

SECTION 15800 - AIR DISTRIBUTION

PART 1 - GENERAL

1.1 SUMMARY

- A. Section Includes:
 - 1. Ductwork, dampers, inlets and outlets for HVAC systems.
- B. Related Requirements:
 - 1. Section 08311 - Access Doors and Frames.
 - 2. Section 01455 - Mechanical Equipment Testing, Adjusting, and Balancing: Testing and balance of HVAC systems.
 - 3. Section 15700 - Heating, Ventilating, and Air Conditioning Equipment.
 - 4. Appendix A – Products and Work By Owner or Separate Contractor.
 - a. General procedures related to Owner furnished products and transport, handle, store and protect products.
 - b. Manufacturers, suppliers, and vendor contacts and product names and numbers related to Owner furnished products.

1.2 DEFINITION OF TERMS

- A. Work shall mean complete installation of equipment and devices in accordance with applicable Specifications and as described in the Drawings, Application Sheets, Manufacturer's Cut Sheets and Instructions.
- B. HVAC Contractor shall mean the General Contractor's, Subcontractor that is responsible for performing the HVAC work as specified on the construction documents. HVAC Contractor shall be responsible for compliance with applicable codes, ordinances, and work permits.

1.3 REFERENCES

- A. The publications listed below form a part of this specification to the extent referenced. Publications are referenced within the text by the basic designation only.
- B. Air Movement and Control Association (AMCA):
 - 1. AMCA 500-D – Laboratory Methods for Testing Dampers for Rating.
 - 2. AMCA 500-L – Laboratory Methods for Testing Louvers for Rating.
- C. ASTM International (ASTM):
 - 1. ASTM A653 - Steel Sheet, Zinc-Coated (Galvanized), or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot Dip Process.
 - 2. ASTM C553 - Mineral Fiber Blanket Thermal Insulation for Commercial and Industrial Applications.
 - 3. ASTM C1071 - Thermal and Acoustical Insulation (Mineral Fiber, Dust Lining Material).
 - 4. ASTM C1136 - Flexible, Low Permeance Vapor Retarders for Thermal Insulation.
 - 5. ASTM C 1290 - Flexible Fibrous Glass Blanket Insulation Used to Externally Insulate HVAC Ducts.
 - 6. ASTM E84 - Surface Burning Characteristics of Building Materials.
 - 7. ASTM E 96 - Standard Test Methods for Water Vapor Transmission of Materials
 - 8. ASTM E119 - Fire Tests of Building Construction and Materials.
- D. National Fire Protection Association (NFPA):
 - 1. NFPA 90A - Installation of Air Conditioning and Ventilating Systems.
 - 2. NFPA 90B - Installation of Warm Air Heating and Air-Conditioning Systems
 - 3. NFPA 96 - Ventilation Control And Fire Protection Of Commercial Cooking Operations.

- E. Sheet Metal Air Conditioning Contractors National Association (SMACNA):
 - 1. SMACNA - HVAC Duct Construction Standards - Metal & Flexible.
- F. British Standards Institution (BSI):
 - 1. BS 302 - Stranded Steel Wire Ropes.
- G. North American Insulation Manufacturer's Association (NAIMA):
 - 1. AH 124 - Fibrous Glass Duct Liner Standard.

1.4 QUALITY ASSURANCE

- A. Comply with NFPA 90A unless otherwise indicated.

1.5 SCHEDULING

- A. Milestone Completion Date: Complete Work of this Section on or before Delivery date specified in Appendix A (Section 15800) "Owner Furnished Equipment show on Drawings".
- B. Schedule testing and balancing in accordance Section 01455 after completion of system start-up requirements.

1.6 WARRANTY

- A. Warrant new and modified ductwork for period of one year from date of final acceptance of job, against noise and vibration under full range of operating conditions.

