

SECTION 23 31 00

HVAC DUCTS, ACCESSORIES, AND CASINGS

1.0 GENERAL

1.01 DESCRIPTION

- A. All work specified in this Section is governed by the Common Work Results for HVAC Section 23 05 00.
- B. This Section 23 31 00 and the accompanying drawings cover the provisions of all labor, equipment, appliances, and materials and performing all operations in connection with the construction of the ductwork systems as specified herein and as shown. These systems include, but are not limited to, the following:
 - 1. Supply air ductwork
 - 2. Return, transfer and relief air ductwork
 - 3. Exhaust ductwork
 - 4. Outside air ductwork
 - 5. Ductwork accessories

1.02 INTENT

- A. It is the intent of this Section of the specifications to provide a complete operable duct system as shown and specified which is reasonably airtight, free of noise, vibration and sweating, and fabricated so as to fit into the space allotted and to exhibit a minimum resistance to airflow.

1.03 DESIGN AND CONSTRUCTION - DUCTWORK

- A. Ductwork shall be provided in strict accordance with the third edition - 2005 - of the SMACNA HVAC Duct Construction Standards - Metal and Flexible, NFPA No. 90A, 90B, 91 and 96, and UL 181. **Where SMACNA tables have an option between different gauges and supports, the heavier gauge shall be used.**
- B. Ductwork dimensions shown are net, clear, inside dimensions with no allowance shown for duct liner. All ductwork specified to be lined shall be 2" larger than shown in each dimension to compensate for the liner. Ductwork shall be square, rectangular, round, spiral or flat oval as noted. Conversion of duct shapes and sizes shown shall be accomplished without increasing air velocities or friction losses and is subject to prior approval by the Architect and Engineer.
- C. Elbows shall be either full radius type (inside radius equal to duct width), five-gore radiused flat-oval type or, in low pressure systems only, mitered with double-thickness turning vanes except that lined ductwork for low pressure returns and transfers shall not have turning vanes.

- D. Abrupt changes in duct sizes and shapes shall not be permitted. The total angle of diverging transitions shall be not more than 15 degrees; converging transitions shall be not more than 30 degrees unless otherwise noted or required due to structural constraints.
- E. Offsets, transitions, rises and drops are not individually called out on the Design Drawings. They shall be provided as required to fit the ductwork into the allocated spaces.
- F. Transition rectangular ductwork on bottom and sides. Maintain top of ductwork level and as high as possible.
- G. "Medium pressure ductwork" shall be constructed for 3" WC static pressure class at 4000 FPM velocity with Class A seals. Applications shall include:
 - 1. All supply air ductwork from the packaged rooftop unit
 - 2. All ductwork between central ventilation fans (such as outside air, toilet exhaust, pressure relief, energy recovery units, 100% outdoor air units)
 - 3. All ductwork in systems subject to more than 1" WC.
- H. All other ductwork shall be constructed for standard 1" WC static pressure class at 2500 FPM with Class C seals and is herein defined as "low pressure ductwork".
- I. Provide the following types of ductwork material for the services indicated:
 - 1. Galvanized sheetmetal: supply, return, exhaust, and relief of conditioned and outside air

2.0 PRODUCTS

2.01 GALVANIZED SHEETMETAL

- A. Galvanized sheetmetal shall be lock-forming grade G90-ASTM A 653 hot dip galvanized steel sheets. Sheetmetal shall be galvanized with not less than 0.90 ounces of zinc per square foot on both sides of the sheet.
- B. Galvanized sheetmetal installed outside the building and subject to weather shall be soldered or welded. See Section 23 07 13 for additional information about covering and insulation.
- C. Galvanized sheetmetal installed outside the building and not exposed to weather, such as in covered loading docks and parking decks, may match the construction of ductwork inside the building.
- D. Galvanized sheetmetal ductwork outside the building within 20 miles of the

seacoast shall have corrosion coating appropriate to the installation location.

2.02 SPIRAL DUCT

- A. Spiral duct shall be utilized for all flat-oval and round ductwork in medium and high-pressure systems.
- B. Spiral duct shall be the product of United McGill Corporation, R.V. Money, Eastern Sheet Metal, or an approved equal.
- C. Spiral duct with internal ribs is not acceptable.
- D. Spiral duct shall conform to SMACNA 2005 Standards. Lighter gauges, etc. due to standing ribs are not acceptable.
- E. Spiral duct in exposed ceiling applications shall have slip fittings, minimum Class 3 for 2" WG negative pressure to 10" WG positive pressure, with EPDM gaskets. Coordinate assembly with ductwork insulation.

