

SECTION 23 XXXX - NON-FIBROUS, CLOSED CELL, INDOOR DUCTWORK

PART 1 – GENERAL

1.1 SUMMARY

A. Section includes:

1. KoolDuct, ducts and fittings.

B. This section does not include:

1. Air passages rated under continuous internal static pressure of 4" w.g. positive, 3.5" negative, with UL pressure rating: 15" w.g. startup and 4.5" w.g. negative documented on product labeling.

1.2 SUBMITTALS

A. Product data: For each type of product indicated.

B. Shop drawings: Fabrication, assembly, and installation, including plans, elevations, sections, components, and attachments to other work including:

1. Duct layout indicating sizes and pressure classes.
2. Elevation of top of ducts.
3. Dimensions of main duct runs from building grid lines.
4. Fittings.
5. Penetrations through fire-rated and other partitions.

C. Coordination Drawings: Plans, drawn to scale, showing coordination general construction, building components, and other building services.

1.3 QUALITY ASSURANCE

A. Installer Qualifications:

1. Manufacturer's authorized representative who is trained and certified, in writing, by manufacturer or manufacture's authorized System Delivery Partner for manufacture and/or installation of KoolDuct-duct and fittings.

Or,

2. Obtained a fabrication and installation certification by Sheet Metal Worker International.

1.4 SPECIFICATION COMPLIANCE

A. SMACNA leakage, Class 3 or less

B. UL (C-UL) 181 Standard for Safety Listed, Class 1 system, with included testing and passing the following;

1. Test for Surface Burning Characteristics
2. Flame Penetration Test
3. Burning Test
4. Mold Growth and Humidity Test
5. Low Temperature Test and High Temperature Test
6. Puncture Test
7. Static Load Test
8. Impact Test
9. Pressure Test and Collapse (negative pressure) Test
10. High Temperature and Humidity for 90 days
11. Cone Calorimeter

C. ASTM E2257 Standard Test Method for Room Fire Test of Wall and Ceiling Materials and Assemblies

C. ASTM E 84 tested, Tunnel Test, Does not exceed 25 flame spread, 50 smoke developed

D. DW144, Class B

E. NRTL product approval, (Subpart S of 29 CFR Part 1910, OSHA)

F. ASTM C 423 noise reduction

G. ASTM E 96/E 96M Procedure A for permeability

G. ASTM C 1071 for erosion

I. ASTM C 518: 2004, Standard Test Method for Steady-State Thermal Transmission Properties by Means of the Heat Flow Meter Apparatus

J. UL 723, Test for Surface Burning Characteristics of Building Materials

K. NFPA Compliance:

1. NFPA 90A, "Installation of Air Conditioning and Ventilating Systems."

2. NFPA 90B, "Installation of Warm Air Heating and Air Conditioning Systems."

3. NFPA 255, "Standard Method of Test of Surface Burning Characteristics of Building Materials"

1.5 PRODUCT DELIVERY AND STORAGE

A. Prevent objectionable aesthetic damage to the outer surface of duct segments during transport and storage.

B. Store duct segments under cover and protect from environment.

PART 2 – PRODUCTS

2.1 KOOLDUCT- DUCT AND FITTINGS

A. Product:

1. Kingspan Insulation; Kingspan KoolDuct.

B. The panel shall be manufactured of CFC-free Kooltherm closed cell rigid thermoset resin thermally bonded on both sides to a factory applied .001" (25 micron) aluminum foil facing reinforced with a fiberglass scrim.

C. The thermal conductivity shall be no greater than 0.13BTU • in/Hr •ft²•°F (.018W/m•°C), the thermal conductivity shall be no greater than 0.13BTU • in/Hr •ft²•°F (.018W/m•°C)

D. The density of the Kooltherm foam shall not be less than 3.5 pcf (56 Kg/m³) with a minimum compressive strength of 28 psi (.2 MPa).

E. The standard panel is 7/8" (22 mm) thick with an R-6.0 (1.2 RSI). For installations requiring higher insulation performance per energy code, a 13/32" (28 mm) thickness panel with R-8.1 (1.5 RSI) shall be utilized.

1. Maximum Temperature: Continuous rating of 176 deg F (70 deg C) inside ducts or ambient temperature surrounding ducts.

2. Maximum Thermal Conductivity: 0.13 Btu x in./h x sq. ft. x deg F at 75 deg F mean temperature.

3. Permeability: 0.02 perms maximum when tested according to ASTM E 96/E 96M, Procedure A.

4. Antimicrobial Agent: Compound shall be tested for efficacy by an NRTL, and registered by the EPA for use in HVAC systems.
5. Noise-Reduction Coefficient: 0.05 minimum when tested according to ASTM C 423, Mounting A.
6. Required Markings: UL label and other markings required by UL 181 on each full sheet of duct panel; UL ratings for closure materials.
7. All insulation materials shall be closed cell with a closed cell content of >90%.
8. R-Value:
 - a. 7/8 inch (22 mm) Thick Panel: 6.0 R.
 - b. 1 3/16 inch (28 mm) Thick Panel: 8.1 R.