PART 2 - PRODUCTS

2.1 OWNER FURNISHED PRODUCTS

- A. Under provisions of Appendix A, Owner's supplier will furnish drop box diffusers as specified hereinafter for installation by the Contractor. All other items specified in this section shall be Contractor furnished and installed.
- B. Descriptions and specifications of Owner furnished items and equipment hereinafter are included as information to the Contractor only and not to be considered as Contractor requirements unless otherwise stated.

2.2 SHEET METAL DUCTWORK

- A. Sheet Metal Ductwork: Continuous hot-dip mill galvanized, minimum coating of G90, lock-forming quality steel sheets, in accordance with ASTM A653.
- B. Gages: Sheet metal gage as specified in SMACNA 1035 but not less than the following:
 - 1. Rectangular Duct: 26 gage for all sizes.
 - 2. Round Duct: Prime grade steel sheets, by United Sheet Metal Co. Inc. or equivalent.
 - a. 14 inch diameter and smaller: 26 gage.
 - b. 15 inch diameter and larger: 24 gage.
 - c. 27 inch diameter through 36 inch diameter: 22 gage.
- C. Round ductwork shall be spiral seam where exposed and not insulated on sales floor area and spiral or longitudinal seam in all other areas.
- D. Ductwork connections for round duct may be made using SpiralMate self-sealing duct connection system by Ductmate Industries (800) 245-3188.

2.3 DUCTWORK INSULATION

- A. Manufacturers:

1. CertainTeed.
2. Knauf.
3. Schuller (Manville).
4. Owens/Corning.

B. Substitutions: Not permitted.

C. Duct Liner: Fibrous-Glass complying with ASTM C 1071, NFPA 90A, or NFPA 90B; and NAIMA AH124.

1. Minimum Thermal Conductivity: R-Value at 75 deg F mean temperature ..
 - a. Type I, Flexible: R=3.7 per inch.
 - b. Type II, Rigid: R=4.2 per inch.

D. Duct Wrap: Mineral-fiber blanket insulation with factory applied FSK or vinyl jacket. Insulation shall be mineral or glass fibers bonded with a thermosetting resin, complying with ASTM C 553, Type II (for use on surfaces at temperatures up to 1700 deg. F) and ASTM C 1290. Factory-applied jackets shall conform to the following:

1. FSK Jacket: Aluminum-foil, fiberglass-reinforced scrim with kraft-paper backing; complying with ASTM C 1136, Type II.
2. Vinyl Jacket: White vinyl with a permeance of 1.3 perms when tested according to ASTM E 96, Procedure A, and complying with NFPA 90A and NFPA 90B.

2.4 SELF-SEALING SPIRAL DUCTWORK SYSTEM (CONTRACTOR OPTION)

A. General:

1. At the option of the Contractor, self-sealing ductwork system may be used in lieu of round built-up system.
2. Meet or exceed SMACNA's Leakage Class 3 requirements with no additional sealants.

B. Manufacturer:

1. Lindab Inc., Stamford, CT (800) 797-7476.

C. Round Spiral Sheet Metal Ductwork System:

1. SPIROsafe as manufactured by Lindab, Inc.
2. Duct: Galvanized, minimum coating designation of G90, lock-forming quality steel sheets, in accordance with ASTM A653.
3. Substitutions: Not permitted.

D. Fittings:

1. SPIROsafe as manufactured by Lindab, Inc.
2. End gaskets EPDM rubber, factory installed, U-profile, double lipped.

E. Control Dampers: SPIROsafe DSU as manufactured by Lindab, Inc.

F. Supply Grilles: SPIROcomfort RGS-3 as manufactured by Lindab, Inc.

2.5 DUCTWORK FOR REMOVAL OF GREASE AND SMOKE LADEN VAPORS

A. Sheet Metal Ductwork: 16 gage black steel welded liquid tight.

B. Fire Rated Duct Wrap: Specified in Section 07815.

2.6 VOLUME CONTROL DAMPERS

A. Manual Dampers: Provide manual volume-control dampers where indicated and of the type and model number as scheduled on the drawings. Frame and blades shall be galvanized steel. Provide ceiling doors where required in accordance with Section 08311.

