

**SECTION 23 07 13
DUCT INSULATION**

PART 1 – GENERAL

1.01 REFERENCE STANDARDS

- A. ASTM C553 - Standard Specification for Mineral Fiber Blanket Thermal Insulation for Commercial and Industrial Applications; 2013 (Reapproved 2019).
- B. ASTM C612 - Standard Specification for Mineral Fiber Block and Board Thermal Insulation; 2014 (Reapproved 2019).
- C. ASTM C1071 - Standard Specification for Fibrous Glass Duct Lining Insulation (Thermal and Sound Absorbing Material); 2019.
- D. ASTM D828 - Standard Test Method for Tensile Properties of Paper and Paperboard Using Constant-Rate-of-Elongation Apparatus; 2016, with Editorial Revision (2018).
- E. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials; 2023d.
- F. ASTM G21 - Standard Practice for Determining Resistance of Synthetic Polymeric Materials to Fungi; 2015, with Editorial Revision (2021).
- G. SMACNA (DCS) - HVAC Duct Construction Standards Metal and Flexible; 2020.
- H. UL 723 - Standard for Test for Surface Burning Characteristics of Building Materials; Current Edition, Including All Revisions.

1.02 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 1 Specification Section, apply to this Section.

1.03 WORK INCLUDED

- A. Furnish and install all duct insulation, vapor barriers, jackets, finishes, adhesives, cements and accessories to make a complete and insulated system of all ductwork, fittings, joints, offsets and accessories specified herein.
- B. All insulation system materials shall conform to the maximum flame spread/smoke developed ratings specified herein.

1.04 RELATED SECTIONS

- A. Examine all drawings and criteria sheets and all other Sections of the Specifications for requirements which affect work under this Section whether or not such work is specifically mentioned in this Section.

1.05 REFERENCES

- A. Applicable provisions of the following Codes and Trade Standard Publications shall apply to the work of this Section, and are hereby incorporated into, and made a part of the Contract Documents.
- B. Material standards shall be as specified or detailed hereinafter and as follows:
 - 1. ASTM C553 – Standard Specification for Mineral Fiber Blanket Thermal Insulation for Commercial and Industrial Applications.
 - 2. ASTM C612 – Standard Specification for Mineral Fiber Block and Board Thermal Insulation.

3. ASTM C 921 – Standard Practice for Determining the Properties of Jacketing Materials for Thermal Insulation.
4. ASTM C1071 – Standard Specification for Thermal and Acoustical Insulation (Glass, Fiber, Duct Lining Material).
5. ASTM E84 – Standard Test Method for Surface Burning Characteristics of Building Materials.
6. ASTM E 96 – Standard Test Methods for Water Vapor Transmission of Materials.
7. ASTM G21 – Standard Practice for Determining Resistance of Synthetic Polymeric Materials to Fungi.
8. NFPA 255 – Standard Method of Test of Surface Burning Characteristics of Building Materials.
9. SMACNA (DCS)– HVAC Duct Construction Standards – Metal and Flexible.
10. UL 723 – Standard for Test for Surface Burning Characteristics of Building Materials.
11. ANSI/ASHRAE 90.1 - Energy Conservation in New Building Design.

1.06 SUBMITTALS

- A. See Section 230500 and General conditions for additional requirements.
- B. Product Data: Provide product description, thermal characteristics, list of materials and thickness for each service, and locations.
- C. Manufacturer's Instructions: Indicate installation procedures that ensure acceptable workmanship and installation standards will be achieved.

1.07 QUALITY ASSURANCE

- A. All insulation materials, finishes, coatings, cements, tapes, jackets and other insulation accessories shall have minimum composite or individual fire hazard ratings as well as thickness and "C" values conforming to State Building Codes which control building construction materials that may be used on this project. Where specification requirements exceed the Code requirements, the specification shall govern.
- B. Insulation for the various duct systems and associated equipment shall be composed of materials which are non-combustible and/or provide a fire resistive system of insulation which complies with the applicable Code having jurisdiction. Generally, it is required that fire hazard ratings shall not exceed the following, except as noted:
 1. Flame Spread Rating: 25 (No Exceptions)
 2. Smoke Developed Rating: 50
- C. All fire hazard ratings shall be as determined by NFPA 255 "Method of Test of Surface Burning Characteristics of Building Materials", ASTM E84 or UL 723.
- D. All insulation materials herein specified shall be used subject to the manufacturer's temperature limitations and their compatibility with other materials.
- E. Installation of all insulation work shall be executed by a qualified Insulation Contractor who is thoroughly experienced in this particular type of work and who has adequate facilities and equipment for installation of all insulation work herein specified and who is familiar with the requirements of the Code enforcing Authorities as to fire hazard rating.
- F. The finished installation shall present a neat and workmanlike appearance with all jackets smooth, with all vapor barriers sealed and intact.
- G. Where insulation is specified for ductwork, insulate similarly all collars, dampers, edges, joints, etc. connected to system subject to heat loss or gain. Do not cover damper actuators or other maintenance points on equipment unless identified on the insulation with removable access panels or covers.

