DIVISION 15 - MECHANICAL

Section 15250 - Mechanical Insulation

Introduction

Insulation products associated with:

- PIPING, DUCTWORK

Part 1 - General

- Use wrapped supply ductwork, except in acoustically critical applications where liner may be used only after written permission is given by the University. Liner shall be fiber free type such as closed cell elastomeric. Lined ducts shall not be used in medical areas, clean rooms, or all high velocity supply ductwork. See Section 15850 for Terminal Unit liner requirements.

- These requirements apply to building and tunnel piping. For direct buried chilled water piping discuss with the University.

Part 2 - Products

- Pipe Insulation Schedule (minimum insulation thickness, except where stated otherwise within this section)

Fluid Design Operating Range (ºF)	Conductivity Range Btu•in./(h•ft²•ºF)	Mean Rating Temperature ºF	Nominal Pipe Diameter (in.)				
			Less than 1	1 to 11/2	11/2 to 4	4 to 8	8" and larger
Above 350°F	0.32 - 0.34	250	4.5	5.0	5.0	5.0	5.0
251-350°F	0.29 – 0.32	200	3.0	4.0	4.5	4.5	4.5
201-250°F	0.27 – 0.30	150	2.5	2.5	2.5	3.0	3.0
141-200°	0.25 – 0,29	125	1.5	1.5	2.0	2.0	2.0
105-140°F	0.21 – 0.28	100	1.0	1.0	1.5	1.5	1.5
56 - 104°F	Discuss with UFS Project Manager & Mechanical Engineer						
40-55°F	0.21 – 0.27	75	0.75	1.5	1.5	2.0	2.0
Below 40°F	0.20-0.26	50	1.0	1.0	1.0	1.0	1.5

Notes:
For insulation outside the stated conductivity range, the minimum thickness (*T*) shall be determined as follows: T = r{(1 + t/r)K/k – 1}where T = minimum insulation thickness (in.), r = actual outside radius of pipe (in.), t = insulation thickness listed in this table for applicable fluid temperature and pipe size, K = conductivity of alternate material at mean rating temperature indicated for the applicable fluid temperature (Btu·in./h·ft2·°F); and k = the upper value of the conductivity range listed in this table for the applicable fluid temperature.

For closed loop systems with differing supply and return temperatures, use the design temperature that results in the greatest thickness throughout the piping system.

Piping serving environmental temperature control systems shall always be insulated.

- HVAC Hydronic Piping Applications
  - Insulation shall be provided on all non-ambient applications including, but not limited to, chilled, process cooling, heating, and domestic hot water as well as steam, steam condensate, and coil condensate.

  - Coil condensate insulation shall have a minimum thickness of 0.75 inches and provide a continuous vapor barrier to prevent condensation on the piping's outer wall. Closed cell elastomeric foam insulation is preferred for this application.

- Chilled Water Piping – Additional Requirements

- All exposed metal surfaces shall be insulated when located above ceilings.
- All chilled water valves operating below dew point are to be provided with insulated tee-handles such as NIBCO NIB-SEAL, Apollo Therma-Seal or equivalent.
- Chilled water mains shall be insulated with fiberglass pipe insulation with factory applied ASJ per schedule and applied per all manufacturer's instructions for piping operating below 45 degrees.
- See Part 3 for requirements at piping hangers.

- Duct and Plenum Insulation (minimum)

  - At a minimum, all supply and ducted return systems shall be fully insulated. Where such duct system reside in the zone they condition and only that zone, insulation may be omitted if there is no chance for condensing on the surface and approved in writing by UFS Mechanical engineer.

  - Discuss other duct system types (e.g. outside air) with UFS Project Manager and Mechanical Engineer which may also require insulation.
  - Duct and plenum insulation shall meet the minimum installed R-vale requirements stated below. The preferred product is fiberglass with factory applied FSK jacketing. Other products may be utilized if approved in writing by the UFS Project Manager and Mechanical Engineer.
    - Ducts installed in unconditioned spaces within the building envelope: R-6
    - Ducts installed in conditioned spaces and serving multiple zones: R-4
    - Ducts installed in conditioned spaces serving only that space: no requirement.
    - Ducts installed outside of the building envelope: R-8
  - Duct liner – See Part 1.
  - Exterior ductwork to be insulated and lagged with aluminum jacketing. Jacketing shall be pitched on the top surface when exposed to weather (e.g. rain) to prevent pooling.

- Pipe Insulation Field Applied Jacket

  - Interior concealed - PVC jacket shall be specified for chilled water in indirectly conditioned or potentially humid spaces.
  - Interior exposed or in equipment rooms –
    - Cover hot piping less than 10 feet above finish floor with 8 oz. Canvas jacket sealed with water based lagging adhesive and sizing compound, like Foster 30-30. PVC jacketing is also acceptable.
    - Chilled water piping- cover with PVC jacket
  - Tunnel piping
    – Steam and condensate -Canvas jacket sealed with water based lagging adhesive and sizing compound, like Foster 30-30
    Chilled water - PVC jacketed
  - Exterior piping - Embossed aluminum jacket with banding at joints and sealed with 25 year clear silicone.
  - Any insulated pipework installed within an air handling unit to be covered with PVC jacket.

- Equipment Insulation

  - Rigid, foil faced, fiberglass with a minimum density of 3.0 lb./ft.3. Cold equipment (where fluid temperature is below 50 degrees F) shall be insulated with closed cell foam insulation. (Armaflex or equal).

  - Where maintenance access is required, equipment insulation shall be constructed as removable sections capable of reinstallation.

  - Removable sections shall also be provided at equipment nameplates and other physically attached parameter indicators. Do not remove nameplates from equipment.

- Closed cell foam insulation which meets smoke developed/flame spread ratings of 50/25 may be used where allowed by the code.

Part 3 - Execution

- Provide fitted insulation which can be removed and reused around equipment, valves, flanges, etc.
- Use Z-strips on all leading edges of duct liner, (when permitted).
- Insulated fittings, i.e., elbows, tees, Y's to be packed and fitted with PVC covers or pre-molded insulation and PVC covers if applicable.
- Install insulation per Manufacturers Installation Manual and latest edition MICA Standards.
- Use welded pins for ductwork insulation attachment. No mechanical or glued attachments are allowed.
- For pipe sizes greater than 1¼" provide calcium silicate inserts and metal shields to protect the insulation at each support. Provide solid inserts for smaller pipe sizes.
- Piping to be insulated continuously through clamping, support, sleeving, and penetrations.

END OF SECTION 15250