1. Manufacturers: Provide dampers by one of the following:
 - a. A.E.S. Inc, East Tallassee, AL, Contact: Chad Burt (800) 786-0402.

- b. Sisneros Brothers Mfg, Contact: Joshua Gallegos (800) 499-0106.
 - c. Ruskin Company, Kansas City, MO, (816) 761-7476.
 - 2. Round Dampers: Dampers shall have end bearings and center locking control handle with position indicator. Control handle shall be Durodyne KL-7R, Durodyne SRST-2R or Ventlok 639 with 2-inch extension to protect insulation.
 - 3. Rectangular Dampers: Dampers shall have single blade or multiple inter-locked opposed blades with shaft bearings, 3/8 inch square control shaft and center locking control handle. Control handle shall be Durodyne KL7, Durodyne SRST-2R or Ventlok 639 with 2-inch extension to protect insulation.
- B. Field fabricated dampers shall not be used.
 - C. Substitutions: Not permitted unless otherwise specified.

2.7 FIRE DAMPERS

- A. Dampers: UL labeled, constructed and installed in accordance with NFPA 90A and UL instructions. Size dampers to provide free area equal to duct dimensions.
- B. Provide hanger design, and methods of hanging and supporting compatible with the structure.

2.8 AIR INLETS AND OUTLETS

- A. Grilles, registers, ceiling outlets, and ceiling inlets shall be as indicated on Drawings. Wall mounted and hard ceiling mounted air inlets and outlets shall be provided with heavy-duty sponge or soft felt gaskets.

2.9 HIGH TEMPERATURE SEALANT (FLUE SEALANT)

- A. Manufacturer: Provide high temp sealant as follows or equivalent:
 - 1. RTV 4500 1-Part Silicone Sealant by Silco, Inc.

2.10 DUCT SEALERS

- A. Manufacturer: Provide duct sealers of one of the following:
 - 1. Kingco 11376 or 10526 by ITW Polymers Sealants North America (formerly ITW TACC).
 - 2. Ductmate PROseal.
 - 3. United McGill Duct-Sealer.
 - 4. Trans-Continental Equipment Co. (TCE) - MP Multipurpose Duct Sealant.
 - 5. Hardcast #601 Iron-Grip.
 - 6. Hardcast Aluma-Grip Tape.
- B. Substitutions: Not permitted.

2.11 WIRE ROPE HANGER SYSTEMS (CONTRACTOR OPTION).

- A. General: At the option of the Contractor, wire rope hanger system for ductwork may be used in lieu of conventional hangers. Hanger systems shall be approved in accordance with SMACNA HVAC Duct Construction Standards (HVAC-DCS) with a minimum load safety factor of 5:1.
- B. Manufacturer: One of the following:
 - 1. Ductmate Industries, Charleroi, PA, (800) 245-3188.
 - 2. Erico, Inc., Solon, OH (800) 462-4797.
 - 3. Gripple, Inc., Batavia, IL., (630) 208- 0111.
- C. Wire Rope Hanger System: One of the following:
 - 1. Clutcher Mechanical Hanger System by Ductmate.
 - 2. Hang Fast Wire Rope Hanging System by Gripple.

3. Caddy Speed Link Universal Support System by Erico.
- D. Wire Rope:
1. Gripple: Zinc galvanized steel wire rope. Standard lengths of 5, 10, 15, and 30 feet with a preformed loop at one end.
 2. Ductmate: Zinc coated steel aircraft quality rope, field cut to length.
 3. Erico: Galvanized steel aircraft quality wire rope. Available in 3.3, 6.6, 9.9, 16.4, and 32.8 feet lengths with factory hook at one end.
- E. Locking Device:
1. Gripple Fastener: Zinc housing with stainless steel springs.
 2. Ductmate: Clutcher cast zinc housing with stainless steel springs.
 3. Erico: Stainless steel housing with all steel locking device.

