

PART 1 - GENERAL REQUIREMENTS

1.01 SUMMARY

- A. Extent of Plumbing insulation required by this Section is indicated on drawings and schedules, and by requirements of this Section.
- B. Types of Plumbing insulation specified in this Section include the following:
 - 1. Piping Systems Insulation:
 - a) Fiberglass
 - b) Flexible Elastomeric
 - 2. Equipment Insulation:
 - a) Fiberglass

1.02 QUALITY ASSURANCE

- A. Flame/Smoke Ratings: Provide composite Plumbing insulation (insulation, jackets, coverings, sealers, mastics and adhesives) with flame-spread index of 25 or less, and smoke-developed index of 50 or less, as tested by UL 723 or ASTM E 84 (NFPA 255) method.
 - 1. Exception: Outdoor Plumbing insulation may have flame spread index of 75 and smoke developed index of 150.
 - 2. Exception: Industrial Plumbing insulation that will not affect life safety egress of building may have flame spread index of 75 and smoke developed index of 150.
- B. Related Sections: The following sections contain requirements that relate to this Section:
 - 1. Division 22 Section "Hangers and Supports for Plumbing Piping," for insulation shields for protecting insulation vapor barrier and materials and methods for piping installations.

1.03 SUBMITTALS

- A. Product Data: Submit manufacturer's technical product data and installation instructions for each type of Plumbing insulation. Submit schedule showing manufacturer's product number, k-value, thickness, and furnished accessories for each Plumbing system requiring insulation.
- B. Maintenance Data: Submit maintenance data and replacement material lists for each type of Plumbing insulation. Include this data and product data in maintenance manual.

PART 2 - PRODUCTS AND MATERIALS

2.01 ACCEPTABLE MANUFACTURERS

- A. Manufacturer: Subject to compliance with requirements, provide products of one of the following:
 - 1. Aeroflex USA, Inc.
 - 2. Armacell LLC.
 - 3. CertainTeed Corp.
 - 4. Knauf Insulation
 - 5. Johns Manville
 - 6. K-Flex USA
 - 7. Owens Corning

2.02 PIPING INSULATION MATERIALS

- A. Fiberglass Piping Insulation: ASTM C 547, Class 1 unless otherwise indicated.
- B. Flexible Elastomeric Piping Insulation: ASTM C534, Type I.
- C. Jackets for Piping Insulation: ASTM C1136, Type I for piping with temperatures below ambient, Type II for piping with temperatures above ambient. Type I may be used for all piping at Installers option.
 - 1. PVC: One-piece, pre-molded PVC cover conforming to ASTM D1784, Johns Manville Zeston 2000 PVC or approved equivalent. Factory supplied, pre-cut insulation blanket inserts for use with PVC fitting covers are acceptable.
- D. Staples, Bands, Wires, and Cement: As recommended by insulation manufacturer for applications indicated.
- E. Adhesives, Sealers, and Protective Finishes: As recommended by insulation manufacturer for applications indicated.
- F. Insulation Diameters: Comply with ASTM C585 for inner and outer diameters of rigid thermal insulation.
- G. Pipe, Valve and Fitting Covers: Comply with ASTM C450 for fabrication of fitting covers for pipe, valves and fittings.
- H. High Density Insulation Billets:
 - 1. Cellular Glass: ASTM C552.

2.03 EQUIPMENT INSULATION MATERIALS

- A. Rigid Fiberglass Equipment Insulation: ASTM C612, Class 2.

- B. Flexible Fiberglass Equipment Insulation: ASTM C553, Type I, Class B-4.
- C. Flexible Elastomeric Equipment Insulation: ASTM C534, TYPE II.
- D. Jacketing Material for Equipment Insulation: Provide pre-sized glass cloth jacketing material, not less than 7.8 ounces per square yard, or metal jacket at Installer's option, except as otherwise indicated.
- E. Equipment Insulation Compounds: Provide adhesives, cements, sealers, mastics and protective finishes as recommended by insulation manufacturer for applications indicated.
- F. Equipment Insulation Accessories: Provide staples, bands, wire, wire netting, tape, corner angles, anchors and stud pins as recommended by insulation manufacturer for applications indicated.

