

## SECTION 23 31 16 - NONMETAL DUCTS

### PART 1 - GENERAL

#### 1.1 SUMMARY

A. Section Includes:

1. Phenolic-foam ducts and fittings.
2. Flexible ducts

#### 1.2 SUBMITTALS

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

B. Shop Drawings: Fabrication, assembly, and installation, including plans, elevations, sections, components, and attachments to other work including:

1. Duct layout indicating sizes and pressure classes.
2. Elevation of top of ducts.
3. Dimensions of main duct runs from building grid lines.
4. Fittings.
5. Penetrations through fire-rated and other partitions.

C. Coordination Drawings: Plans, drawn to scale, showing coordination general construction, building components, and other building services.

#### 1.3 QUALITY ASSURANCE

A. Installer Qualifications: Manufacturer's authorized representative who is trained and certified in writing by manufacturer for installation of phenolic-foam ducts and fittings.

B. NFPA Compliance:

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

#### 1.4 PRODUCT DELIVERY AND STORAGE

A. Prevent objectionable aesthetic damage to the outer surface of duct segments during transport and storage.

B. Store duct segments under cover and protect from environment.

## PART 2 - PRODUCTS

### 2.1 PHENOLIC-FOAM DUCTS AND FITTINGS

#### A. Product:

1. Knauf Insulation; Knauf KoolDuct.

#### B. Polymeric Sealing System: Coat ducts, including gang-nail couplings, grip flanges, and couplings.

#### C. Duct Panel: CFC-free phenolic-foam bonded on both sides with factory-applied 0.001-inch- (0.03 mm-) thick, aluminum foil reinforced with fiberglass scrim.

1. Maximum Temperature: 158 deg F (70 deg C) inside ducts or ambient temperature surrounding ducts.
2. Maximum Thermal Conductivity: 0.13 Btu x in./h x sq. ft. x deg F at 75 deg F mean temperature.
3. Permeability: 0.02 perms maximum when tested according to ASTM E 96/E 96M, Procedure A.
4. Antimicrobial Agent: Compound shall be tested for efficacy by an NRTL, and registered by the EPA for use in HVAC systems.
5. Noise-Reduction Coefficient: 0.05 minimum when tested according to ASTM C 423, Mounting A.
6. Required Markings: UL label and other markings required by UL 181 on each full sheet of duct panel; UL ratings for closure materials.
7. R-Value:
  - a. 29/32 inch (23 mm) Thick Panel: 6.1 R.
  - b. 1 3/32 inch (28 mm) Thick Panel: 8.0 R.

#### D. Closure Materials:

1. V-Groove Adhesive: Silicone.
2. Pressure-Sensitive Tape: Comply with UL 181A; imprinted by the manufacturer with the coding "181A-P," the manufacturer's name, and a date code.
  - a. Tape: Aluminum foil tape imprinted with listing information.
  - b. Minimum Tape Width: 3 inches (76 mm).
  - c. Water resistant.
  - d. Mold and mildew resistant.
3. Polymeric Sealing System:
  - a. Structural Membrane: Woven glass fiber.
  - b. Minimum Tape Width: 3 inches (76 mm).
  - c. Sealant: Water based.
  - d. Color: White.
  - e. Water resistant.
  - f. Mold and mildew resistant.

E. Fabrication:

1. Fabricate joints, seams, transitions, reinforcement, elbows, branch connections, access doors and panels, and damage repairs according to manufacturer's written instructions.
2. Fabricate 90-degree mitered elbows to include turning vanes.
3. Fabricate duct segments in accordance with manufacturer's written design guide.
4. Fabricate duct segments utilizing v-groove method of fabrication. Tape external seams, and fully seal internal seams with an unbroken layer of silicone. Flange each duct segment with either aluminum grip pro-file or Tiger connectors in accordance with manufacturer's design guide. Apply duct reinforcement to protect against side deformation from both positive and negative pressure per manufacturer's design guide based on ductwork size and system pressure.
5. Design fabricated duct segment fittings in accordance with "SMACNA HVAC Duct Construction Standards" latest edition.

2.2 FLEXIBLE DUCTS

A. Manufacturers:

1. Flexmaster U.S.A., Inc.
2. Hart & Cooley, Inc.
3. McGill AirFlow Corporation.

B. Noninsulated-Duct Connectors: UL 181, Class 1, multiple layers of aluminum laminate supported by helically wound, spring-steel wire.