PART 3 - EXECUTION

3.1 FABRICATION

- A. Fabrication requirements apply to new and modified ductwork.
- B. Fabricate, erect, and install ductwork for heating, ventilating, and air conditioning systems per SMACNA 1035 and the requirements of the Authority Having Jurisdiction.
- C. Make joints air tight on supply, return, and exhaust ducts. Seal transverse and longitudinal joints with duct sealer unless otherwise noted. Seal exhaust ducts with exterior seal as required to assure positive seal. Comply with SMACNA Duct Class A.

3.2 DUCT INSULATION

- A. Insulate ducts in accordance with SMACNA 1035. Do not insulate exhaust ductwork unless otherwise shown or specified.
- B. Rectangular Duct:
 1. Supply duct and air plenums: 1 inch liner.
 2. Return duct and air boots: 1/2-inch liner.
- C. Round Duct:
 1. Insulate the following round duct with duct wrap:
 - a. Supply and return duct in receiving areas.
 - b. Supply and return duct above finished ceilings.
 2. Duct Wrap Thickness:
 - a. 2-inch (R=6.0 minimum installed value).
 3. Overlap facing and staple securely.

3.3 AIR INLETS AND OUTLETS

- A. Locations of outlets indicated on Drawings are approximate. Coordinate with other trades to make symmetrical patterns. Determine locations by established pattern of lighting fixtures, or architectural reflected ceiling plan.
- B. Install fire radiation dampers and other devices at air inlets and outlets where required by codes and regulations of governing authorities. Dampers shall be UL labeled, constructed and installed in accordance with NFPA 90A and UL instructions.

3.4 DROP BOX DIFFUSERS

- A. Install drop boxes in accordance with the manufacturer's installation instructions and as detailed on the drawings.

- B. Provide duct transitions and return air plenums as required to complete the installation of drop boxes. Insulate duct transitions with 1" x 1.5 lb density duct liner glued and spot welded to interior surfaces.
- C. Labeling: Contractor shall label drop box diffusers by painting the appropriate RTU number in black 6" letters on the bottom of each drop box.

3.5 DUCT SUPPORTS

- A. Duct support requirements apply to new and modified ductwork.
- B. Support horizontal and vertical sheet metal duct work in accordance with Schedule I or II at the end of this section.
- C. Wire Rope Hanger System (Contractor Option):
 - 3. Comply with manufacturers' load ratings and recommended installation procedures.
 - 4. Comply with SMACNA HVAC Duct Construction Standards (DCS) with the following exceptions.
 - a. Use is not restricted to the SMACNA DCS diametrical limits for single wires.
 - b. Wire rope system shall not be used for hanging risers nor for two-tier trapeze hanging method.
 - 5. Provide stress distribution saddles as required when a single wire rope is passed continuously under round and rectangular duct as required to retain duct shape
 - 6. Support wire rope from the top chord of roof joists within 3" of panel points, or from 2 x 2 x 1/4 or 1 5/8 x 1 5/8 unistrut spanning the bottom chords and overhanging a minimum of 6" on each end.
- D. Do not use fasteners which penetrate roof deck.
- E. Provide sway bracing to comply with seismic requirements per local codes and Authority Having Jurisdiction.

3.6 FIRE DAMPERS

- A. Install approved fire dampers in air ducts or air inlets and outlets where required by codes and regulations of governing authorities. Install access doors in ducts at all fire dampers.

3.7 PROTECTION

- A. Protect work, equipment and material to prevent obstruction, damage or breakage. Close pipe openings with caps or plugs during installation. Cover and protect equipment against dirt, water, chemical or mechanical injury. At the completion of work, thoroughly clean all equipment and deliver the entire system in an unblemished condition.