2.03 DAMPERS

- A. Manual Volume Dampers
 - 1. Single blade butterfly dampers are acceptable up to 12" round or 12" x 12" square. Dampers larger than these dimensions shall be multi-blade type. Single blade dampers shall be constructed of 16 gauge or heavier galvanized sheetmetal.
 - 2. No multi-blade damper blade shall exceed 8" in width. All multiple blade dampers shall be constructed of 16 gauge galvanized steel or heavier. The damper frame shall be 16 gauge or heavier. The damper action shall be opposed-blade type.
 - 3. Each blade shall pivot on a 1/2" cadmium plated, cold-rolled steel axle which pivots within self-lubricating, Oilite bronze bearings.
 - 4. The top and bottom edges of each rectangular damper blade shall be crimped for stiffness.
 - 5. The operating rod for all dampers shall be extended outside the damper frame for attachment of an operator. Each operator shall have a position indicator and locking quadrant.
 - 6. All dampers utilized for introduction of outside air shall have flexible, gasketed edge and end seals. The leakage rate shall be less than 4 CFM per SF of face area against a 1" WC differential pressure, based on a

nominal 48" x 48" damper size.

7. All dampers utilized for exhaust or relief air shall have flexible, gasketed edge and end seals. The leakage rate shall be less than 4 CFM per SF of face area against a 1" WC differential pressure, based on a nominal 48" x 48" damper size.
8. Dampers to be installed in insulated ductwork shall have standoffs sufficient to allow for insulation and vapor barrier integrity.
9. Manual volume dampers shall be as manufactured by Louvers & Dampers, Inc., Pottorff, Greenheck, Nailor, Ruskin, or an approved equal.

B. Control Dampers

1. Control dampers shall be of the same construction as manual volume dampers, except that no manual operator and quadrant is required. The operating rod shall be suitable for operation by an automatic pneumatic or electric operator.

C. Fire Dampers

1. Fire dampers shall be UL-listed and labeled for 1 1/2 or 3 hours, in accordance with the installation location, and shall be provided with 160°F links or linkages appropriate for the service. Dampers installed within ducts shall be Type B or Type C with the blades out of the air stream. Areas indicated shall be net, clear, open areas.
2. Fire dampers shall be appropriate for the installation location and application. All fire dampers in supply, return, exhaust, etc. shall be dynamic-type.
3. Fire dampers shall be as manufactured by Louvers & Dampers, Inc., Pottorff, Greenheck, Nailor, Ruskin, or an approved equal.

D. Smoke Dampers

1. Smoke dampers shall be UL-listed as Class 1 low-leakage smoke dampers. Smoke dampers shall be 24V and wired under this Division.
2. Smoke dampers shall be appropriate for the installation location and application. All fire dampers in supply, return, exhaust, etc. shall be dynamic-type.
3. Smoke dampers shall be as manufactured by Prefco, Louvers & Dampers, Inc., Pottorff, Greenheck, Nailor, Ruskin, or an approved equal.

E. Fire/Smoke Dampers

1. Fire/smoke dampers may be combined into a combination fire/smoke dampers. All provisions of the above shall apply. Fire/smoke dampers shall be UL-listed.

F. Backdraft Dampers

1. Backdraft dampers shall be sized according to their installation location and noted pressure setting. Damper pressure setting shall be adjustable and shall be accessible from outside ductwork or via access hatch, as applicable.

2.04 LOW-PRESSURE DUCT BRANCHES

- A. Splitter dampers shall be provided at all low-pressure ductwork branches. All low-pressure ductwork branches shall be radiused or 45 degree take-offs; straight taps are unacceptable. The length of the damper blade shall be the same as the width of the widest duct section at the split, but in no case shall blade length be less than 12". Each operator rod shall have a locking swivel joint.

2.05 FLEXIBLE DUCT

- A. Flexible ductwork shall be Class 1, UL 181 air duct and meet NFPA 90A and 90B Standards.
- B. The internal duct surface shall be acoustically rated, core layers bonded to a coated steel wire helix. The external jacket shall be a fiberglass, bi-directionally reinforced, metallized vapor barrier with a standing, triple ply seam. Fiberglass insulation shall be provided between the duct surface and the jacket to achieve a minimum R-4.2. Any flex duct outside the building thermal envelope shall be R-8 in Climate Zones 1-4 and R-12 in Climate Zones 5-8.
- C. Flexible ductwork shall be suitable for 10" WG positive pressure and 0.5" WG negative pressure in sizes 4" through 12" ID, and 6" WG positive pressure and 0.5" WG negative pressure in sizes 14-16" ID.
- D. Flexible ductwork, insulation and insulation cover shall be suitable for ceiling return air plenum installation and shall comply with all applicable codes and standards regarding such ceiling plenum installations.
- E. Flexible duct shall be ATCO or an approved equal.
- F. The maximum allowable installed length of flexible ductwork shall be as follows:

