.
- C. Grind welds to provide smooth surface free of burrs, sharp edges, and weld splatter. When welding stainless steel with a No. 3 or 4 finish, grind the welds flush, polish the exposed welds, and treat the welds to remove discoloration caused by welding.
- D. Maintain consistency, symmetry, and uniformity in arrangement and fabrication of fittings, hangers and supports, duct accessories, and air outlets.
- E. Repair or replace damaged sections and finished work that does not comply with these requirements.

### 3.3 DUCT SEALING

- A. Seal ducts for duct static-pressure, seal classes, and leakage classes specified in "Duct Schedule" Article in accordance with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible."
- B. Seal ducts at a minimum to the following seal classes in accordance with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible":
  1. Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible."
  2. Outdoor, Supply-Air Ducts: Seal Class A.
  3. Outdoor, Exhaust Ducts: Seal Class C.
  4. Outdoor, Return-Air Ducts: Seal Class C.
  5. Unconditioned Space, Supply-Air Ducts in Pressure Classes 2-Inch wg and Lower: Seal Class B.
  6. Unconditioned Space, Supply-Air Ducts in Pressure Classes Higher Than 2-Inch wg: Seal Class A.
  7. Unconditioned Space, Exhaust Ducts: Seal Class C.
  8. Unconditioned Space, Return-Air Ducts: Seal Class B.
  9. Conditioned Space, Supply-Air Ducts in Pressure Classes 2-Inch wg and Lower: Seal Class C.
  10. Conditioned Space, Supply-Air Ducts in Pressure Classes Higher Than 2-Inch wg: Seal Class B.
  11. Conditioned Space, Exhaust Ducts: Seal Class B.
  12. Conditioned Space, Return-Air Ducts: Seal Class C.

### 3.4 HANGER AND SUPPORT INSTALLATION

- A. Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Chapter 5, "Hangers and Supports."
- B. Building Attachments: Concrete inserts, powder-actuated fasteners, or structural-steel fasteners appropriate for construction materials to which hangers are being attached.
  - 1. Where practical, install concrete inserts before placing concrete.
  - 2. Install powder-actuated concrete fasteners after concrete is placed and completely cured.
  - 3. Use powder-actuated concrete fasteners for standard-weight aggregate concretes or for slabs more than 4 inches thick.
  - 4. Do not use powder-actuated concrete fasteners for lightweight-aggregate concretes or for slabs less than 4 inches thick.
  - 5. Do not use powder-actuated concrete fasteners for seismic restraints.
- C. Hanger Spacing: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Table 5-1, "Rectangular Duct Hangers Minimum Size," and Table 5-2, "Minimum Hanger Sizes for Round Duct," for maximum hanger spacing; install hangers and supports within 24 inches of each elbow and within 48 inches of each branch intersection.
- D. Hangers Exposed to View: Threaded rod and angle or channel supports.
- E. Support vertical ducts with steel angles or channel secured to the sides of the duct with welds, bolts, sheet metal screws, or blind rivets; support at each floor and at a maximum intervals of 16 feet.
- F. Install upper attachments to structures. Select and size upper attachments with pull-out, tension, and shear capacities appropriate for supported loads and building materials where used.

### 3.5 CONNECTIONS

- A. Make connections to equipment with flexible connectors complying with Section 233300 "Air Duct Accessories."
- B. Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible" for branch, outlet and inlet, and terminal unit connections.

### 3.6 PAINTING

- A. Paint interior of metal ducts that are visible through registers and grilles and that do not have duct liner. Apply one coat of flat, black, latex paint over a compatible galvanized-steel primer. Paint materials and application requirements are specified in Section 099113 "Exterior Painting" and Section 099123 "Interior Painting."

### 3.7 FIELD QUALITY CONTROL

- A. Perform tests and inspections.

- B. Duct System Cleanliness Tests:
  - 1. Visually inspect duct system to ensure that no visible contaminants are present.
- C. Duct system will be considered defective if it does not pass tests and inspections.
- D. Prepare test and inspection reports.

### 3.8 DUCT CLEANING

- A. Clean new duct system(s) before testing, adjusting, and balancing.
- B. Use duct cleaning methodology as indicated in NADCA ACR.
- C. Use service openings for entry and inspection.
  - 1. Provide openings with access panels appropriate for duct static-pressure and leakage class at dampers, coils, and any other locations where required for inspection and cleaning access. Provide insulated panels for insulated or lined duct. Patch insulation and liner as recommended by duct liner manufacturer. Comply with Section 233300 "Air Duct Accessories" for access panels and doors.
  - 2. Disconnect and reconnect flexible ducts as needed for cleaning and inspection.
  - 3. Remove and reinstall ceiling to gain access during the cleaning process.
- D. Particulate Collection and Odor Control:
  - 1. When venting vacuuming system inside the building, use HEPA filtration with 99.97 percent collection efficiency for 0.3-micron-size (or larger) particles.
  - 2. When venting vacuuming system to outdoors, use filter to collect debris removed from HVAC system, and locate exhaust downwind and away from air intakes and other points of entry into building.
- E. Clean the following components by removing surface contaminants and deposits:
  - 1. Air outlets and inlets (registers, grilles, and diffusers).
  - 2. Supply, return, and exhaust fans including fan housings, plenums (except ceiling supply and return plenums), scrolls, blades or vanes, shafts, baffles, dampers, and drive assemblies.
  - 3. Air-handling unit internal surfaces and components including mixing box, coil section, air wash systems, spray eliminators, condensate drain pans, humidifiers and dehumidifiers, filters and filter sections, and condensate collectors and drains.
  - 4. Coils and related components.
  - 5. Return-air ducts, dampers, actuators, and turning vanes except in ceiling plenums and mechanical equipment rooms.
  - 6. Supply-air ducts, dampers, actuators, and turning vanes.
  - 7. Dedicated exhaust and ventilation components and makeup air systems.