1.08 REGULATORY REQUIREMENTS

- A. Conform to maximum flame spread/smoke developed rating of 25/50 inch accordance with ASTM E84, NFPA 255, or UL 723.
- B.

1.09 DELIVERY, STORAGE AND PROTECTION

- A. Accept materials on site, labeled with manufacturer's identification, product density and thickness.
- B. All materials shall be stored in a dry area free from moisture and debris.
 - 1. ENVIRONMENTAL REQUIREMENTS
 - a. Maintain ambient conditions required by manufacturers of each product.
 - b. Maintain temperature before, during and after installation for minimum of 24 hours.

1.10 DUCTWORK INSULATION SCHEDULE

- A. See Para 3.02 under this section.

PART 2 – PRODUCTS

2.01 MANUFACTURERS ACCEPTABLE FOR PRODUCT TYPES INDICATED CONTINGENT UPON PRODUCTS' COMPLIANCE WITH THE SPECIFICATIONS

- A. Insulation:
 - 1. Manville Corporation.
 - 2. Owens-Corning Fiberglass Corporation.
 - 3. Armstrong World Industries, Incorporated.
 - 4. Certainteed Corporation.
 - 5. Knauf
 - 6. Or approved equal
- B. Mastics and adhesives:
 - 1. Childers Products Company.
 - 2. H. B. Fuller Company, Foster Products Division.
 - 3. 3M Company Adhesives, Coatings and Sealers.
 - 4. Armstrong World Industries, Incorporated.
 - 5. Ruston Plant.
 - 6. Chicago-Mastic
 - 7. Insul-Coustic
 - 8. St. Clair Rubber
 - 9. Vimasco
 - 10. Baldwin-Ehret-Hill
 - 11. Or approved equal
- C. PVC fitting covers:
 - 1. Manville, Corporation.
 - 2. Ceel-Co.
 - 3. Certainteed, Corp.
 - 4. Cell Co. Plastics
 - 5. Or approved equal

2.02 FACED FLEXIBLE FIBER GLASS INSULATION

- A. Faced flexible fiber glass duct insulation shall be equal and equivalent to Owens-Corning Fiberglas Faced Duct Wrap, Series ED 100, FRK-25 having an approximate density of 1.0 lb./cu.ft. and an approximate thermal conductivity of 0.17 at 75°F for ductwork located in

unconditioned space and thermal conductivity of 0.125 at 75°F for ductwork located outside of the building.

- B. Insulation shall be tightly wrapped on the duct work with all circumferential joints butted and longitudinal joints lapped 2 inches and stapled. All joints shall be sealed with approved adhesive. Adhere insulation to ducts with 4 inch wide strips of an approved bonding adhesive, at 18 inches on center. Additionally, secure insulation to bottom of rectangular ducts over 24 inches wide with weld pins or stickclips at no more than 18 inches on center. Alternative means of securing insulation to ducts will be permitted, subject to the manufacturer's recommendations and the Architect's written approval.
- C. Insulation shall be butted with facing overlapping all joints at least 2 inches and sealed with approved fire retardant vapor barrier adhesive. All breaks, punctures and pin penetration in facing, shall be sealed with vapor barrier tape per the manufacturer's published installation instructions.

2.03 RIGID FIBERGLASS BOARD INSULATION

- A. Rigid fiberglass board insulation shall be equal to Owens-Corning Fiberglas 25 with ASJ having an approximate density of 4.2 lbs./cu.ft. and an approximate thermal conductivity of 0.17 at 75°F for ductwork located in unconditioned space and thermal conductivity of 0.125 at 75°F for ductwork located outside of the building.
- B. The insulation shall be applied by use of weld pins or stick clips. Such fasteners shall be spaced 3 inches from each corner of the board with intermediate pins spaced no more than 12 inches on center. Pin caps shall be covered with a round vapor seal patch that matches the jacket on the ASJ board.
- C. Ducts, plenums and equipment having sharp bend shall have the insulation scored as required to conform to the curved surfaces to provide a neat and workmanlike appearance when finished.
- D. All insulation edges and joints shall be sealed with a fire retardant vapor barrier adhesive, reinforced with a vapor barrier tape similar to that of the board facing. Tape shall be 3 to 5 inches wide as recommended by the particular manufacturer.
- E. The above specified insulation will be used in all areas, and it is intended that the finish present a neat and uniform appearance as to color and workmanship.

2.04 INSULATION FACING

- A. Code ASJ: All service jacket composed of high intensity white chemically treated Kraft paper reinforced with fiberglass yarn and mesh and laminated to aluminum foil with a fire retardant adhesive. Longitudinal laps and butt strips shall be a minimum of 3 inches.
- B. Code FSKL: 0.35 mil aluminum foil reinforced with fiberglass yarn reinforcing scrim and laminated to chemically treated fire resistive Kraft paper having a minimum 35 pound per inch width tensile strength when tested in accordance with ASTM D828. Water vapor permeability 0.04 perms. Longitudinal laps and butt strips shall be a minimum of 3 inches.

