SECTION 230713

DUCTWORK INSULATION

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Ductwork insulation.

B. Insulation jackets.

1.2 RELATED SECTIONS

A. Division 09 - Painting: Painting insulation jackets.

B. Section 23 05 53 - Mechanical Identification.

1.3 REFERENCES

A. ASTM B209 - Aluminum and Aluminum-Alloy Sheet and Plate.

B. ASTM C518 - Steady-State Heat Flux Measurements and Thermal Transmission Properties by Means of the Heat Flow Meter Apparatus.

C. ASTM C553 - Mineral Fiber Blanket Thermal Insulation for Commercial and Industrial Applications.

D. ASTM C612 - Mineral Fiber Block and Board Thermal Insulation.

E. ASTM C921 - Standard Practice for Determining the Properties of Jacketing Materials for Thermal Insulation.

F. ASTM C1071 - Thermal and Acoustical Insulation (Glass Fiber, Duct Lining Material).

G. ASTM E84 - Surface Burning Characteristics of Building Materials.

H. ASTM E96 - Water Vapor Transmission of Materials.

I. ASTM E162 - Surface Flammability of Materials Using a Radiant Heat Energy Source.

J. ASTM G21 - Standard Practice for Determining Resistance of Synthetic Polymeric Materials to Fungi.

K. NAIMA National Insulation Standards.

L. NFPA 255 - Surface Burning Characteristics of Building Materials.

M. SMACNA - HVAC Duct Construction Standards - Metal and Flexible.

N. UL 723 - Surface Burning Characteristics of Building Materials.

1.4 SUBMITTALS

A. Submit under the provisions of Division 01.

B. Product Data: Provide product description, thermal characteristics, list of materials and thickness for each service, and locations.

C. Manufacturer's Installation Instructions: Indicate procedures which ensure acceptable workmanship and installation standards will be achieved.

1.5 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in manufacturing the Products specified in this section with a minimum of three (3) years' documented experience.

B. Applicator Qualifications: Company specializing in performing the work of this section with a minimum of three (3) years' documented experience and approved by manufacturer.

1.6 REGULATORY REQUIREMENTS

A. Materials: Flame spread/smoke developed rating of 25/50 in accordance with ASTM E84.

B. Insulation thickness and performance values shall meet the requirements of both the schedules and the applicable energy code.

1.7 DELIVERY, STORAGE, AND HANDLING

A. Deliver, store, protect, and handle products to site under provisions of Section 23 05 00.

B. Accept materials on site in original factory packaging, labeled with manufacturer's identification, including product density and thickness.

C. Store insulation in original wrapping and protect from weather and construction traffic.

D. Protect insulation against dirt, water, chemical, and mechanical damage.

1.8 ENVIRONMENTAL REQUIREMENTS

A. Maintain ambient temperatures and conditions required by manufacturers of adhesives, mastics, and insulation cements.

B. Maintain temperature during and after installation for minimum period of 24 hours.

PART 2 PRODUCTS

2.1 GLASS FIBER DUCT WRAP, FLEXIBLE

A. Manufacturers:
   1. Johns Manville.
   2. Other acceptable manufacturers offering equivalent products.
      a) Knauf Micrilite.
      b) Owens Corning.

B. Insulation: ASTM C553; flexible, noncombustible blanket.
   1. 'K' value: ASTM C518, 0.29 at 75 degrees F.
   2. Maximum service temperature: 250 degrees F.
   3. Maximum moisture absorption: 0.20 percent by volume.
   4. Density: 1.0 lb./cu ft.

C. Vapor Barrier Jacket
   1. Kraft paper is reinforced with glass fiber yarn and bonded to aluminized film.
   2. Moisture vapor transmission: ASTM E96; 0.04 perm.
   3. Secure with pressure sensitive tape.

D. Vapor Barrier Tape
   1. Install vapor barrier tape as recommended by the insulation manufacturer.
   2. Kraft paper reinforced with glass fiber yarn and bonded to aluminized film, with pressure sensitive rubber-based adhesive.

E. Tie Wire: Annealed steel, 16-gage.

2.2 GLASS FIBER DUCT WRAP, RIGID

A. Manufacturers:
   1. Johns Manville Micro-Aire.
   2. Other acceptable manufacturers offering equivalent products.
      a) Knauf.
      b) Owens Corning.

B. Insulation: ASTM C612; rigid, noncombustible blanket.
   1. 'K' value: ASTM C518, .24 at 75 degrees F.
   2. Maximum service temperature: 250 degrees F.
   3. Maximum moisture absorption: 0.20 percent by volume.
   4. Density: 3.0 lb./cu ft.