3.9 STARTUP

- A. Air Balance: Comply with requirements in Section 230593 "Testing, Adjusting, and Balancing for HVAC."

3.10 DUCT SCHEDULE

- A. Fabricate ducts with galvanized sheet steel except as otherwise indicated and as follows:
  - 1. Fabricate all ducts to achieve SMACNA pressure class, seal class, and leakage class as indicated below.
  - 2.
- B. Supply Ducts:
  - 1. Ducts Connected to Constant-Volume Air-Handling Units:
    - a. Pressure Class: Positive 2-inch wg.
    - b. Minimum SMACNA Seal Class: B.
    - c. SMACNA Leakage Class for Rectangular: 16.
    - d. SMACNA Leakage Class for Round and Flat Oval: 8.
  - 2. Ducts Connected to Variable-Air-Volume Air-Handling Units:
    - a. Pressure Class: Positive 3-inch wg.
    - b. Minimum SMACNA Seal Class: B.
    - c. SMACNA Leakage Class for Rectangular: 8.
    - d. SMACNA Leakage Class for Round and Flat Oval: 4.
- C. Return Ducts:
  - 1. Ducts Connected to Air-Handling Units:
    - a. Pressure Class: Positive or negative 2-inch wg.
    - b. Minimum SMACNA Seal Class: C.
    - c. SMACNA Leakage Class for Rectangular: 16.
    - d. SMACNA Leakage Class for Round and Flat Oval: 8.
- D. Intermediate Reinforcement:
  - 1. Galvanized-Steel Ducts: Galvanized steel.
  - 2. Stainless-Steel Ducts:
    - a. Exposed to Airstream: Match duct material.
  - 3. Aluminum Ducts: Aluminum or galvanized steel coated with zinc chromate.
- E. Elbow Configuration:
  - 1. Rectangular Duct: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 4-2, "Rectangular Elbows."



- a. Velocity 1000 fpm or Lower:
    - 1) Radius Type RE 1 with minimum 0.5 radius-to-diameter ratio.
    - 2) Mitered Type RE 4 without vanes.
  - b. Velocity 1000 to 1500 fpm:
    - 1) Radius Type RE 1 with minimum 1.0 radius-to-diameter ratio.
    - 2) Radius Type RE 3 with minimum 0.5 radius-to-diameter ratio and two vanes.
    - 3) Mitered Type RE 2 with vanes complying with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 4-3, "Vanes and Vane Runners," and Figure 4-4, "Vane Support in Elbows."
  - c. Velocity 1500 fpm or Higher:
    - 1) Radius Type RE 1 with minimum 1.5 radius-to-diameter ratio.
    - 2) Radius Type RE 3 with minimum 1.0 radius-to-diameter ratio and two vanes.
    - 3) Mitered Type RE 2 with vanes complying with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 4-3, "Vanes and Vane Runners," and Figure 4-4, "Vane Support in Elbows."
2. Rectangular Duct: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 4-2, "Rectangular Elbows."
- a. Radius Type RE 1 with minimum 1.5 radius-to-diameter ratio.
  - b. Radius Type RE 3 with minimum 1.0 radius-to-diameter ratio and two vanes.
  - c. Mitered Type RE 2 with vanes complying with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 4-3, "Vanes and Vane Runners," and Figure 4-4, "Vane Support in Elbows."
3. Round Duct: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 3-4, "Round Duct Elbows."
- a. Minimum Radius-to-Diameter Ratio and Elbow Segments: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Table 3-1, "Mitered Elbows." Elbows with less than 90-degree change of direction have proportionately fewer segments.
    - 1) Velocity 1000 fpm or Lower: 0.5 radius-to-diameter ratio and three segments for 90-degree elbow.
    - 2) Velocity 1000 to 1500 fpm: 1.0 radius-to-diameter ratio and four segments for 90-degree elbow.
    - 3) Velocity 1500 fpm or Higher: 1.5 radius-to-diameter ratio and five segments for 90-degree elbow.
    - 4) Radius-to Diameter Ratio: 1.5.
  - b. Round Elbows, 12 Inches and Smaller in Diameter: Stamped or pleated.
  - c. Round Elbows, 14 Inches and Larger in Diameter: Welded.

F. Branch Configuration:

1. Rectangular Duct: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 4-6, "Branch Connection."
  - a. Rectangular Main to Rectangular Branch: 45-degree entry.
  - b. Rectangular Main to Round Branch: Conical spin in.
2. Round and Flat Oval: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 3-5, "90 Degree Tees and Laterals," and Figure 3-6, "Conical Tees." Saddle taps are permitted in existing duct.
  - a. Velocity 1000 fpm or Lower: 90-degree tap.
  - b. Velocity 1000 to 1500 fpm: Conical tap.
  - c. Velocity 1500 fpm or Higher: 45-degree lateral.

END OF SECTION 233113

## SECTION 233300 - AIR DUCT ACCESSORIES

### PART 1 - GENERAL

#### 1.1 SUMMARY

##### A. Section Includes:

1. Manual volume dampers.
2. Flange connectors.
3. Turning vanes.
4. Duct-mounted access doors.
5. Flexible connectors.
6. Duct accessory hardware.