PART 3 - EXECUTION

3.01 INSTALLATION, GENERAL

- A. Install in accordance with manufacturer's installation instructions.

3.02 PLUMBING PIPING SYSTEM INSULATION

- A. Insulation Omitted: Omit insulation on the following:
 - 1. Chrome-plated exposed piping
 - 2. Water Hammer Arrestors
 - 3. Balancing and flow valves
 - 4. Check Valves
 - 5. Drain lines from water coolers
 - 6. Exterior condensate drain piping
 - 7. Exposed storm drainage piping in parking structures
- B. Cold Piping:
 - 1. Application Requirements: Insulate the following cold plumbing piping systems:
 - a) Potable cold water piping.
 - b) Non-potable cold water piping
 - c) Potable chilled water piping.
 - d) Plumbing vents within 6 lineal feet of roof outlet.
 - e) Horizontal interior above-ground storm drainage piping and vertical run from roof drain to horizontal run.
 - f) Horizontal and vertical interior above-ground storm drainage piping and vertical run from roof drain to horizontal run.
 - g) Horizontal and vertical interior above-ground overflow storm drainage piping and vertical run from roof drain to horizontal run.

Where vertical overflow storm drainage piping from the outlet exceeds 15 feet, only insulate within 15 feet of the outlet.

- h) Lawn irrigation piping.
- i) Condensate piping inside the building.
- j) Auxiliary Condensate Piping.
- k) Trap arms, waste branches and dedicated stacks serving chilled water waste or condensate drains.

2. Insulate each piping system specified above with one of the following types and thicknesses of insulation:

- a) Fiberglass: 1" thickness.

C. Hot Piping:

1. Application Requirements: Insulate the following hot plumbing piping systems:

- a) Potable hot water piping.
- b) Potable hot water recirculation piping.
- c) Hot drain piping (where indicated).

2. Insulate hot water piping systems up to 140F specified above with one of the following types and thicknesses of insulation:

- a) Fiberglass: 1" thick for pipe sizes up to and including 1-1/4", 1-1/2" thick for pipe sizes 1-1/2" and larger.

D. P-traps:

1. Insulate P-traps receiving chilled water waste and P-traps of water coolers as described below:

- a) Flexible Elastomeric: 1/2" thick for pipe sizes up to and including 2", 1" thick for pipe sizes 2" to 6" (largest size permitted).

2. Insulate P-traps receiving hot water waste above 140F as described below:

- a) Fiberglass: 1" thickness.
- b) Flexible Elastomeric (high temp formula up to 300F: 1" thickness.

E. Piping Inside Masonry Wall Units:

1. Insulate cold, hot and hot water recirculation piping installed inside of masonry walls where the piping needs to be insulated as the wall is constructed as described below:

- a) Flexible Elastomeric: 1/2" thick for pipe sizes up to and including 2", 1" thick for pipe sizes 2" to 6" (largest size permitted).

F. Exterior piping:

1. Encase exterior piping insulation with aluminum weather-proof jackets.

2. Insulate exterior cold water, hot water, hot water recirculation and non-potable water piping as previously described.
3. Insulate and heat trace exterior sanitary p-traps, sanitary, and grease waste piping as described below. Refer to Division 22 Section "Heat Tracing for Plumbing Piping" for heat trace system material and installation requirements.
 - a) Fiberglass: 1" thickness.

3.03 EQUIPMENT INSULATION

- A. Cold Equipment (Below Ambient Temperature):
 1. Application Requirements: Insulate the following cold equipment:
 - a) Roof drain bodies.
 2. Insulate each item of equipment specified above with one of the following types and thicknesses of insulation:
 - a) Fiberglass: 2" thick for cold surfaces above 35 degrees F (2 degrees C) and 3" thick for surfaces 35 degrees F (2 degrees C) and lower.