3.8 TESTING

- A. Prepare systems for test and balance as specified in Section 01455.
- B. In coordination with Section 01455, make changes in pulleys, belts, ductwork, and dampers as required for correct balance as recommended by air balance and testing agency.

3.9 SCHEDULES

SCHEDULE I – DUCT SUPPORT SCHEDULE								
MINIMUM HANGER SIZE								
RECTANGULAR DUCTWORK								
Maximum Half of Duct Perimeter*	Pair at 10 ft Spacing		Pair at 8 ft spacing		Pair at 5 ft spacing		Pair at 4 ft spacing	
	Strap	Rod	Strap	Rod	Strap	Rod	Strap	Rod
P/2 = 30"	1" x 22 ga	10 ga	1" x 22 ga	10 ga	1" x 22 ga	12 ga	1" x 22 ga	12 ga
P/2 = 72"	1" x 18 ga	3/8"	1" x 20 ga	1/4"	1" x 22 ga	1/4"	1" x 22 ga	1/4"
* Perimeter = Sum of Sides								
ROUND DUCTWORK								
Diameter	Maximum Spacing		Strap					
24" and less	12'		1" x 22 ga					
26"-36"	12'		1" x 20 ga					

SCHEDULE II - WIRE ROPE HANGER SYSTEM SCHEDULE - OPTION
MINIMUM HANGER SIZE

SQUARE/RECTANGULAR DUCTWORK

Maximum Half of Duct Perimeter*		Single Loop at 10 ft Spacing			Single Loop at 8 ft Spacing			Single Loop at 5 ft Spacing			Single Loop at 4 ft Spacing		
	Wt (lbs/ft)	Gripple	Ductmate	Erico	Gripple	Ductmate	Erico	Gripple	Ductmate	Erico	Gripple	Ductmate	Erico
P/2 = 12"	5.20	No. 2	No. 10	SLD2L	No. 2	No. 10	SLD2L	No. 2	No. 10	SLD2L	No. 1	No. 10	SLD2L
P/2 = 16"	7.09	No. 2	No. 10	SLD2L	No. 2	No. 10	SLD2L	No. 2	No. 10	SLD2L	No. 2	No. 10	SLD2L
P/2 = 24"	10.62	No. 3	No. 10	SLD3L	No. 2	No. 10	SLD2L	No. 2	No. 10	SLD2L	No. 2	No. 10	SLD2L
P/2 = 32"	14.16	No. 3	No. 20	SLD3L	No. 3	No. 10	SLD3L	No. 2	No. 10	SLD2L	No. 2	No. 10	SLD2L
P/2 = 36"	15.94	No. 3	No. 20	SLD3L	No. 3	No. 20	SLD3L	No. 2	No. 10	SLD2L	No. 2	No. 10	SLD2L
P/2 = 48"	21.25	No. 4	No. 20	-	No. 3	No. 20	SLD3L	No. 3	No. 10	SLD3L	No. 2	No. 10	SLD2L
P/2 = 56"	24.78	No. 4	No. 20	-	No. 4	No. 20	SLD3L	No. 3	No. 10	SLD3L	No. 2	No. 10	SLD2L
P/2 = 60"	26.56	No. 4	No. 30	-	No. 4	No. 20	-	No. 3	No. 20	SLD3L	No. 3	No. 10	SLD3L
P/2 = 108"	47.81	No. 4	No. 30	-	No. 4	No. 30	-	No. 4	No. 20	-	No. 3	No. 20	SLD3L

