

## SECTION 233110

### DUCTWORK, ACCESSORIES, AND SHEETMETAL SPECIALTIES

#### PART 1 GENERAL

##### 1.1 STIPULATION

- A. The General Conditions, drawings and all other attached documents form a part of this Section and all other Sections by reference thereto and have the same force and effect as if printed herewith in full. The Contractor shall be strictly accountable for the cognizance of carrying out the provisions thereof.

#### PART 2 PRODUCTS

##### 2.1 DUCTWORK

###### A. General

1. All duct dimensions listed on drawings are clear inside openings after insulation application.
2. All duct work passing through fire-rated or smoke separations protected by Halon shall be sealed around with Flame Seal as manufactured by Nelson, 3M Brand Fire Barrier CP25WB, or UL rated ceramic fiber as accepted, to provide a vapor tight seal and 2-hour UL listed fire stop.

###### B. Material

1. SMACNA has discontinued the use of the terms "low", "medium", "high" as applied to duct air velocity and or pressure classifications, however, for the purpose of this contract: low, medium, and high pressure ductwork shall be defined as follows, unless more stringent requirements are indicated on the drawings or specified herein.

###### **Classification: "LOW" PRESSURE DUCTWORK**

SMACNA Pressure Class	Operating Pressure Velocity	
1/2" w.g. pos. or neg.	Up to 1/2" w.g.	2000 fpm max.
1" w.g. pos. or neg.	Over 1/2" up to 1" w.g.	2000 fpm max.
2" w.g. pos. or neg.	Over 1" up to 2" w.g.	2000 fpm max.

###### **Classification: "MEDIUM" PRESSURE DUCTWORK**

SMACNA Pressure Class	Operating Pressure Velocity	
3" w.g. pos. or neg.	Over 2" up to 3" w.g.	2800 fpm max.
4" w.g. pos.	Over 3" up to 4" w.g.	2800 fpm max.
6" w.g. pos.	Over 4" up to 6" w.g.	2800 fpm max.

###### **Classification: "HIGH" PRESSURE DUCTWORK**

SMACNA Pressure Class	Operating Pressure Velocity
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10" w.g. pos.

Over 6" up to 10" w.g.

4000 fpm max.

2. Unless otherwise noted, the following pressure classifications are to be used:
  - a. All non-variable-air-volume ductwork shall be low pressure ductwork.
  - b. Variable-air-volume supply ductwork from the supply fan to the variable-air-volume terminal unit shall be medium pressure.
  - c. Ductwork down stream of the variable-air-volume terminal unit shall be low pressure.
  - d. Ductwork associated with smoke control systems shall be medium pressure.
3. Ductwork shall be sealed with a UL listed sealing compound in accordance with SMACNA and as required below.

**SEAL CLASS A**

Sealing Required: All transverse joints, longitudinal seams and duct wall penetrations

Static Pressure Construction Class:

4" w.g. and up

Medium and high pressure ductwork

**SEAL CLASS B**

Sealing required: All transverse joints and longitudinal seams

Static Pressure Construction Class:

3" w.g.

Medium pressure ductwork

**SEAL CLASS C**

Sealing required: Transverse joints

Static Pressure Construction Class:

2" w.g.

Low pressure ductwork

Static Pressure Construction Class:

2" w.g. and down

Low pressure supply, fresh air, and  
combination fresh air/return ductwork

**C. Low Pressure Rectangular, Square and Round Galvanized Ducts**

1. Duct base metal shall be not less than the following gauges:

Longest Side or Diameter	U.S.S. Gauge Number
12" or less	26
13" to 30"	24
31" to 60"	22
61" to 90"	20
Over 90"	18

2. Ducts with larger dimension of 24" and over shall be provided with transverse joint or angle bracing stiffeners, 4' o.c. for ducts up to 60" and 2' o.c. for ducts over 60", long sides. O.C. spacing for transverse joints shall not exceed 8'.

3. Bracing angles generally shall be of the same material as the ducts or structural steel shapes. Bracing shall be riveted to duct 5" o.c.
4. Long radius elbows and transitions shall be used wherever possible. Where not possible, rectangular elbows may be used. Provide air foil turning vanes with rectangular or short radius elbows.
5. Transform duct sizes gradually, not exceeding 15 degrees divergence and 30 degrees convergence.
6. Structural steel angle cradles or metal strips shall be used to support all ductwork as required for proper installation.