1. Pressure Rating: 10-inch wg (2500 Pa) positive and 1.0-inch wg (250 Pa) negative.
2. Maximum Air Velocity: 4000 fpm (20.3 m/s).
3. Temperature Range: Minus 20 to plus 210 deg F (Minus 28 to plus 99 deg C).

C. Insulated-Duct Connectors: UL 181, Class 1, 2-ply vinyl film supported by helically wound, spring-steel wire; fibrous-glass insulation; polyethylene vapor barrier film.

1. Pressure Rating: 10-inch wg (2500 Pa) positive and 1.0-inch wg (250 Pa) negative.
2. Maximum Air Velocity: 4000 fpm (20.3 m/s).
3. Temperature Range: Minus 10 to plus 160 deg F (Minus 23 to plus 71 deg C).
4. Flexible Duct Clamps: Stainless-steel band with cadmium-plated hex screw to tighten band with a worm-gear action or Nylon strap, in sizes 3 through 18 inches (75 to 450 mm) to suit duct size.

2.3 HANGERS AND SUPPORTS

A. Hanger Rods: Cadmium-plated steel rods and nuts.

B. Strap and Rod Sizes: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Table 4-1, "Rectangular Duct Hangers Minimum Size," and Table 4-2, "Minimum Hanger Sizes for Round Duct."

- C. Steel Cables: ASTM A 603, galvanized steel with end connections made of cadmium-plated steel assemblies with brackets, swivel, and bolts designed for duct hanger service; with an automatic-locking and clamping device.
- D. Duct Attachments: Sheet metal screws, blind rivets, or self-tapping metal screws; compatible with duct materials.
- E. Trapeze and Riser Supports: Steel shapes complying with ASTM A 36/A 36M.
- F. Cable Lock System: Duro Dyne; CL23 or CL12 cable locks with the WC4 or WC6 cable.

## PART 3 - EXECUTION

### 3.1 DUCT INSTALLATION

- A. Limit installation of non-metal duct to non-sales areas where non-metal duct is concealed by a ceiling.
- B. Install foam ducts and fittings to comply with manufacturer's written system design guide and as follows:
  - 1. Install ducts with fewest possible joints.
  - 2. Unless otherwise indicated, install ducts vertically and horizontally, and parallel and perpendicular to building lines.
  - 3. Install ducts close to walls, overhead construction, columns, and other structural and permanent enclosure elements of building.
  - 4. 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. Overlap openings on four sides by at least **1-1/2 inches (38 mm)**.
  - 5. Where ducts pass through fire-rated interior partitions and exterior walls, install fire dampers. Comply with requirements in Division 23 Section "Air Duct Accessories" for fire and smoke dampers.
  - 6. Protect duct interiors from the moisture, construction debris and dust, and other foreign materials. Comply with SMACNA's "Duct Cleanliness for New Construction Guidelines."
- C. Connect flexible ducts to metal ducts with liquid adhesive plus tape.
- D. Air Leakage: Duct air leakage rates to be in compliance with "SMACNA HVAC Duct Construction Standards" latest version per applicable leakage class based on pressure.

### 3.2 HANGER AND SUPPORT INSTALLATION

- A. Install hangers and supports for fibrous-glass ducts and fittings to comply with manufacturer's written instructions and SMACNA's "Fibrous Glass Duct Construction Standards," Chapter 6, "Hangers and Supports."

- B. Install upper attachments to structures. Select and size upper attachments with pull-out, tension, and shear capacities appropriate for supported loads and building materials where used.

### 3.3 FIELD QUALITY CONTROL

- A. Inspection: Arrange for manufacturer's representative to inspect completed installation and provide written report that installation complies with manufacturer's written instructions.
  - 1. Remove and replace duct system where inspection indicates that it does not comply with specified requirements.
- B. Perform additional testing and inspecting, at Contractor's expense, to determine compliance of replaced or additional work with specified requirements.

### 3.4 DUCT SCHEDULE

- A. Indoor Ducts and Fittings:
  - 1. Phenolic-Foam Rectangular Ducts and Fittings:
    - a. Minimum Panel Thickness: 29/32 inch (23 mm).
    - b. Aluminum Cladding: Minimum 0.025 inch (6 mm) thick.

END OF SECTION 23 31 16

**BLANK SHEET**