

SECTION 233100 - METAL HVAC DUCTS

PART 1 GENERAL

1.1 SECTION INCLUDES

- A. Metal ductwork.
- B. Nonmetal ductwork.
- C. Duct cleaning.

1.2 RELATED REQUIREMENTS

- A. Section 09 9000 - Painting and Coating: Weld priming, weather resistant, paint or coating.
- B. Section 11 4000 - Foodservice Equipment: Supply of kitchen range hoods for placement by this Section.
- C. Section 23 1030.51 - HVAC Air Duct Cleaning: Cleaning ducts after completion of installation.
- D. Section 23 0713 - Duct Insulation: External insulation and duct liner.
- E. Section 23 3300 - Air Duct Accessories.
- F. Section 23 3700 - Air Outlets and Inlets.
- G. Section 23 0593 - Testing, Adjusting, and Balancing for HVAC.

1.3 REFERENCE STANDARDS

- A. ASHRAE (FUND) - ASHRAE Handbook - Fundamentals; 2005.
- B. ASTM A 653/A 653M - Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process; 2009a.
- C. ASTM E 84 - Standard Test Method for Surface Burning Characteristics of Building Materials; 2010.
- D. NFPA 90A - Standard for the Installation of Air-Conditioning and Ventilating Systems; National Fire Protection Association; 2009.
- E. NFPA 90B - Standard for the Installation of Warm Air Heating and Air Conditioning Systems; National Fire Protection Association; 2009.
- F. SMACNA (LEAK) - HVAC Air Duct Leakage Test Manual; Sheet Metal and Air Conditioning Contractors' National Association; 1985, First Edition.
- G. SMACNA (DCS) - HVAC Duct Construction Standards - Metal and Flexible; Sheet Metal and Air Conditioning Contractors' National Association; 2005.
- H. UL 181 - Standard for Factory-Made Air Ducts and Air Connectors; Underwriters Laboratories Inc.; Current Edition, Including All Revisions.

1.4 SUBMITTALS

- A. See Section 01 3000 - Administrative Requirements, for submittal procedures.
- B. Shop Drawings: Indicate duct fittings, particulars such as gages, sizes, welds, and configuration prior to start of work for 1" pressure class and higher systems.
- C. Project Record Documents: Record locations of ducts and duct fittings. Record changes in fitting location and type. Show additional fittings used.

1.5 QUALITY ASSURANCE

- A. Manufacturer Qualifications: Company specializing in manufacturing the type of products specified in this section, with a minimum of three years of documented experience.
- B. Installer Qualifications: Company specializing in performing the type of work specified in this section, with a minimum of 3 years of documented experience.

1.6 REGULATORY REQUIREMENTS

- A. Construct ductwork to NFPA 90A standards.

1.7 FIELD CONDITIONS

- A. Do not install duct sealants when temperatures are less than those recommended by sealant manufacturers.
- B. Maintain temperatures within acceptable range during and after installation of duct sealants.

PART 2 PRODUCTS

2.1 DUCT ASSEMBLIES

- A. All Ducts: Galvanized steel, unless otherwise indicated.
- B. Low Pressure Supply: 2-inch w.g. pressure class, galvanized steel, seal class "B".
- D. Double-Wall Duct and Fitting Fabrication:
 - 1. Manufacturers:
 - a. Eastern Sheet Metal, Inc.
 - b. Lindab Inc.
 - c. McGill AirFlow Corporation.
 - d. SEMCO Incorporated.
 - 2. Outer Shell: Base metal thickness on outer-shell dimensions. Fabricate outer-shell lengths 2 inches longer than inner duct and insulation and in metal thickness specified for single-wall duct. Provide paint grip outer finish for field painting.
 - 3. Insulation: 1-inch- thick fibrous glass, unless otherwise indicated. Terminate insulation where double-wall duct connects to single-wall duct or uninsulated components and reduce outer shell diameter to inner duct diameter.
 - 4. Thermal Conductivity (k-Value): 0.26 at 75 deg F mean temperature.
 - 5. Perforated Inner Ducts: Fabricate with 0.028-inch-thick sheet metal having 3/32-inch- diameter perforations, with overall open area of 23 percent.
 - 6. Maintain concentricity of inner duct to outer shell by mechanical means. Prevent dislocation of insulation by mechanical means.
 - 7. Fittings: Fabricate double-wall (insulated) fittings with an outer shell and an inner duct. Provide paint grip outer finish for field painting.
 - 8. Perforated Inner Ducts: Fabricate with 0.028-inch- thick sheet metal having 3/32-inch- diameter perforations, with overall open area of 23 percent.
 - 9. DO NOT apply duct sealer to exposed duct joints.
- E. Return and Relief: 2-inch w.g. pressure class, galvanized steel.
- F. General Exhaust: 1-inch w.g. pressure class, galvanized steel.
- G. Transfer Air: 1-inch w.g. pressure class, galvanized steel.