#### D. Duct Connection Systems

1. At the Contractor's option or where indicated on drawings, the Ductmate Duct Connection System manufactured by Ductmate Industries, Inc., and as specified herein, may be used as a method for connection sections of rectangular ductwork. Ductmate shall be used on round ducts in chase areas where indicated on drawings.
  - a. The Ductmate System shall result in the creation of a tight joint with zero leakage.
  - b. System shall be assembled and installed per manufacturer's instructions.
  - c. All component parts shall be of the composition and materials manufactured only by Ductmate Industries, Inc., and guaranteed against defective material and workmanship. If the Contractor desires to submit a substitute manufacturer, he shall provide full compliance report containing catalog data, test data, and engineering specifications, to the Professional for review.
  - d. The Ductmate System shall not be used for applications with duct gauges heavier than 16 gauge or lighter than 26 gauge.
  - e. Factory trained personnel shall be available upon the Contractor's request, at no charge, to instruct the Contractor in the use of the Ductmate System.

## 2.2 FLEXIBLE COLLARS

- A. Collars shall be approximately four (4") inches long, of the flexible, neoprene type.
- B. All materials shall have a flame spread of 25 or less and a smoke developed rating of 50 or less when tested in accordance with ASTM E 84.

## 2.3 FLEXIBLE DUCT

### A. Material

1. Flexible duct for connection to diffusers shall be a factory fabricated assembly consisting of an inner sleeve, insulation and an outer moisture barrier. The inner sleeve shall be constructed of a continuous vinyl-coated spring steel wire helix fused to a continuous layer of Fiberglass impregnated and coated with vinyl. A 1-1/4" thick insulating blanket of Fiberglass wool shall incase the inner sleeve and be sheathed with an outer moisture barrier of a reinforced Mylar neoprene laminate of low permeability. The flexible duct shall be rated for a maximum working velocity 2000 fpm (low pressure) and shall be listed by the Underwriters Laboratories

under their UL-181 standards as Class 1 duct and shall comply with NFPA Standard 90A. All materials shall have a flame spread of 25 or less and a smoke developed rating of 50 or less when tested in ASTM E 84. The flexible duct shall be Thermaflex Model MK-E (low pressure).

## 2.4 TURNING VANES

- A. Furnish and install turning vanes, where indicated on drawings.
- B. Vanes shall be High Efficiency Profile as manufactured by Tuttle & Bailey/Hart & Cooley, Cain Manufacturing Co., Inc., Duro Dyne Corp, or equal as accepted.

## 2.5 BALANCING DAMPERS

- A. Balancing dampers shall be an opposed blade locking control type.
- B. Damper (when closed) shall have less than 1/2 of 1% leakage holding against 4" W.G. static pressure. Performance curves shall be based on 2000 fpm velocity.
- C. The frame shall be fabricated of heavy gauge galvanized steel, triple crimped for strength. The frame shall be welded construction throughout, except for operable blades shall pivot on half inch diameter cadmium plated, cold rolled steel stub shafts, in sintered bronze, self-lubricating bearings with one movable blade shaft extendable up to six inches.
- D. The blade linkage shall consist of 12 gauge galvanized steel clips on alternate rolled steel rod, and welded/riveted shaft end linkage, concealed in the jamb, connecting interim blades. The maximum blade width shall not exceed ten inches.
- E. Units with blade spans greater than 42 inches shall be made in multiple sections.
- F. The dampers shall be complete with mounting holes punched in the side frames on the blade centerlines.
- G. Dampers shall be as manufactured by Louvers and Dampers, Inc., Ruskin Manufacturing Co., or Arrow United.

## 2.6 FIRE DAMPERS

- A. A sleeve gauge may not be less than shown for duct gauge as listed in NFPA Bulletin 90A, Latest Edition.
- B. All fire dampers shall have been tested under the STANDARD FOR FIRE DAMPERS UL -55- (latest edition) and shall be so labeled by UNDERWRITERS' LABORATORIES, INC. Dampers shall also be of the stacked blade design with the blade ends extended into the tracks at both jambs a minimum of 3/4". Dampers shall be UL listed for installation in a 2-hour fire stop. For locations where the damper is in the rectangular duct with an air flow velocity between 1000 and 2000 FPM, the nominal damper width shall be the same as the duct width but the blade stack (damper in open position), shall be out of the air stream (Type B damper). For locations involving round or flat oval duct, or rectangular with an air velocity exceeding 2000 FPM, the fire damper frame in the air stream (Type C damper). Mullions required for multiple damper installations shall have the same rating of the dampers. Manufacturer's data shall show UL testing approval for both duct and ductless

testing. Dampers shall be Air Balance Inc., Ruskin Manufacturing Company Inc., Prefco Products, Inc., and must meet applicable U.L. design numbers.

## 2.7 SPIN COLLARS

- A. For each flexible duct connection off of a main or branch duct to a ceiling diffuser and for each outlet off of the ventilation ductwork to the plenum air furnish and install a spin collar with a positive locking balancing damper.
- B. Spin collars shall be Type DESC for sheetmetal ductwork or Type FDESC for fiberglass ductwork as manufactured by Clevaflex Division of Clevapak Corporation, Type FLDE for sheetmetal ductwork of Type DBDE for fiberglass ductwork as manufactured by Flexmaster U.S.A., Inc., or equal as approved. In lieu of spin-in collars, this Contractor may, at his option, provide Buckley Air-Tite Bellmouth Model BM-D connectors with locking quadrant damper.

