

SECTION 15880

AIR DISTRIBUTION

PART 1 GENERAL

1.1 SUMMARY

- A. This section describes minimum requirements, products and methods of execution relating to the project air distribution systems.

PART 2 PRODUCTS

1.2 DUCTWORK

- A. Constructed ductwork shall be in accordance with SMACNA HVAC Duct Construction Standards, Metal and Flexible. Metal thickness and reinforcing shall comply with the Standard for the pressure class of each duct system.
- B. Seal all ductwork in accordance with SMACNA HVAC Duct Construction Standards, Metal and Flexible.
- C. Materials:
 - 1. Refer to part 3 for the duct material schedule.
 - 2. Steel ducts: Hot-dip galvanized steel sheets per ASTM Standard A 653. Gauge numbers indicated in contract and reference documents are from Manufacturers Standard Gauge. Minimum thickness within tolerance permitted by AISI Steel Products Handbook.
 - 3. Aluminum ducts: Where indicated or scheduled, mill-finish aluminum sheet series 2XXX or 3XXX. Thickness specified in Brown and Sharp gauge numbers. Note that for equal thickness B&S non-ferrous gauge numbers are numerically lower than MSG numbers.
- D. Pressure Classes:
 - 1. Construct each duct systems for the appropriate duct pressure classification according to SMANCA. Refer to the schedule in Part 3 for pressure classification of existing air handler distribution ductwork.
 - 2. Where pressure classes are not scheduled or indicated on the contract drawings, duct systems shall be constructed using 1-inch water gauge pressure class methods, except when the duct serves a variable volume supply system.
 - 3. All variable volume duct systems where pressure classes not scheduled or indicated on the contract drawings shall be constructed with 2-inch water gauge pressure class methods upstream of terminal units and 1-inch water gauge pressure class methods downstream of terminal units.

1.3 UNDERGROUND DUCTWORK

- A. Direct bury:
 - 1. Duct: Fiberglass reinforced, polyester resin, 3/16 inch wall thickness.

2. Fittings: Fiberglass reinforced, polyester resin, 3/16 Inch wall thickness. Bends may be of mitered construction, with maximum 45 Degree bend per miter.
 3. Manufacturers: Spunstrand or equal.
- B. Concrete Encased: Provide in accordance with "A" above, or Article 2.1 Ductwork.
- C. Insulated: Provide water tight double wall construction with sheet metal inner liner in accordance with Article 2.1, and fiberglass completely filling the void between inner and outer walls.

1.4 PLENUMS AND CASINGS

- A. Construct from factory fabricated plenum wall in accordance with the manufacturer's instructions. Acoustical material shall be covered with Mylar or similar material to protect packing from accumulation of dust.
- B. Except where otherwise shown or scheduled plenums shall be double wall constructed with an outer sheetmetal layer (20 gauge, minimum), insulated with a thickness of 2 inches (4 inches when designated), and covered with perforated galvanized sheet metal inner layer (22 gauge minimum.). Design Pressure for Plenums and casings shall not be less than the highest point of the fan static pressure curve at design rpm multiplied by 1.25 and considered to be negative or positive depending upon location relative to fan.
- C. Acoustical Performance Sound Transmission Losses (dB):

<u>BAND, HZ</u>	<u>125</u>	<u>250</u>	<u>500</u>	<u>1000</u>	<u>2000</u>	<u>4000</u>
2" Plenum	18	21	29	38	49	55
4" Plenum	16	24	35	45	53	58

- D. Manufacturers for Double Wall Plenums and Casings: United Sheet Metal, Pace, DynaSonics, IAC, air handling equipment manufacturer when applicable.

1.5 FLEXIBLE DUCT

- A. Flexible ductwork between air terminal units and air outlets was included in the noise control systems for the existing air handlers, and may be required to meet noise criteria in finished spaces. A minimum of 8 LF is recommended.
- B. Flexible duct shall be Form NM-IL (Nonmetallic, insulated, lined) unless otherwise indicated and shall be listed by UL as complying with Standard 181, Class 1 Air Duct, and shall comply with NFPA 90A.
- C. Permitted uses shall be:
1. Connections to air diffusers and returns in lay-in ceiling, 10 to 12 feet in length with one 90-degree bend or a large radius 180-degree curve in addition to connection at diffuser.
 2. Connections from medium pressure duct systems to terminal units not permitted.
- D. Acoustic characteristics shall not be less than the following, which is based on Thermoflex M-KF. Net insertion loss for 8 inch diameter, 10 feet of straight run:

<u>BAND, HZ</u>	<u>125</u>	<u>250</u>	<u>500</u>	<u>1000</u>	<u>2000</u>	<u>4000</u>	<u>8000</u>
Loss dB	8	12	29	35	36	24	14

- E. Manufacturers: Thermoflex (Type M-KF), Genflex or approved equal.