#### 1.2 ACTION SUBMITTALS

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

##### B. Shop Drawings: For duct accessories. Include plans, elevations, sections, details and attachments to other work.

1. Detail duct accessories fabrication and installation in ducts and other construction. Include dimensions, weights, loads, and required clearances; and method of field assembly into duct systems and other construction. Include the following:
  - a. Special fittings.
  - b. Manual volume damper installations.
  - c. Control-damper installations.
  - d. Fire-damper and smoke-damper installations, including sleeves; and duct-mounted access doors.
  - e. Wiring Diagrams: For power, signal, and control wiring.

#### 1.3 CLOSEOUT SUBMITTALS

##### A. Operation and maintenance data.

### PART 2 - PRODUCTS

#### 2.1 ASSEMBLY DESCRIPTION

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

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

## 2.2 MATERIALS

- A. Galvanized Sheet Steel: Comply with ASTM A653/A653M.
  - 1. Galvanized Coating Designation: G60.
  - 2. Exposed-Surface Finish: Mill phosphatized.
- B. Aluminum Sheets: Comply with ASTM B209, Alloy 3003, Temper H14; with mill finish for concealed ducts and standard, 1-side bright finish for exposed ducts.
- C. Extruded Aluminum: Comply with ASTM B221, Alloy 6063, Temper T6.
- D. Reinforcement Shapes and Plates: Galvanized-steel reinforcement where installed on galvanized sheet metal ducts; compatible materials for aluminum and stainless-steel ducts.
- E. Tie Rods: Galvanized steel, 1/4-inch minimum diameter for lengths 36 inches or less; 3/8-inch minimum diameter for lengths longer than 36 inches.

## 2.3 MANUAL VOLUME DAMPERS

- A. Standard, Steel, Manual Volume Dampers:
  - 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
    - a. Aire Technologies.
    - b. American Warming and Ventilating; a Mestek Architectural Group company.
    - c. Flexmaster U.S.A., Inc.
    - d. Flex-Tek Group.
    - e. McGill AirFlow LLC.
    - f. Nailor Industries Inc.
    - g. Ruskin Company.
    - h. Trox USA Inc.
    - i. Vent Products Co., Inc.
  - 2. Standard leakage rating.
  - 3. Suitable for horizontal or vertical applications.
  - 4. Frames:
    - a. Frame: Hat-shaped, 0.094-inch-thick, galvanized sheet steel.
    - b. Mitered and welded corners.
    - c. Flanges for attaching to walls and flangeless frames for installing in ducts.
  - 5. Blades:
    - a. Multiple or single blade.

- b. Parallel- or opposed-blade design.
  - c. Stiffen damper blades for stability.
  - d. Galvanized-steel, 0.064 inch thick.
- 6. Blade Axles: Galvanized steel.
  - 7. Bearings:
    - a. Oil-impregnated bronze.
    - b. Dampers in ducts with pressure classes of 3-inch wg or less shall have axles full length of damper blades and bearings at both ends of operating shaft.
  - 8. Tie Bars and Brackets: Galvanized steel.
- B. Standard, Aluminum, Manual Volume Dampers:
- 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
    - a. American Warming and Ventilating; a Mestek Architectural Group company.
    - b. McGill AirFlow LLC.
    - c. Nailor Industries Inc.
    - d. Ruskin Company.
    - e. Trox USA Inc.
    - f. Vent Products Co., Inc.
  - 2. Standard leakage rating.
  - 3. Suitable for horizontal or vertical applications.
  - 4. Frames: Hat-shaped, 0.10-inch-thick, aluminum sheet channels; frames with flanges for attaching to walls and flangeless frames for installing in ducts.
  - 5. Blades:
    - a. Multiple or single blade.
    - b. Parallel- or opposed-blade design.
    - c. Stiffen damper blades for stability.
    - d. Roll-Formed Aluminum Blades: 0.10-inch-thick aluminum sheet.
    - e. Extruded-Aluminum Blades: 0.050-inch-thick extruded aluminum.
  - 6. Blade Axles: Galvanized steel.
  - 7. Bearings:
    - a. Oil-impregnated bronze.
    - b. Dampers in ducts with pressure classes of 3-inch wg or less shall have axles full length of damper blades and bearings at both ends of operating shaft.
  - 8. Tie Bars and Brackets: Aluminum.
- C. Jackshaft:
- 1. Size: 0.5-inch diameter.
  - 2. Material: Galvanized-steel pipe rotating within pipe-bearing assembly mounted on supports at each mullion and at each end of multiple-damper assemblies.
  - 3. Length and Number of Mountings: As required to connect linkage of each damper in multiple-damper assembly.

D. Damper Hardware:

1. Zinc-plated, die-cast core with dial and handle made of 3/32-inch-thick zinc-plated steel, and a 3/4-inch hexagon locking nut.
2. Include center hole to suit damper operating-rod size.
3. Include elevated platform for insulated duct mounting.

2.4 FLANGE CONNECTORS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. CL WARD & Family Inc.
2. Ductmate Industries, Inc.
3. Harccast, Inc.
4. Nexus PDQ.
5. Ward Industries; a brand of Hart & Cooley, Inc.

B. Description: Add-on or roll-formed, factory-fabricated, slide-on transverse flange connectors, gaskets, and components.

C. Material: Galvanized steel.

D. Gauge and Shape: Match connecting ductwork.

2.5 TURNING VANES

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Aero-Dyne Sound Control Co.
2. Ductmate Industries, Inc.
3. Duro Dyne Inc.
4. METALAIRE, Inc.
5. SEMCO LLC.
6. Ward Industries; a brand of Hart & Cooley, Inc.