C. Vapor Barrier Jacket
   1. Kraft paper is reinforced with glass fiber yarn and bonded to aluminized film.
   2. Moisture vapor transmission: ASTM E96; 0.04 perm.
   3. Secure with pressure sensitive tape.

D. Vapor Barrier Tape
   1. Install vapor barrier tape as recommended by the insulation manufacturer.
   2. Kraft paper reinforced with glass fiber yarn and bonded to aluminized film, with pressure sensitive rubber-based adhesive.

2.3 JACKETS

A. Canvas Jacket: UL listed.
   1. Fabric: ASTM C921, 6 oz/sq yd, plain weave cotton treated with dilute fire-retardant lagging adhesive.
   2. Lagging Adhesive
      a) Manufacturers:
         1) Insul-Coustic.
         2) Marathon.
         3) Foster.
      b) Compatible with insulation.

B. Outdoor Jacket: VentureClad 1577CW or Protecto Wrap Protecto Seal 45. Finish: Aluminum or white, stucco embossed, as selected by Architect, minimum 24.0 mil thickness with integral adhesive, 0.0000 perm rating, -10 to 240 degrees F of operating range, 35.4 lb. puncture resistance.

C. Aluminum Jacket: ASTM B209
   1. Thickness: 0.016-inch sheet.
   2. Finish: Smooth.

3. Joining: Longitudinal slip joints and 2-inch laps.
4. Fittings: 0.016-inch-thick die shaped fitting covers with factory attached protective liner.
5. Metal Jacket Bands: 3/8-inch-wide; 0.015-inch-thick aluminum.

PART 3 EXECUTION

3.1 EXAMINATION

A. Verify that ductwork has been tested before applying insulation materials.

B. Verify that surfaces are clean, foreign material removed, and dry.

3.2 INSTALLATION

A. Install materials in accordance with NAIMA National Insulation Standards.

B. Insulated ductwork conveying air below ambient temperature:
1. Provide insulation with vapor barrier jackets.
2. Finish with tape and vapor barrier jacket.
3. Continue insulation through walls, sleeves, hangers, and other duct penetrations.
4. Insulate the entire system including fittings, joints, flanges, fire dampers, flexible connections, and expansion joints.

C. Insulated ductwork conveying air above ambient temperature:
1. Provide with or without standard vapor barrier jacket.
2. Insulate fittings and joints. Where service access is required, bevel and seal ends of insulation.

D. For ductwork exposed in mechanical equipment rooms, finish with canvas jacket sized for finish painting.

E. For exterior applications, provide insulation with vapor barrier jacket. Cover with outdoor jacket, with seams located on bottom side of horizontal duct section.

F. External Duct Insulation Application:
1. Secure insulation with vapor barrier and seal jacket joints with vapor barrier adhesive or tape to match jacket.
2. Secure insulation without vapor barrier with staples, tape, or wires.
3. Install without sagging on the underside of ductwork. Use adhesive or mechanical fasteners where necessary to prevent sagging. Lift ductwork off trapeze hangers and insert spacers.
4. Seal vapor barrier penetrations by mechanical fasteners with vapor barrier adhesive.
5. Stop and point insulation around access doors and damper operators to allow operation without disturbing wrapping.

G. Exhaust or relief air ductwork upstream of an energy recovery ventilator shall be insulated the same as return ductwork in the schedules below.

3.3 TOLERANCE

A. Substituted insulation materials shall provide thermal resistance within 10 percent at normal conditions, as materials indicated.

3.4 FLEXIBLE GLASS FIBER DUCTWRAP INSULATION SCHEDULE

DUCTWORK	THICKNESS	R-VALUE	FINISH
Low Pressure Supply, Return And Outside Air Ductwork	2"	6.0	FSK
Medium Pressure Supply	2"	6.0	FSK
Ductwork in Attic Space	3"	8.4	FSK
Flexible Duct Connections	2"	6.0	FSK
Reheat Coils	2"	6.0	FSK
Fire Damper Sleeves	2"	6.0	FSK
Flex at A.H.U.	2"	6.0	FSK

3.5 RIGID GLASS FIBER DUCTWRAP INSULATION SCHEDULE

DUCTWORK	THICKNESS	R-VALUE	FINISH
Rectangular Supply, Return and Outside Air in Mech. Rooms	2"	5.6	FSK
Rectangular Supply, Return and Outside Air Exposed in Finished Spaces	1"	2.3	

END OF SECTION