

SECTION 15081

Sheet Metal Ducts - Acoustical Lining Insulation

PART 1.00 - GENERAL

1.01 Summary

- A. The work covered by this specification consists of furnishing all labor, equipment, materials and accessories, and performing all operations required, for correct fabrication and installation of air duct systems of sheet metal lined with fibrous glass duct liner, in accordance with applicable project drawings and specifications, subject to terms and conditions of the contract:
- B. All air duct systems operating at internal air velocities not exceeding rated duct liner limitations as listed below and internal air temperature not exceeding 250°F (121°C).
- C. Duct liner products shall conform to the requirements of ASTM C1071.
- D. The manufacturers product identification shall appear on the air stream surface.
- E. Duct liner adhesive shall conform to the requirements of ASTM C 916.
- F. The finished duct system shall meet the requirements of NFPA 90A and 90B.
- G. Duct dimensions shown on the plans are finished inside dimensions.
- H. Fabrication and installation shall conform to manufacturer's recommendations and to the requirements of the latest edition of the North American Insulation Manufacturers Association's *Fibrous Glass Duct Liner Standard* (hereinafter referred to as NAIMA FGDLS), or of the Sheet Metal and Air Conditioning Contractors National Association *HVAC Duct Construction Standards - Metal and Flexible* (hereinafter referred to as SMACNA HVAC DCS) or the manufacturers recommendations.

1.02 References

- A. American Society of Testing and Materials(ASTM)
 - 1. ASTM C1071
 - 2. ASTM C916
 - 3. ASTM G21
 - 4. ASTM G22
 - 5. ASTM C423
 - 6. ASTM C 518
- B. National Fire Protection Association (NFPA)
 - 1. NFPA 90A
 - 2. NFPA 90B
 - 3. NFPA 259
- C. Sheet Metal and Air Conditioning Contractor's National Association (SMACNA)
 - 1. HVAC Duct Construction Standards Metal and Flexible (HVAC DCS)
- D. North American Insulation Manufacturers Association (NAIMA)
 - 1. Fibrous Glass Duct Liner Standard (FGDLS)
- E. International Nonwovens & Disposables Association (INDA)
 - 1. IST 80.6

1.03 Delivery, Storage and Handling

- A. Deliver all materials and/or fabricated, insulated duct sections and fittings to the job site and store in a safe, dry place.
- B. Protect materials from dust, dirt, moisture, and physical abuse before and during installation, startup and commissioning. Wet or contaminated duct liner shall be replaced.

PART 2.00 - PRODUCTS

2.01 Insulated Duct System

- A. All supply ducts, return ducts, and fittings indicated on drawings, shall be insulated with duct liner meeting the requirements of ASTM C1071 and the additional following requirements:
1. Have a liquid water repellency rating not less than 4 when tested in accordance with INDA IST 80.6.
 2. Have a potential heat value not exceeding 3500 btu/lb when tested in accordance with NFPA 259 and meeting the classification of "Limited Combustible" as defined by NFPA 90A.
 3. Maximum rated velocity not less than 6000 FPM when tested in accordance with ASTM C 1071.
 4. Resistant to microbial growth using a "no growth criteria" when tested in accordance with ASTM C 1138, G 21 and G22.
 5. Type I - Blanket material, in roll form,
 - a. [1/2" (13mm), 1"(25mm), 1-1/2" (38mm), 2" (51mm)] thick, [Type150, Type 200, Type 300] shall have a maximum thermal conductivity(k-value), at 75°F (24°C) mean temperature, of [.28 Btu.●in/hr.●sq.ft.●°F (0.040 W/m.●°C), .27 Btu.●in/hr.●sq.ft.●°F (0.039 W/m.●°C), .24 Btu.●in/hr.●sq.ft.●°F (0.035 W/m.●°C)]. when tested in accordance with ASTM C 518.
 - b. Sound absorption coefficients and NRC rating shall meet or exceed the following when tested in accordance with ASTM C 423 using an "A" mounting.

Thickness	Type	Absorption Coefficients @ Octave Band Frequencies (Hz)						NRC
		125	250	500	1000	2000	4000	
1"	150	.10	.28	.50	.70	.82	.83	.60
1-1/2"	150	.20	.40	.71	.86	.91	.85	.70
2"	150	.22	.49	.83	.89	.89	.91	.80
1/2"	200	.04	.10	.24	.41	.56	.73	.35
1"	200	.10	.29	.53	.72	.83	.84	.60
1-1/2"	200	.20	.42	.80	.93	.93	.88	.75
1/2"	300	.05	.12	.29	.51	.68	.80	.40
1"	300	.05	.25	.57	.78	.87	.89	.60

i. CertainTeed ToughGard Duct Liner w/Enhanced Surface {Type 150, Type 200, or Type 300}