B. Manufactured Turning Vanes for Metal Ducts: Curved blades of galvanized sheet steel; support with bars perpendicular to blades set; set into vane runners suitable for duct mounting.

1. Acoustic Turning Vanes: Fabricate airfoil-shaped aluminum extrusions with perforated faces and fibrous-glass fill.

C. Manufactured Turning Vanes for Nonmetal Ducts: Fabricate curved blades of resin-bonded fiberglass with acrylic polymer coating; support with bars perpendicular to blades set; set into vane runners suitable for duct mounting.

D. General Requirements: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible"; Figures 4-3, "Vanes and Vane Runners," and 4-4, "Vane Support in Elbows."

E. Vane Construction: Double wall.

## 2.6 DUCT-MOUNTED ACCESS DOORS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
1. Aire Technologies.
  2. American Warming and Ventilating; a Mestek Architectural Group company.
  3. Ductmate Industries, Inc.
  4. Flexmaster U.S.A., Inc.
  5. Greenheck Fan Corporation.
  6. McGill AirFlow LLC.
  7. Nailor Industries Inc.
  8. Ward Industries; a brand of Hart & Cooley, Inc.
- B. Duct-Mounted Access Doors: Fabricate access panels according to SMACNA's "HVAC Duct Construction Standards - Metal and Flexible"; Figures 7-2, "Duct Access Doors and Panels," and 7-3, "Access Doors - Round Duct."
1. Door:
    - a. Double wall, rectangular.
    - b. Galvanized sheet metal with insulation fill and thickness as indicated for duct pressure class.
    - c. Vision panel.
    - d. Hinges and Latches: 1-by-1-inch butt or piano hinge and cam latches.
    - e. Fabricate doors airtight and suitable for duct pressure class.
  2. Frame: Galvanized sheet steel, with bend-over tabs and foam gaskets.
  3. Number of Hinges and Locks:
    - a. Access Doors Less Than 12 Inches Square: No hinges and two sash locks.
    - b. Access Doors up to 18 Inches Square: Two hinges and two sash locks.

## 2.7 FLEXIBLE CONNECTORS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
1. Ductmate Industries, Inc.
  2. Duro Dyne Inc.
  3. Ventfabrics, Inc.
  4. Ward Industries; a brand of Hart & Cooley, Inc.
- B. Materials: Flame-retardant or noncombustible fabrics.
- C. Coatings and Adhesives: Comply with UL 181, Class 1.
- D. Metal-Edged Connectors: Factory fabricated with a fabric strip 3-1/2 inches wide attached to two strips of 2-3/4-inch-wide, 0.028-inch-thick, galvanized sheet steel or 0.032-inch-thick aluminum sheets. Provide metal compatible with connected ducts.

- E. Indoor System, Flexible Connector Fabric: Glass fabric double coated with neoprene.
  - 1. Minimum Weight: 26 oz./sq. yd..
  - 2. Tensile Strength: 480 lbf/inch in the warp and 360 lbf/inch in the filling.
  - 3. Service Temperature: Minus 40 to plus 200 deg F.
  
- F. Outdoor System, Flexible Connector Fabric: Glass fabric double coated with weatherproof, synthetic rubber resistant to UV rays and ozone.
  - 1. Minimum Weight: 24 oz./sq. yd..
  - 2. Tensile Strength: 530 lbf/inch in the warp and 440 lbf/inch in the filling.
  - 3. Service Temperature: Minus 50 to plus 250 deg F.

## 2.8 DUCT ACCESSORY HARDWARE

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

## PART 3 - EXECUTION

### 3.1 INSTALLATION

- A. Install duct accessories according to applicable details in SMACNA's "HVAC Duct Construction Standards - Metal and Flexible" for metal ducts and in NAIMA AH116, "Fibrous Glass Duct Construction Standards," for fibrous-glass ducts.
  
- B. Install duct accessories of materials suited to duct materials; use galvanized-steel accessories in galvanized-steel and fibrous-glass ducts, stainless-steel accessories in stainless-steel ducts, and aluminum accessories in aluminum ducts.
  
- C. Install volume dampers at points on supply, return, and exhaust systems where branches extend from larger ducts. Where dampers are installed in ducts having duct liner, install dampers with hat channels of same depth as liner, and terminate liner with nosing at hat channel.
  - 1. Install steel volume dampers in steel ducts.
  - 2. Install aluminum volume dampers in aluminum ducts.
  
- D. Set dampers to fully open position before testing, adjusting, and balancing.
  
- E. Install test holes at fan inlets and outlets and elsewhere as indicated.
  
- F. Install duct access doors on sides of ducts to allow for inspecting, adjusting, and maintaining accessories and equipment at the following locations:
  - 1. Downstream from manual volume dampers, control dampers, backdraft dampers, and equipment.



2. Adjacent to and close enough to fire or smoke dampers, to reset or reinstall fusible links. Access doors for access to fire or smoke dampers having fusible links shall be pressure relief access doors and shall be outward operation for access doors installed upstream from dampers and inward operation for access doors installed downstream from dampers.
  3. Elsewhere as indicated.
- G. Install access doors with swing against duct static pressure.
- H. Access Door Sizes:
1. One-Hand or Inspection Access: 8 by 5 inches.
  2. Two-Hand Access: 12 by 6 inches.
  3. Head and Hand Access: 18 by 10 inches.
  4. Head and Shoulders Access: 21 by 14 inches.
  5. Body Access: 25 by 14 inches.
  6. Body plus Ladder Access: 25 by 17 inches.
- I. Label access doors according to Section 230553 "Identification for HVAC Piping and Equipment" to indicate the purpose of access door.
- J. Install flexible connectors to connect ducts to equipment.
- K. Install duct test holes where required for testing and balancing purposes.

