

February 2014, Rev 02

23 0719 – HVAC Piping Insulation

PART-1. GENERAL

1.01 Section Includes

- A. Piping Insulation
- B. Insulation Jackets

1.02 References

- A. IECC; International Energy Conservation Code 2012, C403.2.8
- B. ASHRAE Standard 90.1, 2010 – Energy Standard for Buildings; Tables 6.8.3A and 6.8.3B
- C. ANSI/ASTM C195 - Mineral Fiber Thermal Insulation Cement.
- D. ANSI/ASTM C533 - Calcium Silicate Block and Pipe Thermal Insulation.
- E. ANSI/ASTM C534 - Elastomeric Foam Insulation.
- F. ANSI/ASTM C547 - Mineral Fiber Preformed Pipe Insulation.
- G. ANSI/ASTM C552 - Cellular Glass Block and Pipe Thermal Insulation.
- H. ASTM B209 - Aluminum and Aluminum-alloy Sheet and Plate.
- I. ASTM C449 - Mineral Fiber Hydraulic-setting Thermal Insulating and Finishing Cement.
- J. ASTM C591 - Unfaced Preformed Rigid Cellular Polyisocyanurate Insulation.
- K. ASTM C578 - Preformed Cellular Polystyrene Thermal Insulation.
- L. ASTM E84 - Surface Burning Characteristics of Building Materials.
- M. NFPA 255 - Surface Burning Characteristics of Building Materials.
- N. UL 723 - Surface Burning Characteristics of Building Materials.
- O. National Commercial & Industrial Insulation Standards - 1999 Edition - as published by Midwest Insulation Contractors Association and endorsed by National Insulation Contractors Association.

1.03 Quality Assurance

- A. Applicator: Company specializing in piping insulation application with five years minimum experience.
- B. Materials: Flame spread/smoke developed rating of 25/50 in accordance with ASTM E84, NFPA 255, or UL 723 (where required).

1.04 Submittals

- A. Submit shop drawings per contract. Include product description, list of materials and thickness for each service, and locations.

PART-2. PRODUCTS

2.01 Insulation

- A. Type A: Glass fiber; ANSI/ASTM C547; 0.24 maximum 'K' value at 75°F; noncombustible. All purpose, white kraft jacket bonded to aluminum foil and reinforced with fiberglass yarn, 25/50 flame spread/smoke developed rating.
- B. Type B: Elastomeric cellular foam; ANSI/ASTM C534; flexible plastic; 0.28 maximum 'K' value at 75°F, 25/50 flame spread/smoke developed rating. Maximum 3/4" thick per layer where multiple layers are specified.

- 1. The preferred products are:

- a. Armacell Armaflex <http://www.armacell.com>
- b. For higher temperature range applications including Chilled Water and Heating Hot Water in common piping the preferred product is Armacell HT Armaflex.

- C. Type E: Hydrous Calcium Silicate; ASTM C533; rigid molded pipe insulation; asbestos free; 0.40 'K' value at 300°F; 1200°F maximum service temperature; 16 gauge stainless steel tie wires on maximum 12" centers.

2.02 Vapor Barrier Jackets

- A. Kraft reinforced foil vapor barrier with self-sealing adhesive joints. Beach puncture resistance ratio of at least 50 units. Tensile strength: 35 psi minimum. Single, self-seal acrylic adhesive on longitudinal jacket laps and butt strips.

2.03 Jacket Covering

- A. Aluminum Jackets: ASTM B209; 0.016" thick; stucco embossed finish with Z edge seams and aluminum bands for outdoor use. Where colored jacket covers are

called for, provide factory-applied hard film acrylic paint in color selected by Architect.

PART-3. EXECUTION

3.01 Preparation

- A. Install insulation after piping has been tested. Pipe shall be clean, dry and free of rust before applying insulation.

3.02 Installation

- A. Install materials per manufacturer's instructions, building codes and industry standards.
- B. Continue insulation with vapor barrier through penetrations. This applies to all insulated piping. Maintain fire rating of all penetrations.
- C. On exposed piping, locate and cover seams in least visible locations.
- D. On insulated piping operating below 60°F, insulate fittings, valves, unions, flanges, strainers, flexible connections, flexible hoses, and expansion joints. Seal all penetrations of vapor barrier.
- E. On piping operating below 60°F in locations that are not mechanically cooled (e.g., penthouses, mechanical rooms, tunnels, chases at exterior walls, etc.), Type B insulation shall be used.
- F. On insulated piping operating above 140°F, insulate fittings, valves, flanges, and strainers.
- G. On insulated piping operating between 60°F and 140°F, do not insulate flanges and unions, but bevel and seal ends of insulation at such locations. Insulate all fittings, valves and strainers.
- H. **Blocking:** On all insulated piping, provide at each support an insert of same thickness and contour as adjoining insulation, between the pipe and insulation jacket, to prevent insulation from sagging and crushing. The insert shall be suitable for planned temperatures, be suitable for use with specific pipe material, and shall be a 180° cylindrical segment the same length as metal shields. Inserts shall be a cellular glass or molded hydrous calcium silicate, with a minimum compressive strength of 50 psi. High density polyisocyanurate insulation with a compressive strength of 24 psi is acceptable for pipe sizes below 6", 50 psi over 6", and operate below 260°F. Factory fabricated inserts may be used. Rectangular blocks, plugs, or wood material are not acceptable. Temporary wood blocking may be used by the Piping Contractor for proper height; however, these must be removed and replaced with proper inserts by the Insulation Contractor.