1. 8'-0" on low-pressure supply air systems limited to short runouts and end of runs connected to round neck supply diffusers and registers.
 2. 4'-0" on medium and high-pressure supply air systems limited to the runouts from the sheetmetal ductwork to each terminal unit.
 3. 2'-0" on connections from round neck grilles to sheetmetal ductwork on return, exhaust and transfer ductwork.
- G. Provide a spin-in fitting with integral scoop and volume damper at all flexible run-out connections in low-pressure supply air ductwork only, except locations where spin-in fittings would project more than 50% into the projecting ductwork dimension. Adhesive fittings are acceptable provided they are also screwed to the ductwork and sealed with mastic.
- H. Flexible ductwork shall not pass through wall, floors, or ceilings.

2.06 TERMINAL UNIT RUNOUTS

- A. Medium and high-pressure runouts to terminal units shall be connected to the trunk duct with factory-welded laterals, conical tees or bellmouth fittings; abrupt round to rectangular taps are strictly prohibited and shall be rejected.
- B. Terminal unit runouts shall be the largest of the associated terminal unit inlet size, the size noted on the drawings, or the scheduled runout size.

2.07 FLEXIBLE CONNECTIONS

- A. Provide flexible duct connections at the inlet and outlet of each belt-driven fan, indoor unit, fan coil unit, air handling unit, etc., and at all other locations indicated. Flexible connections shall be fabricated from a glass fabric coated on both sides with neoprene. Minimum weight shall be 30 oz. per sq. yard. Flexible connections shall be used for vibration isolation only and shall not be used to correct connection misalignment.

2.08 DUCT HARDWARE

- A. Duct hardware shall be as manufactured by Young Regulator or an approved equal.

2.09 ACCESS DOORS

- A. A duct access door shall be provided at each fire and smoke damper. Access doors shall be designed for 1.5 times the pressure of the duct in which they are mounted. Access doors shall be of sufficient size to provide access to the dampers for resetting the blades and replacing the links. Access doors in medium and high-

pressure ductwork shall be installed downstream of fire dampers and shall be implosion type. Where access is provided through gypsum board walls or ceilings, furnish access door for installation under Division 09. Coordinate with Division 09 and Architect. Each door shall match the fire-rating of the wall or ceiling indicated.

- B. Access shall be provided to duct-mounted smoke detector locations. Access shall allow inspection and maintenance of all aspects of the detector. Access doors shall meet the requirements of A, above, as needed.

3.0 EXECUTION

3.01 INSTALLATION

- A. Ductwork shall be installed in strict accordance with SMACNA, UL, and NFPA standards.
- B. All ductwork installed outside the building shall be secured to the structure. Coordinate with the Structural Engineer as needed. It is the Contractor's responsibility to design and coordinate all supports. All supports shall be designed to withstand all code-required wind and seismic loads.
- C. Flexible ducts utilized in the low-pressure ductwork systems shall be installed without kinks or bends which are less than a centerline radius equal to or greater than twice the diameter of the flexible duct being installed. Also, in the runouts from the medium or high-pressure ductwork to the terminal units, the flexible ducts shall be installed with a variance of no more than 1" per foot of installed length off a straight and level line from the centerline of the sheetmetal ductwork runout or tap to the centerline of the terminal unit inlet. The size of the flexible ductwork connected to each terminal unit shall be the equivalent size of the larger of the following:
 - 1. The inlet size of the terminal unit valve
 - 2. The runout size indicated on the drawings

Should the runout size indicated on the drawings differ from the inlet size of the terminal unit valve, or where the inlet to the terminal unit is rectangular, the transition shall be made with sheetmetal and shall occur at the inlet to the terminal unit.

- D. All low pressure ductwork downstream of VAV units shall be left uncapped for balancing until tenant fit-up affects the units.
- E. All intersections (crossing) of low-pressure and medium-pressure ductwork shall be made with offsets in the low-pressure ductwork only. The medium pressure ductwork shall be ran straight and level.

- F. Electric duct heaters shall be installed as indicated and in conformance with the manufacturer's recommendations. Coordinate the actual units to be provided with all trades. The heater shall be tested and adjusted after installation to provide the capacities indicated.
- G. Ductwork labels, including factory labels, tags, etc. except equipment nameplates shall be removed to the satisfaction of the Architect in all exposed areas.
- H. Dampers shall be adjustable. Where dampers are not or will not be accessible without access panels, provide and install remote balancing cable control system, Young Regulator or equal. Adjustment shall be from a nearby accessible area.

END OF SECTION