1. Type II - Board in sheet form,
 - a. [1-1/2" (38mm), 2" (51mm)], Thick, [Type 200, Type 300] shall have maximum thermal conductivity at 75°F (24°C) mean temperature, of [.27 Btu.●in/hr.●sq.ft.●°F (0.039 W/m.●°C), .24 Btu.●in/hr.●sq.ft.●°F (0.035 W/m.●°C)] when tested in accordance with ASTM C 518.
 - b. Sound absorption coefficients shall meet or exceed the following when tested in accordance with ASTM C 423 using an "A" mounting:

Thickness	Type	Absorption Coefficients @ Octave Band Frequencies (Hz)						NRC
		125	250	500	1000	2000	4000	
2"	200	.24	.57	.90	.95	.95	.96	.85
1-1/2"	300	.20	.46	.82	.94	.95	.91	.80
2"	300	.27	.72	1.04	1.02	.96	.92	.95

i. CertainTeed ToughGard Duct Liner w/Enhanced Surface {Type 200 -2", Type 300-1-1/2 or 2"}

PART 3.00 - EXECUTION

3.01 Examination

- A. Verify that the duct liner products is installed in accordance with project drawings, duct liner operating performance parameters and limitations, and provisions of NAIMA FGDLS or SMACNA HVAC DCS or manufactures recommendations.

3.02 Insulation

- A. All portions of duct designated to receive duct liner shall be completely covered with duct liner. All joints shall be neatly butted and there shall be no interruptions or gaps. Duct liner shall be installed with the Printed air stream surface treatment exposed to the air stream.
- B. Duct liner shall be adhered to the sheet metal with 90% (minimum) coverage of adhesive complying with the requirements of ASTM C 916.
- C. All transverse edges that are not to receive sheet metal nosing shall be coated. Longitudinal joints shall occur at the corners of ducts. If duct size and standard duct liner product dimensions make exposed longitudinal joints necessary, such joints shall be coated with adhesive designated for duct liner application and which meets the requirements of ASTM C 916. Such joints shall be additionally secured with mechanical fasteners in accordance with NAIMA FGDLS, or SMACNA HVAC DCS as if they were transverse joints.
- D. Duct liner shall be additionally secured with mechanical fasteners complying with the requirements NAIMA FGDLS or SMACNA HVAC DCS and of the correct type for the duct liner being installed. Fasteners may be either weld-secured or impact-driven, and shall be installed perpendicular to the duct surface.. Mechanical fasteners shall not compress the insulation more than 1/8" (3 mm) based on nominal insulation thickness. Fastener spacing with respect to interior duct dimensions shall be in accordance with NAIMA FGDLS or SMACNA HVAC DCS. Fastener heads or washers shall have a minimum area of 0.75 in² (484 mm²), with beveled or cupped edges to prevent their cutting into the duct liner.
- E. Where air velocities exceed 4000 fpm (20.3 m/sec), metal nosing (either channel or "zee" profile) shall be installed on upstream edges of liner duct sections.
- F. Metal nosing shall be securely installed over transverse liner edges facing the airstream at fan discharge and at any point where lined duct is preceded by unlined duct.
- G. Duct liner in roll form shall be folded and compressed in the corners of rectangular duct sections, or shall be cut and fit to assure a lapped, compressed corner joint
- H. Duct liner in sheet form shall be cut and fit to assure tight, over-lapped corner joints. Top pieces of liner shall be supported at the edges by the side pieces
- I. Any damage to the air stream surface must be repaired by coating the damaged area with adhesive or coating designed for duct liner application. Adhesive or coating shall meet requirements of ASTM C916

3.03 Field Quality Control

- A. Upon completion of installation of lined duct and before HVAC system start-up, visually inspect the ductwork and verify that duct liner has been correctly installed. Confirm that the duct system is free from construction debris.
- B. After the lined duct system is completely installed and ready for service, conduct a final inspection of the entire system. This inspection should include, at minimum, the following steps:
 - 1. Check all registers, grilles, and diffusers to ensure that they are clean and free from construction debris.
 - 2. Check all filters in accordance with their manufacturer's instructions. Use specified grade of filters at all times that system is operating.
 - 3. Cover supply openings with filter media prior to system start-up to catch any loose material that may remain inside the ductwork.
 - 4. Turn the HVAC system on and allow it to run until steady state operation is reached.
 - 5. Remove the temporary filter media from supply openings and, along with it, any loose material blown downstream and caught by the filter media.

6. Check to ensure that air delivery performance meets all requirements and complies with SMACNA leakage specifications.

3.04 Protection

- A. Contractor' employees shall be properly protected during installation of all insulation. Protection shall include proper attire when handling and applying insulation materials, and shall include (but not be limited to) disposable dust respirators, gloves, hard hats and eye protection.
- B. The contractor shall conduct all job site operations in compliance with applicable provisions of the Occupational Safety and Health Act, as well as with all state and/or local safety and health codes and regulations that may apply to the work.