3.04 INSTALLATION OF PIPING INSULATION

- A. General: Install insulation products in accordance with manufacturer's written instructions, and in accordance with recognized industry practices to ensure that insulation serves its intended purpose.
- B. Maintain continuous thermal and vapor-retarder integrity throughout entire installation unless otherwise indicated.
- C. Install insulation on pipe systems subsequent to installation of heat tracing, painting, testing, and acceptance of tests.
- D. Install insulation materials with smooth and even surfaces. Insulate each continuous run of piping with full-length units of insulation, with a single cut piece to complete run. Do not use cut pieces or scraps abutting each other.
- E. Clean and dry pipe surfaces prior to insulating.
- F. Cold Pipe Insulation:
 1. Insulate all cold piping to prevent moisture condensation on exterior surfaces.
 2. Provide high density insulation material under supports or pre-insulated supports. Refer to Division 22 Section "Hangers and Supports for Plumbing Piping" for pre-insulated supports.
 3. Protect insulation with shields to prevent puncture or other damage. Refer to division 22 Section "Hangers & Supports for Plumbing Piping" for insulation shields.

4. High density insulation material shall extend a minimum 2 inches past the pipe shield on each side.
5. Butt pipe insulation tightly at insulation joints. Apply wet coat of vapor barrier lap cement on joint and seal with 3 inch wide vapor barrier tape or band and coat all taped seams and staple penetrations with vapor barrier coating to prevent moisture ingress.

G. Hot Pipe Insulation:

1. Provide pipe hangers for hot piping sized for the outside diameter of piping.
2. Butt insulation to hanger or riser clamp for vertical pipe. Butt pipe insulation tightly at insulation joints. Seal exposed insulation at hanger with joint sealant.

H. Pipe insulation:

1. Insulate all cold piping to prevent moisture condensation on exterior surfaces.
2. Provide high density insulation material under supports or pre-insulated supports. Refer to Division 22 Section "Hangers and Supports for Plumbing Piping" for pre-insulated supports.
3. Protect insulation with shields to prevent puncture or other damage. Refer to division 22 Section "Hangers & Supports for Plumbing Piping" for insulation shields.
4. High density insulation material shall extend a minimum 2 inches past the pipe shield on each side.
5. Butt insulation to hanger or riser clamp for vertical pipe. Butt pipe insulation tightly at insulation joints.
6. For hot pipes, apply 3" wide vapor barrier tape or band over the butt joints.
7. For cold pipes, apply wet coat of vapor barrier lap cement on joint and seal with 3 inch wide vapor barrier tape or band and coat all taped seams and staple penetrations with vapor barrier coating to prevent moisture ingress.

I. Insulation Installation on Fittings, Valves, Strainers, Flanges, and Unions:

1. Install insulation over fittings, valves (except balancing and flow control valves), strainers, flanges, unions, and other specialties with continuous thermal and vapor-retarder integrity unless otherwise indicated.
2. Insulate pipe elbows using preformed fitting insulation or mitered fittings made from same material and density as adjacent pipe insulation. Butt tightly against adjoining pieces and bond with adhesive. Fill joints, seams, voids, and irregular surfaces with insulating cement finished to a smooth, hard, and uniform contour that is uniform with adjoining pipe insulation.
3. Insulate tee fittings with preformed fitting insulation or sectional pipe insulation of same material and thickness as used for adjacent pipe. Cut sectional pipe insulation to fit. Butt each section closely to the next and hold in place with tie wire. Bond pieces with adhesive.