- I. Steam and condensate piping systems installed in utility tunnels shall be insulated with Type “E”.
- J. Neatly finish insulation at supports, protrusions, and interruptions.
- K. Install metal shields between all hangers or supports and the pipe insulation. Shields shall be galvanized sheet metal, half-round with flared edges. Adhere shields to insulation. On cold piping, seal the shields vapor-tight to the insulation as required to maintain the vapor barrier, or add separate vapor barrier jacket.
- L. Shields shall be at least the following lengths and gauges:

	Pipe Size	Shield Size
1.	½” to 3-1/2”	12” long x 18 gauge
2.	4”	12” long x 16 gauge
3.	5” to 6”	18” long x 16 gauge
4.	8” to 14”	24” long x 14 gauge

- M. Where exposed insulated piping extends above the floor, provide a sheet metal guard around the insulation extending 12" above the floor. Guard shall be .016" cylindrical smooth or stucco aluminum and shall fit tightly to the insulation.
- N. All piping and insulation that does not meet 25/50 that is located in an air plenum shall have written approval from the Authority Having Jurisdiction and the local fire department for authorization and materials approval. If approval has been allowed, the non-rated material shall be wrapped with a product that has passed ASTM E84 and/or NFPA 255 testing with a rating of 25/50 or below.
- O. All balance valves with fluid operating below 60°F shall be insulated with a removable plug wrapped with vapor barrier tape to allow reading and adjusting of the valve. All balance valves with fluid operating above 140°F shall be insulated and an opening shall be left in the insulation to allow for reading and adjusting the valve.

3.03 Insulation

A. Type A Insulation:

- 1. All Service Jackets: Seal all longitudinal joints with self-seal laps using a single pressure sensitive adhesive system. Outwardly clinching staple shall be used on all laps and butt joints.
- 2. Insulation without self-seal lap may be used if installed with Benjamin Foster 85-20 or equivalent Chicago Mastic, 3M or Childers lap adhesive.
- 3. Apply insulation with laps on top of pipe.

4. Fittings, Valve Bodies and Flanges: For 4" and smaller pipes, insulate with 1 lb. density insulation wrapped under compression to a thickness equal to the adjacent pipe insulation. For pipes over 4", use mitered segments of pipe insulation. Finish with preformed plastic fitting covers. Secure fitting covers with pressure sensitive tape at each end. Overlap tape at least 2" on itself. For pipes operating below 60°F, seal fitting covers with vapor retarder mastic in addition to tape.

B. Type B Insulation:

1. Elastomeric Cellular Foam: Where possible, slip insulation over the open end of pipe without slitting. Seal all butt ends, longitudinal seams, and fittings with adhesive. At elbows and tees, use mitered connections. Do not compress or crush insulation at cemented joints. Joints shall be sealed completely and not pucker or wrinkle. Paint the outside of outdoor insulation with two coats of latex enamel paint recommended by the manufacturer.
2. Self-seal insulation may be used on pipes operating below 170°F.
3. To reduce air gaps and the possibility of condensation, Elastomeric Cellular Foam insulation shall be factory sized in diameter to the pipe being insulated.
4. To reduce air gaps and the possibility of condensation, Elastomeric Cellular Foam insulation shall be factory sized in diameter to the fitting being insulated.

C. Type E Insulation:

1. Use pre-molded half sections. Butt longitudinal and circumferential joints tightly. Wire in place with 16 gauge stainless steel wire on maximum 12" centers. Single layer, butt joints staggered on 9" to 18" centers.
2. Apply in two layers. Stagger all joints between layers. Wire each layer individually.

3.04 Jacket Cover Installation

A. Metal Covering:

1. Provide vapor barrier as specified for insulation type. Cover with aluminum jacket covering with seams located on the bottom of horizontal piping. Include fittings, joints and valves.
2. Seal all interior and exterior butt joints with metal draw bands and sealant. Seal all exterior joints watertight.
3. Interior joints do not need to be sealed.

4. Use metal covering on the following pipes:
 - a. All exposed piping in areas noted on drawings.
 - b. All exposed piping below 8'-0" above floor.
 - c. All piping in mechanical rooms and/or tunnels that are subject to damage from normal operations. (Example: Piping that must be stepped over routinely.)

3.05 Schedule

Minimum Pipe Insulation Thickness (thickness in inches)

Fluid Operating Temp. and Pressure	Insulation Type	Nominal Pipe or Tube Size (inches)				
		<1	1 to <1-1/2	1-1/2 to <4	4 to <8	≤8
Steam High; >120 psig	A, E	4.5	5.0	5.0	5.0	5.0
Steam Med; >15 - <120 psig	A, E	3.0	4.0	4.5	4.5	4.5
Steam low; <15 psig	A	2.5	2.5	2.5	3.0	3.0
HHW, Condensate; 141 - 200	A	1.5	1.5	2.0	2.0	2.0
Domestic HW; 105 - 140	A	1.0	1.0	1.5	1.5	1.5
CHW; 40 - 60	B	0.5	0.5	1.0	1.0	1.0
Refrigeration; < 40	B	0.5	1.0	1.0	1.0	1.5
All Steam, Condensate piping in utility tunnels	E	All				

End of Division 23 0719

This section of the NIU Design and Construction Standards establishes minimum requirements only. It should not be used as a complete specification.