## PART 3 EXECUTION

### 3.1 GENERAL

- A. Where equipment furnished vary in dimensions, configuration, electrical characteristics, or location, etc., from the layout indicated on the drawings, the contractor shall make all modifications required to accommodate the actual equipment to be provided. Submission of shop drawings shall indicate acceptance of this responsibility. In any case an accurate 1/4" - 1'0" drawings shall be submitted with the shop drawings for approval by the professional prior to installation.
- B. All equipment shall be installed in a workmanlike manner by skilled workmen regularly engaged in this type of work.
- C. Where equipment is relocated to a place other than that shown on the drawings or when equipment other than that specified is used, the Contractor shall pay the entire cost of required revisions to such items as structural steel, concrete, electrical work, piping and ductwork.
- D. It is the full responsibility of this Contractor to ensure that the equipment he is providing fully conforms to this specification before submission to the Professional for review. This Contractor shall incur and shall be fully responsible for any and all costs associated with the equipment provided by a substitute manufacturer. Acceptance of the substitute manufacturer's equipment by the Professional will not relieve this Contractor of this responsibility.
- E. All ductwork as specified herein shall be internally lined, except the dishwasher exhaust ductwork, the kitchen hood make-up air system (on the downstream side of the make-up air system filters), or as otherwise noted on the project drawings or herein specified to be wrapped.
- F. The execution of the work shall be under the direct control and supervision of the insulation manufacturer or his authorized representative, in strict accordance with the manufacturer's instructions and recommendations, the best practice of the trade and the intent of these specifications.
- G. All devices shall be installed according to the best practices of the trade and the manufacturer's recommendations.

### 3.2 DUCT WORK

- A. General

1. Ducts, casings, fittings, transitions and accessories shall be made of galvanized sheet iron or steel and shall be installed in complete accordance with ASHRAE & SMACNA.
2. Provide flexible connections for all duct to equipment connections.
3. All ducts shall be strongly and rigidly constructed, and all joints and seams shall be mechanically tight as well as substantially and properly air tight. Sheet metal for slips and drive caps shall be of equal thickness and material as ducts.
4. Furnish and install access panels as previously specified under Section HVAC SPECIALTIES for concealed duct work.
5. Furnish and install duct access panels at all locations requiring access to:
  - a. dampers, all types
  - b. valves
  - c. control devices
  - d. fire alarm devices
  - e. at fifteen (15') feet on centers to permit duct cleaning
6. All duct work passing through fire-rated or smoke separators shall have the space between the wall and ductwork sealed.
7. Manufacturer's recommendations regarding product application and installation shall be strictly adhered to.
8. Special care shall be taken to construct, support and dress exposed ductwork neatly.

### 3.3 FLEXIBLE COLLARS

- A. Flexible (neoprene) collars shall be provided in all connections between fans and ducts or casings, where required, to prevent excessive movement of long ducts and wherever ducts cross building expansion joints.
- B. Collars shall be approximately four (4") inches long and shall be installed with just sufficient slack to prevent transmission of vibration. Circular collars shall be secured to fans and ducts with 12-gauge metal bands one (1") inch wide. Rectangular collars shall be secured to ducts and fans with 1 X 1/8" flat bars fastened with screws or bolts at eight (8") inch intervals or with slip joints similar to those specified for duct joints, the fabric being tightly crimped into the slip joint and the complete joint being fastened with sheet metal screws at eight (8") inch intervals. Collars shall not be painted. Metal for fastening collars shall be the same as specified for ducts and bracing.

### 3.4 FLEXIBLE DUCT

- A. All flexible duct runs shall not exceed 14 feet (or as shown less than 14 feet on project drawings) in length to comply with UL Standards for air ducts current addition of NFPA 90A-8. Where flexible duct runs exceed 14 feet on the drawings, the remainder shall be made up of round sheet metal and insulated with lining as specified, gauges of round duct shall be as recommended by ASHRAE with bands and hangers attached to the building structure with straight runs and smooth radius.

1. All connections to rigid duct diffusers etc., shall be made with thimble, sleeves and connector as recommended by manufacturer.
2. Furnish and install spin-collars as specified under 15A3 - "Air Control Devices" for all flexible duct to sheet-metal duct connections.
3. Flexible ductwork shall be properly supported elbows per SMACNA standards and in no case laid unsupported over top of ceilings or crushed sections.

### 3.5 DUCTWORK ACCESSORIES

#### A. Turning Vanes

1. Furnish and install turning vanes, where indicated on drawings or as herein specified.

END OF SECTION