D. Closure Materials:

1. V-Groove Adhesive: Silicone.
2. Pressure-Sensitive Tape: Comply with UL 181A; imprinted by the manufacturer with the coding "181A-P," the manufacturer's name, and a date code.
 - a. Tape: Aluminum foil tape imprinted with listing information.
 - b. Minimum Tape Width: 2 7/8" inches (75 mm).
 - c. Water resistant.
 - d. Mold and mildew resistant.
3. Polymeric Sealing System:
 - a. Structural Membrane: Woven glass fiber.
 - b. Minimum Tape Width: 2 7/8" inches (75 mm)

- c. Sealant: Low VOC.
- d. Color: White, black or gray.
- e. Water resistant.
- f. Mold and mildew resistant.

E. Indoor Cladding

1. Aluminum Clad Ductwork for Indoor Installations: Duct segments shall incorporate 0.025" (.6 mm) Minimum thickness aluminum sheet which is introduced during the fabrication process.

F. Weight

1. KoolDuct shall provide low weight stresses on the building framing and support members. The maximum weight for R-6 ductwork is 2.0 lbs. per square foot. R-8.1 KoolDuct shall have a maximum weight of 2.3 lbs. per square foot. Hangers are to be provided per the manufacturer's installation guidelines but not exceeding 13' between hangers and designed to carry the weight of the ductwork.

PART 3 – EXECUTION

3.1 Shop Fabrication

A. Certification:

1. Ducts shall be manufactured by authorized contractors in accordance with the Kingspan KoolDuct system delivery guidelines.

E. Fabrication:

1. Fabricate joints, seams, transitions, reinforcement, elbows, branch connections, access doors and panels, and damage repairs according to manufacturer's written instructions.
2. Fabricate 90-degree mitered elbows to include turning vanes.
3. Fabricate duct segments in accordance with manufacturer's written design guide.
4. Duct Fittings shall include a 6 inches of connecting material, as measured, from last bend line to the end of the duct. Connections on machine manufactured duct may be 4 inches.
5. Fabricate duct segments utilizing v-groove method of fabrication. Tape external seams, and fully seal internal seams with an unbroken layer of silicone. Flange each duct segment with either aluminum grip pro-file or pre-insulated duct connectors in accordance with manufacturer's design guide. Apply duct reinforcement to protect against side deformation from both positive and negative pressure per manufacturer's design guide based on ductwork size and system pressure.

6. Design fabricated duct segment fittings in accordance with “SMACNA HVAC Duct Construction Standards” latest edition.
7. Both positive and negative ductwork and fittings shall be constructed to be UL Listed as a Class 1 air duct to Standard for Safety UL 181.
8. All contractors/fabricators building KoolDuct shall have a certificate of training from one of the following sources: Delta Air Systems, Ohio, PTM Manufacturing, Delaware, A-Kool Distribution, Jacksonville, Admore, Hawaii, or Sheet Metal Workers’ International Association via the local JATC approved training center.

3.2 DUCT INSTALLATION

- A. Duct segments shall be installed by approved contractors for Kingspan KoolDuct System.
- B. Install ducts and fittings to comply with manufacturer’s written system design guide and as follows:
 1. Install ducts with fewest possible joints.
 2. Unless otherwise indicated, install ducts vertically and horizontally, and parallel and perpendicular to building lines.
 3. Install ducts close to walls, overhead construction, columns, and other structural and permanent enclosure elements of building.
 4. Where ducts pass through non-fire-rated interior partitions and exterior walls and are exposed to view, cover the opening between the partition

and duct or duct insulation with sheet metal flanges. Overlap openings on four sides by at least 1-1/2 inches (38 mm).

5. Where ducts pass through fire-rated interior partitions and exterior walls, install fire dampers. Comply with requirements in Division 23 Section "Air Duct Accessories" for fire and smoke dampers.

6. Protect duct interiors from the moisture, construction debris and dust, and other foreign materials. Comply with SMACNA's "Duct Cleanliness for New Construction Guidelines."

C. Air Leakage: Duct air leakage rates to be in compliance with "SMACNA HVAC Duct Construction Standards" latest version per applicable leakage class based on pressure.

3.3 HANGER AND SUPPORT INSTALLATION

A. Contractor to ensure that the ductwork system is properly and adequately supported.

1. Ensure that the chosen method is compatible with the specific ductwork system per KoolDuct design guide.

2. Install upper attachments to structures. Select and size upper attachments with pull-out, tension, and shear capacities appropriate for supported loads and building materials where used

B. Supports on straight runs of ductwork shall be positioned at centers not exceeding 13 feet (3.96 m) for duct sections when fabricated in 13 foot (3.96 m) lengths with sides up to 46"(1168 mm). Larger duct sizes and short segments (4

feet long) (1220 mm) are supported at 6 foot centers or less, in accordance with the KoolDuct design guide.

C. Ductwork shall be supported at changes of direction, at branch duct connections, tee fittings, and all duct accessories such as dampers, etc.

D. The load of such accessories to the ductwork shall be neutralized by the accessory support

3.4 FIELD QUALITY CONTROL

A. Inspection: Arrange for manufacturer's representative to inspect completed installation and provide written report that installation complies with manufacturer's written instructions.

1. Remove and replace duct system where inspection indicates that it does not comply with specified requirements.

B. Perform additional testing and inspecting, at Contractor's expense, to determine compliance of replaced or additional work with specified requirements.

3.5 DUCT SCHEDULE

A. Indoor Ducts and Fittings:

1. KoolDuct-Foam Rectangular Ducts and Fittings:

a. Minimum Panel Thickness: 28/32 inch (22 mm)

b. Aluminum Cladding: Minimum 0.025 inch (6 mm) thick.