### 3.2 FIELD QUALITY CONTROL

- A. Tests and Inspections:
1. Operate dampers to verify full range of movement.
  2. Inspect locations of access doors and verify that purpose of access door can be performed.
  3. Operate fire and smoke dampers to verify full range of movement and verify that proper heat-response device is installed.
  4. Inspect turning vanes for proper and secure installation.

END OF SECTION 233300

## SECTION 233713.13 - AIR DIFFUSERS

### PART 1 - GENERAL

#### 1.1 SUMMARY

A. Section Includes:

1. Round ceiling diffusers.

B. Related Requirements:

1. Section 233300 "Air Duct Accessories" for volume-control dampers not integral to diffusers.

#### 1.2 ACTION SUBMITTALS

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

### PART 2 - PRODUCTS

#### 2.1 ROUND CEILING DIFFUSERS

- A. Manufacturer: Subject to compliance with requirements, provide diffusers of one of the following:

1. E.H. Price
2. Titus Products Div.: Philips Industries, Inc.
3. Nailor.
4. Krueger.

- B. Devices shall be specifically designed for variable-air-volume flows.

- C. Material: Steel.

- D. Finish: Baked enamel, white.

- E. Face Style: Three cone.

- F. Mounting: Duct connection.

- G. Pattern: Adjustable.

- H. Dampers: Radial opposed blade.

### PART 3 - EXECUTION

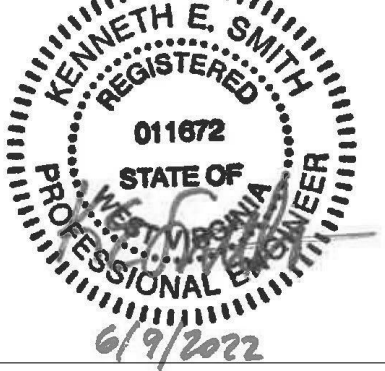
#### 3.1 INSTALLATION

- A. Install diffusers level and plumb.
- B. Ceiling-Mounted Outlets and Inlets: Drawings indicate general arrangement of ducts, fittings, and accessories. Air outlet and inlet locations have been indicated to achieve design requirements for air volume, noise criteria, airflow pattern, throw, and pressure drop. Make final locations where indicated, as much as practical. For units installed in lay-in ceiling panels, locate units in the center of panel. Where architectural features or other items conflict with installation, notify Architect for a determination of final location.
- C. Install diffusers with airtight connections to ducts and to allow service and maintenance of dampers, air extractors, and fire dampers.

#### 3.2 ADJUSTING

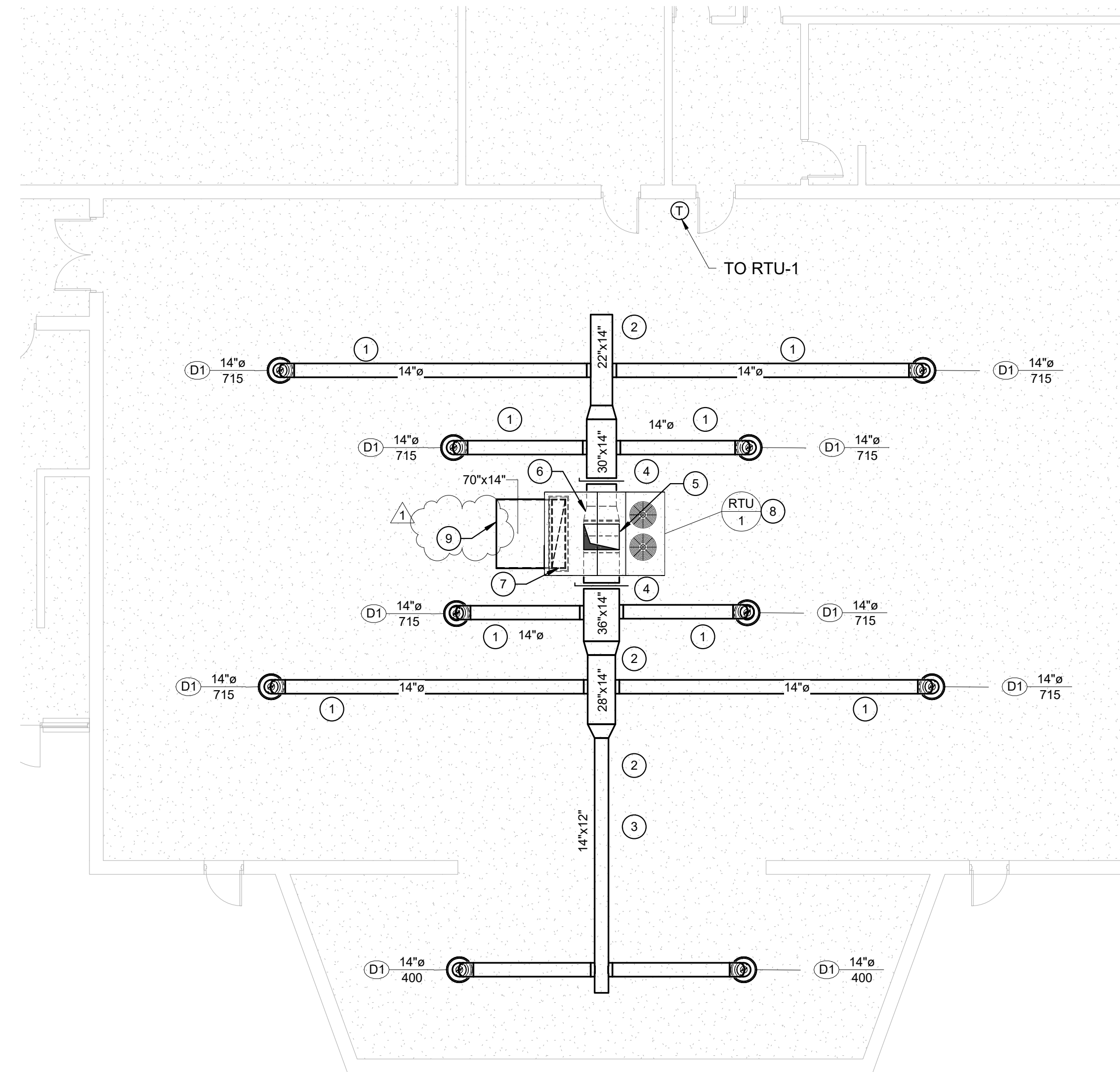
- A. After installation, adjust diffusers to air patterns indicated, or as directed, before starting air balancing.