1.6 DAMPERS

A. Volume Dampers:

1. Locate dampers a minimum of 10 feet from diffusers except where clearly shown otherwise.
2. Remote Volume Damper Operators: Provide where damper is otherwise inaccessible.

B. Combination Fire and Smoke Dampers:

1. Dampers shall be UL listed and labeled in accordance with standard UL Standard 555S. Fire/Smoke dampers shall also be classified in accordance with UL Standard 555 for 1-1/2 hour or 3- hour rating as required for the construction in which it will be installed.
 - a. Temperature resistance classification shall be 250 degrees F.
 - b. Leakage classification shall be I.

Leakage Classifications

"I" = 4 CFM/SF

At 1-inch water column differential and not more than twice listed value at 4 inches water column.

C. Fire Dampers:

1. Dampers shall be listed and labeled in accordance with UL Standard 555. Rating shall be suitable to the wall construction shown on the architectural drawings but not less than 1-1/2 hour minimum rating. Comply with NFPA 90A requirements.

1.7 AIR TERMINAL UNITS

A. Construction:

1. Casing of not less than 22 gauge galvanized steel.
2. Line with fiberglass duct liner material not less than 3/4-inch thickness and 1-1/2 pcf density. Insulation shall be UL Listed under Standard 181 and conform to NFPA Standard 90A. Cover all edges of insulation with metal flange.
3. Provide inner wall constructed by one of the following methods to minimize the collection of dust and to prevent insulation fibers from entering the air stream:
 - a. Metal inner panels constructed from 26 gauge A-60 galvanized steel.
 - b. Mylar or Tedlar film with all edges and tears sealed.
 - c. Foil Scrim Kraft (FSK) liner with all edges and tears sealed.
4. Sound lining for attenuator plenum section for terminal boxes shall be protected from direct contact with air stream by a FSK, Mylar or tedlar film with all edges and tears sealed using SMACNA recommended duct tape or duct sealant as appropriate.
5. Reheat terminals shall be constructed as specified for basic terminal and with heating coil incorporated into casing. Where necessary a transition piece shall be provided to adapt the heating coil to the discharge opening on the casing.

6. Control Damper: Damper shall have a durable elastomer seal suitable for 100 percent shut off. Pressure drop at maximum rated cfm with valve open shall not exceed 0.35 inches water column static pressure.
 7. Factory mounted multi-point, center averaging velocity sensor with minimum of four measuring ports arranged in parallel to the takeoff point, with a minimum of .05 inch differential signal at 500 fpm inlet velocity.
 8. Leakage shall not exceed the following:
 - a. Casing: Two percent rated cfm at 1.5-inch water column internal pressure.
 - b. Damper: Two percent rated cfm at 1.5-inch water column differential pressure.
- B. Hot Water Reheat Coils: Supply with terminal unit.
- C. Acoustical Performance:
1. Sound Rating: Determine sound power ratings from tests conducted in an Air Diffusion Council certified laboratory in accordance with ADC Standard 1062R. Demonstrate that NC ratings can be directly compared and related to those specified.
 2. Basic terminal units, primary air capacity up to 1200 cfm and inlet pressure of one-inch water column shall not exceed the following total radiated noise levels.
- | <u>Band, Hz</u> | <u>125</u> | <u>250</u> | <u>500</u> | <u>1000</u> | <u>2000</u> |
|-----------------|------------|------------|------------|-------------|-------------|
| S.P.L., dB | 66 | 54 | 49 | 41 | 38 |
3. Sound power levels shall be determined in accordance with the current applicable ASHRAE Standard, and shall be included with submittal.
- D. Controllers:
1. Coordinate with Section 15900 – Building Automation System, to have VAV controllers factory mounted.

1.8 LOUVERS

- A. Exterior Louvers:
1. Extruded aluminum drainable blades, 3/4 inch square, flattened aluminum bird screen on inside face, zero water penetration at 900 fpm free area velocity; hidden mullions; frame to match installation detailed on Architectural Drawings; Kynar 500 Fluoropon, color as selected by Contracting Agency.