2.05 ADHESIVES

- A. Code ADH-1: Fibrous adhesive, non-flammable, quick setting adhesive for calcium silicate. Similar to Childers CP-97, 98.
- B. Code ADH-2: Fast-drying vinyl base coating and lagging adhesive. Similar to Childers CP-50A HV2.
- C. Code ADH-3: Fast-drying neoprene base adhesive for lap joints of foil-faced facing applied over pipe insulation. Similar to Childers CP-82.

- D. Code ADH-4: Adhesive for use in adhering fiberglass board or blanket insulation to pipe and equipment. 3M Company Insulation Adhesive No. 35 or 38 non-flammable adhesive.

2.06 CAULKING COMPONENTS

- A. Code CC-1: For use with foam glass and/or joint sealant applications. Flexible elastomeric vapor barrier sealant. Similar to Childers CP-76.

2.07 MASTICS

- A. Code MAS-1: Vapor barrier mastic made with an elastomeric resin. For indoor use. Similar to Childers CP-30.
- B. Code MAS-2: A non-water vapor barrier asphaltic emulsion coating, breathing type, for above ground installations. Similar to Childers CP-10.
- C. Code MAS-3: Vapor barrier mastic made with an elastomeric resin. For outdoor use.

2.08 TIE WIRE

- A. Tie wire for securing insulation in place shall be type 304 stainless steel annealed steel wire of gauge and proper spacing as recommended by the insulation manufacturer. Wire shall be drawn up tightly enough to become embedded in the insulation and the ends of the loop twisted, bent over, and pressed into the insulation so as to leave no ends protruding.

2.09 BANDING

- A. 3/8 inch x 0.02 inch type 304 stainless steel for pipe insulation.
- B. 3/4 inch x 0.02 inch type 304 stainless steel for additional insulation jackets.

2.10 WIRE MESH

- A. Wire mesh shall be one inch by No. 20 BGW hexagonal mesh galvanized.
- B. Expanded metal: Expanded metal shall be 1/2 inch Hi-Rib metal lath of copper bearing steel.

2.11 TAPE

- A. Vinyl plastic tape, silver gray, flame resistant, vapor barrier sealant tape on rigid and flexible insulation material for warm or cold air ducts. Similar to 3M Company Duct Sealing Tape No. 474.
- B. Aluminum foil tape, dead soft aluminum foil, point seal on stick pin, metal patching, moisture barrier, heat reflecting and general sealing on aluminum facing foil. Similar to 3M Company Aluminum Foil Tape No. 425.

2.12 STAPLES

- A. Staples shall be galvanized clad outward clinching insulation staples.

PART 3 – EXECUTION

3.01 INSTALLATION OF INSULATION

- A. All insulation shall be applied by experienced insulating contractors in accordance with best Trade practice.
- B. Test, inspect and clean all surfaces of ductwork to be insulated before applying insulation.

- C. Take all possible precautions to protect work of other Trades. Provide protective covering as required to accomplish this end. This Trade shall be responsible for returning all equipment and material to its original new condition and appearance where damage occurs due to his neglect.
- D. All ductwork shall have been tested and approved prior to installation of insulation.
- E. All ductwork and plenum or surfaces, where subject to condensation on the outside, shall be insulated including vapor seal finish.
- F. All surfaces to be insulated shall be clean, dry and free from dirt and scale when insulation is being applied. Insulation shall be dry at the time of installation and before and during the process of finished application.
- G. Butt ends will not be allowed. However, where required and approved by Architect, jacket material shall be pasted over exposed ends and banded to give a neat and finished appearance. Exposed fiberglass material will not be permitted.
- H. Surfaces of insulation shall be smooth, even and true to line with jackets drawn tight and smoothly secured. Scrap pieces of insulation shall not be used where a full length section will fit.
- I. The methods of application of insulation, finishes, adhesives, cements, accessories are generally specified under the material headings of these specifications. Where not specifically detailed, it is intended that they are equal or exceed the manufacturer's published recommendations, existing at time of bid openings, subject to the approval of the Architect.
- J. Butt covering neatly to walls, floors, ceiling. Apply band at end and position so band covers gap between surface and insulation where exposed.
- K. Fastenings: Provide where required to securely hold insulation. Apply adhesive and weld pins and/or stick clips on exposed risers to prevent slipping and turning of insulation. .
- L. Thickness of insulation shall not be compromised due to piping interferences, improper installation or any other reason.

3.02 DUCTWORK INSULATION SCHEDULE:

Service	Type Insulation and Thickness (Inches)	Facing	Additional Jacket
Outside Air Intake Ducts & Plenums, Supply Air Ductwork (Exposed)	Rigid Fiber Glass Board Insulation 2"	FSKL	
All Supply Air Ductwork (Concealed)	Flexible Fiber Glass w/Vapor Barrier 1 ½"	FSKL	
Others not scheduled with system temperatures below 60°F or above 90°F	Flexible Fiberglass w/Vapor Barrier 1"	FSKL	

- A. HVAC Insulation Schedule Notes
 - 1. Provide vapor barrier on all ductwork insulation.

END OF SECTION 23 07 13 23 07 13