Maximum Half of Duct Perimeter*		Pair at 10 ft Spacing			Pair at 8 ft Spacing			Pair at 5 ft Spacing			Pair at 4 ft Spacing		
	Wt (lbs/ft)	Gripple	Ductmate	Erico	Gripple	Ductmate	Erico	Gripple	Ductmate	Erico	Gripple	Ductmate	Erico
P/2 = 12"	5.20	No. 2	No. 10	SLD2L	No. 1	No. 10	SLD2L	No. 1	No. 10	SLD2L	No. 1	No. 10	SLD2L
P/2 = 16"	7.09	No. 2	No. 10	SLD2L	No. 2	No. 10	SLD2L	No. 1	No. 10	SLD2L	No. 1	No. 10	SLD2L
P/2 = 20"	8.84	No. 2	No. 10	SLD2L	No. 2	No. 10	SLD2L	No. 2	No. 10	SLD2L	No. 1	No. 10	SLD2L
P/2 = 28"	12.40	No. 2	No. 10	SLD2L	No. 2	No. 10	SLD2L	No. 2	No. 10	SLD2L	No. 2	No. 10	SLD2L
P/2 = 48"	21.25	No. 3	No. 10	SLD3L	No. 2	No. 10	SLD2L	No. 2	No. 10	SLD2L	No. 2	No. 10	SLD2L
P/2 = 60"	26.56	No. 3	No. 20	SLD3L	No. 3	No. 10	SLD3L	No. 2	No. 10	SLD2L	No. 2	No. 10	SLD2L
P/2 = 108"	47.81	No. 4	No. 20	-	No. 3	No. 20	SLD3L	No. 3	No. 10	SLD3L	No. 2	No. 10	SLD2L

ROUND DUCTWORK

Maximum Diameter		Single Loop at 10 ft Spacing			Single Loop at 8 ft Spacing			Single Loop at 5 ft Spacing		
	Wt (lbs/ft)	Gripple	Ductmate	Erico	Gripple	Ductmate	Erico	Gripple	Ductmate	Erico
8"	6.7	No. 2	No. 10	SLD2L	No. 2	No. 10	SLD2L	No. 2	No. 10	SLD2L
14"	11.7	No. 3	No. 10	SLD3L	No. 2	No. 10	SLD2L	No. 2	No. 10	SLD2L
16"	13.4	No. 3	No. 20	SLD3L	No. 3	No. 10	SLD3L	No. 2	No. 10	SLD2L
20"	16.7	No. 3	No. 20	SLD3L	No. 3	No. 20	SLD3L	No. 2	No. 10	SLD2L
26"	21.7	No. 4	No. 20	-	No. 3	No. 20	SLD3L	No. 3	No. 10	SLD3L
32"	26.7	No. 4	No. 20	-	No. 4	No. 20	-	No. 3	No. 20	SLD3L

Maximum Diameter		Pair at 10 ft Spacing			Pair at 8 ft Spacing			Pair at 5 ft Spacing		
	Wt (lbs/ft)	Gripple	Ductmate	Erico	Gripple	Ductmate	Erico	Gripple	Ductmate	Erico
20"	16.7	No. 2	No. 10	SLD2L	No. 2	No. 10	SLD2L	No. 2	No. 10	SLD2L
26"	21.7	No. 3	No. 10	SLD3L	No. 2	No. 10	SLD2L	No. 2	No. 10	SLD2L
32"	26.7	No. 3	No. 20	SLD3L	No. 3	No. 10	SLD3L	No. 2	No. 10	SLD2L
36"	30.0	No. 3	No. 20	SLD3L	No. 3	No. 10	SLD3L	No. 2	No. 10	SLD2L

NOTES:

- Schedule is based on 16 gauge maximum ductwork.
- Hanger sizes are based on vertical hanging only. Refer to manufacturer's data for load limits of hangers at angles other than vertical.
- Wire diameters are based on the following sizes:

Gripple	Ductmate	Erico
Size No. 1 = 3/64"	No. 10 = 5/64"	SLD2L = 0.079" = 5/64"
Size No. 2 = 5/64"	No. 20 = 1/8"	SLD3L = 0.118" ~ 1/8"
Size No. 3 = 1/8"	No. 30 = 3/16"	
Size No. 4 = 3/16"		

- The locking device numbers corresponds to the wire numbers for all three manufacturers

END OF SECTION