SECTION 233346 - FLEXIBLE DUCTS

Revise this Section by deleting and inserting text to meet Project-specific requirements.

Verify that Section titles referenced in this Section are correct for this Project's Specifications; Section titles may have changed.

1. GENERAL
	* + 1. RELATED DOCUMENTS

Retain or delete this article in all Sections of Project Manual.

* + - * 1. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.
			1. SUMMARY
				1. Section Includes:

Non-insulated flexible ducts.

Insulated flexible ducts.

* + - 1. SUBMITTALS
				1. Submittals for this section are subject to the re-evaluation fee identified in Article 4 of the General Conditions.
				2. Manufacturer’s installation instructions shall be provided along with product data.
				3. Submittals shall be provided in the order in which they are specified and tabbed (for combined submittals).
				4. Product Data: For each type of product.
				5. Sustainable Design Submittals:
				6. Shop Drawings: For flexible ducts.

Include plans showing locations and mounting and attachment details.

Retain "Coordination Drawings" paragraph below for situations where limited space necessitates maximum utilization for efficient installation of different components or if coordination is required for installation of products and materials by separate installers. Coordinate paragraph with other Sections specifying products listed below. Preparation of coordination drawings requires the participation of each trade involved in installations within the limited space.

* + - * 1. Coordination Drawings: Reflected ceiling plans, drawn to scale, on which ceiling-mounted access panels and access doors required for access to duct accessories are shown and coordinated with each other, using input from installers of the items involved.
1. PRODUCTS

Manufacturers and products listed in SpecAgent and MasterWorks Paragraph Builder are neither recommended nor endorsed by the AIA or Deltek. Before inserting names, verify that manufacturers and products listed there comply with requirements retained or revised in descriptions and are both available and suitable for the intended applications.

* + - 1. ASSEMBLY DESCRIPTION
				1. Comply with NFPA 90A, "Installation of Air Conditioning and Ventilating Systems," and with NFPA 90B, "Installation of Warm Air Heating and Air Conditioning Systems."
				2. Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible" for acceptable materials, material thicknesses, and duct construction methods unless otherwise indicated. Sheet metal materials shall be free of pitting, seam marks, roller marks, stains, discolorations, and other imperfections.
				3. Comply with the Air Diffusion Council's "ADC Flexible Air Duct Test Code FD 72-R1."
				4. Comply with ASTM E96/E96M, "Test Methods for Water Vapor Transmission of Materials."
			2. NON-INSULATED FLEXIBLE DUCTS

UL 181 defines two categories of flexible ducts. Ducts listed according to UL 181 must pass all UL 181 tests. Air connectors listed according to UL 181 must pass most, but not all, UL 181 tests and are limited to lengths of 14 feet (4.3 m) or less.

* + - * 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

McGill AirFlow LLC.

Thermaflex; a Flex-Tek Group company.

Ward Industries; a brand of Hart & Cooley, Inc.

Approved equivalent.

Retain one of five "Non-Insulated, Flexible Duct" paragraphs below to require only one type of non-insulated flexible duct. To require more than one type of non-insulated flexible duct, add drawing designation to each type required and indicate location of each on Drawings.

* + - * 1. Non-Insulated, Flexible Duct: UL 181, Class 1, two-ply vinyl film supported by helically wound, spring-steel wire.

Pressure Rating: 10-inch wg positive and 1.0-inch wg negative.

Maximum Air Velocity: 4000 fpm.

Temperature Range: Minus 10 to plus 160 deg F.

* + - * 1. Non-Insulated, Flexible Duct: UL 181, Class 1, black polymer film supported by helically wound, spring-steel wire.

Pressure Rating: 4-inch wg positive and 0.5-inch wg negative.

Maximum Air Velocity: 4000 fpm.

Temperature Range: Minus 20 to plus 175 deg F.

* + - * 1. Non-Insulated, Flexible Duct: UL 181, Class 1, multiple layers of aluminum laminate supported by helically wound, spring-steel wire.

Pressure Rating: 10-inch wg positive and 1.0-inch wg negative.

Maximum Air Velocity: 4000 fpm.

Temperature Range: Minus 20 to plus 210 deg F.

* + - * 1. Non-Insulated, Flexible Duct: UL 181, Class 1, aluminum laminate and polyester film with latex adhesive supported by helically wound, spring-steel wire.

Pressure Rating: 10-inch wg positive and 1.0-inch wg negative.

Maximum Air Velocity: 4000 fpm.

Temperature Range: Minus 20 to plus 210 deg F.

* + - * 1. Non-Insulated, Flexible Duct: UL 181, Class 0, interlocking spiral of aluminum foil.

Pressure Rating: 8-inch wg positive or negative.

Maximum Air Velocity: 5000 fpm.

Temperature Range: Minus 100 to plus 435 deg F.

* + - 1. INSULATED FLEXIBLE DUCTS
				1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

McGill AirFlow LLC.

Thermaflex; a Flex-Tek Group company.

Ward Industries; a brand of Hart & Cooley, Inc.

Approved equivalent.

Retain one of five "Insulated, Flexible Duct" paragraphs below to require only one type of insulated flexible duct. To require more than one type of insulated flexible duct, add drawing designation to each type required and indicate location of each on Drawings.

* + - * 1. Insulated, Flexible Duct: UL 181, Class 1, two-ply vinyl film supported by helically wound, spring-steel wire; fibrous-glass insulation; [**polyethylene**] [**aluminized**] vapor-barrier film.