END OF SECTION 233713.13

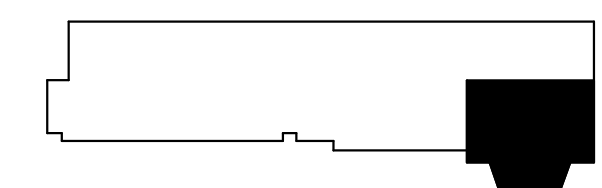


**PLAN NOTES**

NOTE #	DESCRIPTION
1	SUPPLY DUCT WITH 1" SOUND LINING ROUTED THROUGH WEB OF JOISTS.
2	SUPPLY DUCT WITH 1" SOUND LINING ROUTED BETWEEN JOISTS.
3	DROP DUCT DOWN AS REQUIRED TO SERVE THE STAGE.
4	BALANCING DAMPER.
5	36"x14" AND 36"x12" UP, COMBINED TO 36"x26" UP WITH TRANSITION TO UNIT OUTLET SIZE.
6	TRANSITION FROM 30"x14" TO 36"x12".
7	70"x14" UP WITH 1" SOUND LINING AND TRANSITION TO UNIT INLET SIZE.
8	RTU-1 LOCATED ON EXISTING CURB, PROVIDE CURB ADAPTER AS REQUIRED. CONTRACTOR SHALL MEASURE EXISTING CURB FOR COORDINATING CURB ADAPTER WITH NEW EQUIPMENT.
9	COVER OPEN END OF DUCT WITH BIRD SCREEN.



**1 FALL RIVER NEW WORK PLAN - MECHANICAL**  
FRM3.01 1/8" = 1'-0"



FALL RIVER KEY PLAN

Addendum #2  
7/16/2022

1

DESCRIPTION

DATE

BY

NO.

**HVAC UPGRADES FOR MCDOWELL COUNTY SCHOOLS**

FALL RIVER ES, MOUNT VIEW HS, SOUTHSIDE ES

JUNE 9, 2022

CONSTRUCTION DOCUMENTS

DRAWN: TTG DATE: 6/9/2022  
CHECKED: TTG DATE: 6/9/2022  
APPROVED: KES DATE: 6/9/2022

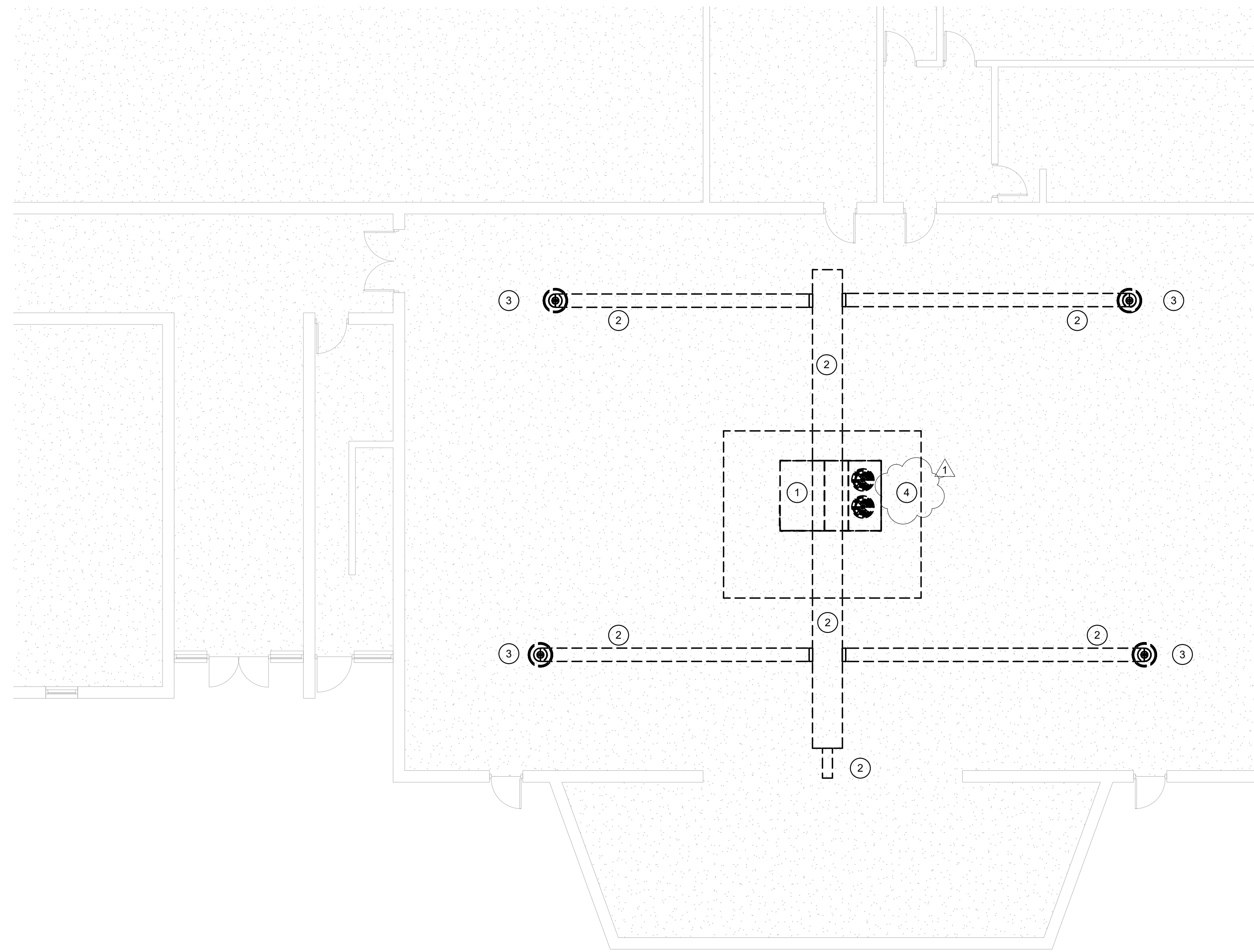
PROJECT No.