1.9 ROOF HOODS

- A. Hood shall be a curb-mounted unit.

PART 2 PART 3 EXECUTION

2.1 INSTALLATION

- A. Ductwork:
1. Install ductwork and mechanical systems in accordance with SMACNA HVAC Duct Construction Standards.

2. Provide vibration isolation for all supply ductwork for the first four duct support points downstream of the fan (at least 15 feet) in accordance with Section 15070.
 3. Seal exhaust ducts along all seams and joints using medium pressure duct sealant. Use of duct tape as a sealant is not acceptable.
 4. Coordinate the routing of ducts with other trades and to avoid interference with other building features.
 5. Flexible duct shall not be used to connect trunk runouts to terminal units.
- B. Duct Supports:
1. Provide generally in accordance with SMACNA HVAC Duct Construction Standards.
 2. Provide earthquake bracing for ductwork in accordance with general criteria specified in Sections 15070. Spacing of sway braced points shall not exceed 20 feet, or as indicated.
 3. Duct mounted equipment such as heating coils shall be supported independently of duct when 40 pounds, or greater weight. Smaller items shall have duct supports and sway bracing within 12 inches.
- C. Air Terminal Units:
1. Locate terminal unit so all access panels, controls, dampers, actuators, and other appurtenances that require adjustment and maintenance are accessible.
 2. Support air terminal units independent of duct system. Provide sway bracing within 12 inches of support attachment.
 3. Connect to system air inlets with rigid ductwork of the same diameter that is straight for a minimum of 10 duct diameters. Flexible duct is not allowed. Where terminal inlet is smaller than run out connection size shown on the drawing, reduce duct to inlet size 10 duct diameters from the inlet.
 4. Provide access panel in boxes with heating coils for cleaning of heating coils.
- D. Volume Dampers:
1. Provide air volume dampers at each low-pressure duct main and branch as necessary for air balancing and as indicated.
 2. Provide volume dampers at each air outlet branch duct. Locate upstream of flexible duct and immediately adjacent to trunk, except where air outlets are scheduled with volume damper integral to the outlet.
- E. Penetrations through exterior building skin:
1. Make all penetrations watertight and weathertight under all weather conditions. Detail ductwork connections to prevent condensation or leakage from entering into surrounding building construction. Provide sleeves, special connections and sealants as required to accomplish this performance requirement.
 2. Slope ductwork to drain through wall louvers and openings for hoods or other sidewall devices. Make bottom of ductwork watertight, and drill 1/2-inch minimum diameter weep holes at six inches on center through base of bottom louver blade as required for drain water to escape.

F. Flexible Connections:

1. Air handling units and fans. Provide flexible connections where ducts attach to unit except internally isolated units as specified below.
2. Ducts connecting internally isolated units may require flexible connections to permit relative movement, such as a duct connecting a roof hood to the air handler casing. Provide as indicated and as required.

2.2 PAINT IN MECHANICAL ROOMS

- A. Paint all ductwork exposed in mechanical rooms. Where the ductwork is insulated, refer to Section 15080 – Mechanical Insulation.

2.3 DUCTWORK MATERIAL SCHEDULE

- A. Provide ductwork with the following materials`

Air System	Material
Supply	Steel, Aluminum, Fibrous
Buried outside air or exhaust	Glass Fiber Reinforced Plastic
Return and Relief	Steel, Aluminum
General Exhaust	Steel, Aluminum
Kitchen Hood Exhaust	Steel, Stainless Steel
Outside Air Intake	Steel
Combustion Air	Steel

2.4 DUCTWORK PRESSURE CLASS SCHEDULE

- A. Provide ductwork for each duct system listed below constructed to the pressure class indicated. All other duct system shall be constructed to 1" pressure class standards.

Air System	Pressure Class (Inches Water Column)
AHU-1C	2"
AHU-2C	3"
AHU-3C	3"
AHU-4C	3"
AHU-5C	3"
AHU-6CA	1"
AHU-6CB	3"
AHU-1M	1"
AHU-2MA	1"
AHU-2MB	2"

Air System	Pressure Class (Inches Water Column)
AHU-2MC	2"
AHU-2MD	2"
AHU-3M	2"
AHU-4M	1"

END OF SECTION