2.2 MATERIALS

- A. Galvanized Steel for Ducts: Hot-dipped galvanized steel sheet, ASTM A 653/A 653M FS Type B, with G90/Z275 coating.

- B. Joint Sealers and Sealants: Non-hardening, water resistant, mildew and mold resistant.
 - 1. Type: Heavy water-based mastic or liquid used alone or with tape, suitable for joint configuration and compatible with substrates, and recommended by manufacturer for pressure class of ducts.
 - 2. VOC Content: Not more than 0 g/L, excluding water.
 - 3. Surface Burning Characteristics: Flame spread of zero, smoke developed of zero, when tested in accordance with ASTM E 84.
- C. Hanger Rod: ASTM A 36/A 36M; steel, galvanized; threaded both ends, threaded one end, or continuously threaded.

2.3 DUCTWORK FABRICATION

- A. Fabricate and support in accordance with SMACNA HVAC Duct Construction Standards - Metal and Flexible, and as indicated.
- B. No variation of duct configuration or size permitted except by written permission. Size round duct installed in place of rectangular ducts in accordance with ASHRAE Handbook - Fundamentals.
- C. Provide duct material, gages, reinforcing, and sealing for operating pressures indicated.
- D. Construct T's, bends, and elbows with radius of not less than 1-1/2 times width of duct on centerline. Where not possible and where rectangular elbows must be used, provide air foil turning vanes of perforated metal with glass fiber insulation.
- E. Increase duct sizes gradually, not exceeding 15 degrees divergence wherever possible; maximum 30 degrees divergence upstream of equipment and 45 degrees convergence downstream.
- F. Fabricate continuously welded round and oval duct fittings in accordance with SMACNA HVAC Duct Construction Standards - Metal and Flexible.
- G. Where ducts are connected to exterior wall louvers and duct outlet is smaller than louver frame, provide blank-out panels sealing louver area around duct. Use same material as duct, painted black on exterior side; seal to louver frame and duct.

2.4 MANUFACTURED DUCTWORK AND FITTINGS

- A. Flexible Ducts (Low Pressure Systems): UL 181, Class 1, aluminum laminate and polyester film with latex adhesive supported by helically wound spring steel wire.
 - 1. Insulation: Fiberglass insulation with polyethylene vapor barrier film.
 - 2. Pressure Rating: 6 inches WG positive and 4 inches WG negative.
 - 3. Maximum Velocity: 4000 fpm.
 - 4. Temperature Range: -20 degrees F to 210 degrees F.
 - 5. Manufacturers:
 - a. Flexmaster Type 5.
 - b. Technaflex WK.
 - c. Thermoflex M-KE.

PART 3 EXECUTION

3.1 INSTALLATION

- A. Install, support, and seal ducts in accordance with SMACNA HVAC Duct Construction Standards - Metal and Flexible.
- B. Install in accordance with manufacturer's instructions.
- C. During construction provide temporary closures of metal or taped polyethylene on open ductwork to prevent construction dust from entering ductwork system.

- D. Flexible Ducts: Connect to metal ducts with draw bands.
- E. Duct sizes indicated are inside (air size) dimensions. Increase size for duct liner.
- F. Provide openings in ductwork where required to accommodate thermometers and controllers. Provide pilot tube openings where required for testing of systems, complete with metal cap with spring device or screw to ensure against air leakage. Where openings are provided in insulated ductwork, install insulation material inside a metal ring.
- G. Locate ducts with sufficient space around equipment to allow normal operating and maintenance activities.
- H. Use crimp joints with or without bead for joining round duct sizes 8 inch and smaller with crimp in direction of air flow.
- I. Use double nuts and lock washers on threaded rod supports.
- J. Do not use flexible duct to change direction.
- K. Connect diffusers to low pressure ducts directly or with 5 feet maximum length of flexible duct held in place with strap or clamp.
- L. At exterior wall louvers, seal duct to louver frame and install blank-out panels.

3.2 CLEANING

- A. Clean duct system and force air at high velocity through duct to remove accumulated dust. To obtain sufficient air, clean half the system at a time. Protect equipment that could be harmed by excessive dirt with temporary filters, or bypass during cleaning.

END OF SECTION 233100