060-10289

FALL RIVER NEW WORK PLAN - MECHANICAL

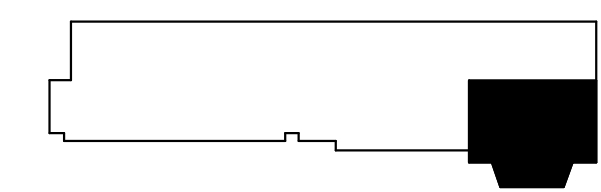
SHEET No.

**FRM3.01**



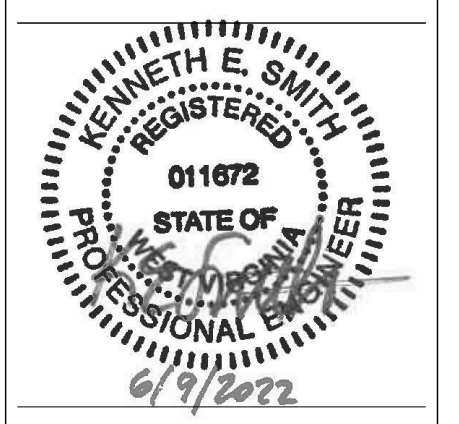
MECHANICAL DEMO KEYNOTES	
NOTE #	DESCRIPTION
1	REMOVE EXISTING ROOFTOP UNIT AND WALL MOUNTED THERMOSTAT. CURB TO REMAIN AND BE REUSED.
2	REMOVE EXISTING SUPPLY DUCTWORK AND HANGERS.
3	REMOVE EXISTING ROUND SUPPLY DIFFUSER AND HANGERS.
4	REMOVE EXISTING RETURN DUCTWORK AND HANGERS.