Pressure Rating: 10-inch wg positive and 1.0-inch wg negative.

Maximum Air Velocity: 4000 fpm.

Temperature Range: Minus 10 to plus 160 deg F.

Insulation R-Value: [**Comply with ASHRAE/IES 90.1**] [**R4.2**] [**R6**] [**R8**] <**Insert value**>.

* + - * 1. Insulated, Flexible Duct: UL 181, Class 1, black polymer film supported by helically wound, spring-steel wire; fibrous-glass insulation; [**polyethylene**] [**aluminized**] vapor-barrier film.

Pressure Rating: 4-inch wg positive and 0.5-inch wg negative.

Maximum Air Velocity: 4000 fpm.

Temperature Range: Minus 20 to plus 175 deg F.

Insulation R-Value: [**Comply with ASHRAE/IES 90.1**] [**R4.2**] [**R6**] [**R8**] <**Insert value**>.

* + - * 1. Insulated, Flexible Duct: UL 181, Class 1, multiple layers of aluminum laminate supported by helically wound, spring-steel wire; fibrous-glass insulation; [**polyethylene**] [**aluminized**] vapor-barrier film.

Pressure Rating: 10-inch wg positive and 1.0-inch wg negative.

Maximum Air Velocity: 4000 fpm.

Temperature Range: Minus 20 to plus 210 deg F.

Insulation R-Value: [**Comply with ASHRAE/IES 90.1**] [**R4.2**] [**R6**] [**R8**] <**Insert value**>.

* + - * 1. Insulated, Flexible Duct: UL 181, Class 1, aluminum laminate and polyester film with latex adhesive supported by helically wound, spring-steel wire; fibrous-glass insulation; [**polyethylene**] [**aluminized**] vapor-barrier film.

Pressure Rating: 10-inch wg positive and 1.0-inch wg negative.

Maximum Air Velocity: 4000 fpm.

Temperature Range: Minus 20 to plus 210 deg F.

Insulation R-Value: [**Comply with ASHRAE/IES 90.1**] [**R4.2**] [**R6**] [**R8**] <**Insert value**>.

* + - * 1. Insulated, Flexible Duct: UL 181, Class 0, interlocking spiral of aluminum foil; fibrous-glass insulation; [**polyethylene**] [**aluminized**] vapor-barrier film.

Pressure Rating: 8-inch wg positive or negative.

Maximum Air Velocity: 5000 fpm.

Temperature Range: Minus 20 to plus 250 deg F.

Insulation R-Value: [**Comply with ASHRAE/IES 90.1**] [**R4.2**] [**R6**] [**R8**] <**Insert value**>.

* + - 1. FLEXIBLE DUCT CONNECTORS
				1. Clamps: [**Stainless-steel band with cadmium-plated hex screw to tighten band with a worm-gear action**] [**Nylon strap**] in sizes 3 through 18 inches, to suit duct size.
				2. Non-Clamp Connectors: [**Adhesive**] [**Liquid adhesive plus tape**] [**Adhesive plus sheet metal screws**].
1. EXECUTION
	* + 1. INSTALLATION
				1. Install flexible ducts according to applicable details in SMACNA's "HVAC Duct Construction Standards - Metal and Flexible" for metal ducts and in NAIMA AH116, "Fibrous Glass Duct Construction Standards," for fibrous-glass ducts.

For detailed instructions on properly installing flexible ducts, see "Flexible Duct Performance & Installation Standards" (the Green Book) from ADC (www.flexibleduct.org/ADC\_Pubs.asp).

* + - * 1. Install in indoor applications only. Flexible ductwork should not be exposed to UV lighting.

Retain first paragraph below to allow use of flexible duct to connect terminal units to metal duct.

* + - * 1. Connect terminal units to supply ducts [**directly or**] with maximum [**12-inch**] <**Insert dimension**> lengths of flexible duct. Do not use flexible ducts to change directions.
				2. Connect diffusers or light troffer boots to ducts [**directly or**] with maximum [**60-inch**] <**Insert dimension**> lengths of flexible duct clamped or strapped in place.
				3. Connect flexible ducts to metal ducts with [**adhesive**] [**liquid adhesive plus tape**] [**draw bands**] [**adhesive plus sheet metal screws**].
				4. Install duct test holes where required for testing and balancing purposes.

"Installation" and "Supporting Flexible Ducts" paragraphs below are excerpts from ADC's Green Book.

* + - * 1. Installation:

Install ducts fully extended.

Do not bend ducts across sharp corners.

Bends of flexible ducting shall not exceed a minimum of one duct diameter.

Avoid contact with metal fixtures, water lines, pipes, or conduits.

Install flexible ducts in a direct line, without sags, twists, or turns.

* + - * 1. Supporting Flexible Ducts:

Suspend flexible ducts with bands 1-1/2 inches wide or wider and spaced a maximum of 48 inches apart. Maximum centerline sag between supports shall not exceed 1/2 inch per 12 inches.

Install extra supports at bends placed approximately one duct diameter from center line of the bend.

Ducts may rest on ceiling joists or truss supports. Spacing between supports shall not exceed the maximum spacing per manufacturer's written installation instructions.

Vertically installed ducts shall be stabilized by support straps at a maximum of 72 inches o.c.

END OF SECTION 233346