1 FALL RIVER DEMOLITION PLAN - MECHANICAL  
 FRMD3.01 1/8" = 1'-0"



FALL RIVER KEY PLAN

**THRASHER**  
 600 WHITE OAKS BLVD.  
 P.O. BOX 940  
 BRIDGEPORT, WV 26330  
 P (304) 624-4108  
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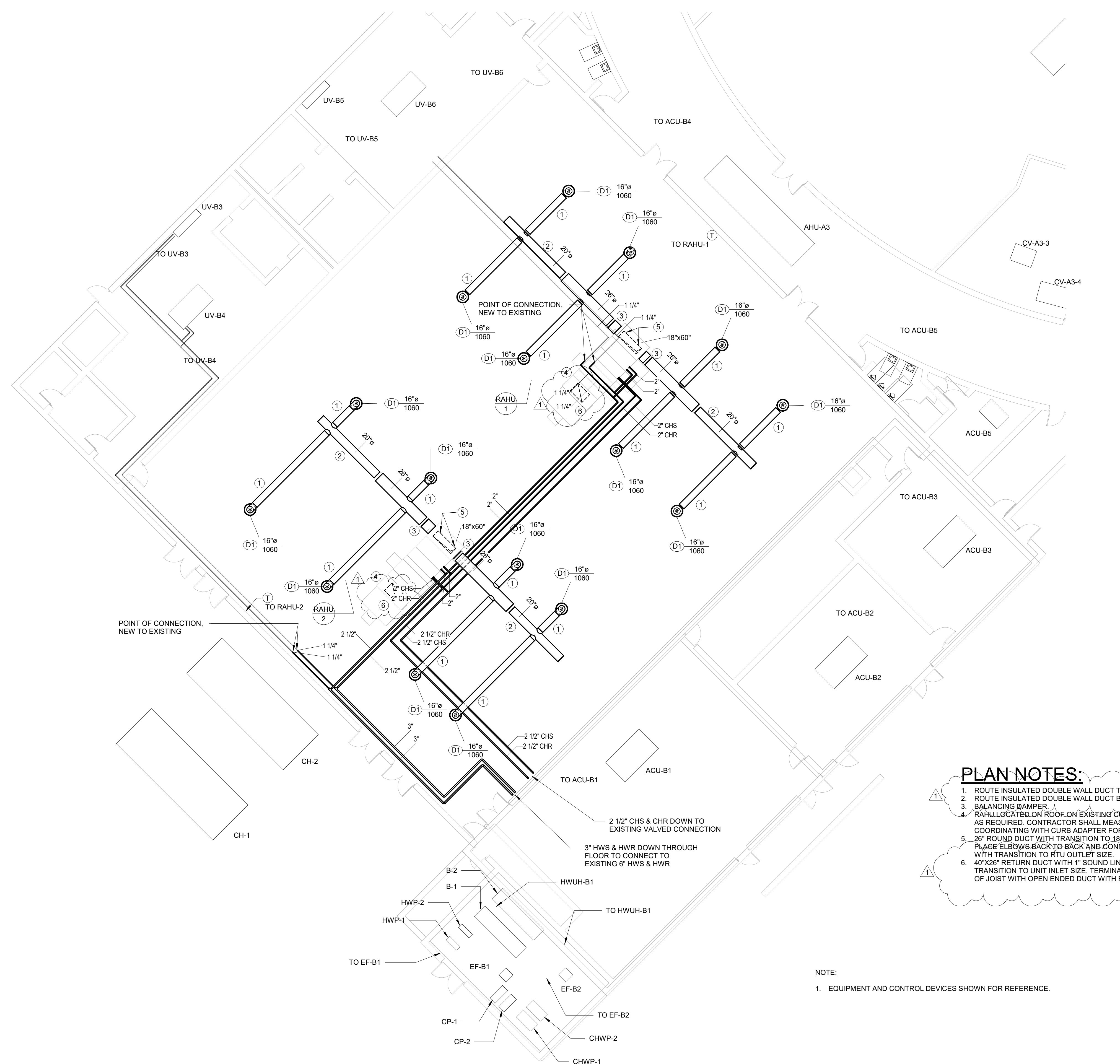
NO.	BY	DATE	DESCRIPTION
1		7/16/2022	Addendum #2

**HVAC UPGRADES FOR MCDOWELL COUNTY SCHOOLS**  
 FALL RIVER ES, MOUNT VIEW HS, SOUTHSIDE ES  
 JUNE 9, 2022  
 CONSTRUCTION DOCUMENTS

DRAWN: TTG DATE: 6/9/2022  
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 APPROVED: KES DATE: 6/9/2022  
 PROJECT No. 060-10289

FALL RIVER DEMOLITION PLAN - MECHANICAL  
 SHEET No.

**FRMD3.01**  
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POINT OF CONNECTION, NEW TO EXISTING

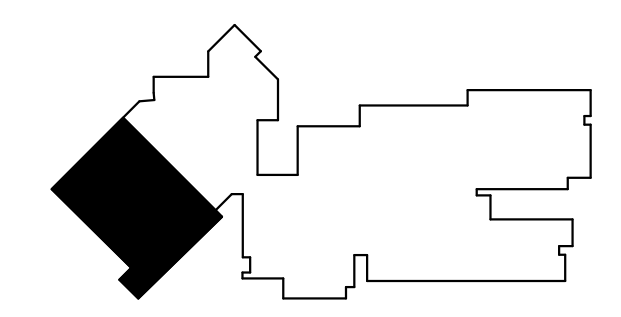
POINT OF CONNECTION, NEW TO EXISTING

**PLAN NOTES:**

1. ROUTE INSULATED DOUBLE WALL DUCT THROUGH WEB OF JOISTS.
2. ROUTE INSULATED DOUBLE WALL DUCT BETWEEN JOISTS.
3. BALANCING DAMPER.
4. RAHU LOCATED ON ROOF ON EXISTING CURB, PROVIDE CURB ADAPTER AS REQUIRED. CONTRACTOR SHALL MEASURE EXISTING CURB FOR COORDINATING WITH CURB ADAPTER FOR NEW EQUIPMENT.
5. 26" ROUND DUCT WITH TRANSITION TO 18"x30" ELBOW TURNING UP. PLACE ELBOWS BACK TO BACK AND CONNECT TO 18"x60" UP TO RTU WITH TRANSITION TO RTU OUTLET SIZE.
6. 40"x26" RETURN DUCT WITH 1" SOUND LINING UP TO RTU WITH TRANSITION TO UNIT INLET SIZE. TERMINATE RETURN DUCT AT BOTTOM OF JOIST WITH OPEN ENDED DUCT WITH BIRD SCREEN.

**NOTE:**

1. EQUIPMENT AND CONTROL DEVICES SHOWN FOR REFERENCE.



MOUNT VIEW KEY PLAN

MOUNT VIEW NEW WORK PLAN - MECHANICAL  
3/32" = 1'-0"

NO.	BY	DATE	DESCRIPTION
1			
7/16/2022			Addendum #2

**HVAC UPGRADES FOR MCDOWELL COUNTY SCHOOLS**  
FALL RIVER ES, MOUNT VIEW HS, SOUTHSIDE ES  
JUNE 9, 2022  
CONSTRUCTION DOCUMENTS

DRAWN: TTG DATE: 6/9/2022  
CHECKED: TTG DATE: 6/9/2022  
APPROVED: KES DATE: 6/9/2022

PROJECT No. 060-10289

MOUNT VIEW NEW WORK PLAN - MECHANICAL  
SHEET No.

**MVM3.01**