4. Insulate valves using preformed fitting insulation or sectional pipe insulation of same material, density, and thickness as used for adjacent pipe. Overlap adjoining pipe insulation by not less than two times the thickness of pipe insulation, or one pipe diameter, whichever is thicker. For valves, insulate up to and including the bonnets, valve stuffing-box studs, bolts, and nuts. Fill joints, seams, and irregular surfaces with insulating cement.
 5. Insulate strainers using preformed fitting insulation or sectional pipe insulation of same material, density, and thickness as used for adjacent pipe. Overlap adjoining pipe insulation by not less than two times the thickness of pipe insulation, or one pipe diameter, whichever is thicker. Fill joints, seams, and irregular surfaces with insulating cement. Insulate strainers so strainer basket flange or plug can be easily removed and replaced without damaging the insulation and jacket. Provide a removable reusable insulation cover. For below-ambient services, provide a design that maintains vapor barrier.
 6. Insulate flanges and unions using a section of oversized preformed pipe insulation. Overlap adjoining pipe insulation by not less than two times the thickness of pipe insulation, or one pipe diameter, whichever is thicker.
 7. Cover segmented insulated surfaces with a layer of finishing cement and coat with a mastic. Install vapor-barrier mastic for below-ambient services and a breather mastic for above-ambient services. Reinforce the mastic with fabric-reinforcing mesh. Trowel the mastic to a smooth and well-shaped contour.
 8. For services not specified to receive a field-applied jacket except for flexible elastomeric, install fitted PVC cover over elbows, tees, strainers, valves (except balancing and flow control valves), flanges, and unions. Terminate ends with PVC end caps. Tape PVC covers to adjoining insulation facing using PVC tape.
 9. Stencil or label the outside insulation jacket of each union with the word "union." Match size and color of pipe labels.
- J. Insulate instrument connections for thermometers, pressure gages, pressure temperature taps, test connections, flow meters, sensors, switches, and transmitters on insulated pipes. Shape insulation at these connections by tapering it to and around the connection with insulating cement and finish with finishing cement, mastic, and flashing sealant.
- K. Install removable insulation covers at locations indicated. Installation shall conform to the following:
1. Make removable flange and union insulation from sectional pipe insulation of same thickness as that on adjoining pipe. Install same insulation jacket as adjoining pipe insulation.
 2. When flange and union covers are made from sectional pipe insulation, extend insulation from flanges or union at least two times the insulation thickness over adjacent pipe insulation on each side of flange or union.

Secure flange cover in place with stainless-steel or aluminum bands. Select band material compatible with insulation and jacket.

3. Construct removable valve insulation covers in same manner as for flanges, except divide the two-part section on the vertical center line of valve body.
 4. When covers are made from block insulation, make two halves, each consisting of mitered blocks wired to stainless-steel fabric. Secure this wire frame, with its attached insulation, to flanges with tie wire. Extend insulation at least 2 inches over adjacent pipe insulation on each side of valve. Fill space between flange or union cover and pipe insulation with insulating cement. Finish cover assembly with insulating cement applied in two coats. After first coat is dry, apply and trowel second coat to a smooth finish.
- L. Extend piping insulation without interruption through walls, floors and similar piping penetrations, except where otherwise indicated.

3.05 INSTALLATION OF EQUIPMENT INSULATION

- A. General: Install equipment thermal insulation products in accordance with manufacturer's written instructions, and in compliance with recognized industry practices to ensure that insulation serves intended purpose.
- B. Install insulation materials with smooth and even surfaces and on clean and dry surfaces. Redo poorly fitted joints. Do not use mastic or joint sealer as filler for gapping joints and excessive voids resulting from poor workmanship.
- C. Maintain integrity of vapor-barrier on equipment insulation and protect it to prevent puncture and other damage.
- D. Apply insulation using the staggered joint method for both single and double layer construction, where feasible. Apply each layer of insulation separately.
- E. Coat insulated surfaces with layer of insulating cement, troweled in workmanlike manner, leaving a smooth continuous surface. Fill in scored block, seams, chipped edges and depressions, and cover over wire netting and joints with cement of sufficient thickness to remove surface irregularities.
- F. Cover insulated surfaces with all-service jacketing neatly fitted and firmly secured. Lap seams at least 2". Apply over vapor barrier where applicable.
- G. Equipment Exposed to Weather: Protect outdoor insulation from weather by installation of weather-barrier mastic protective finish, or jacketing, as recommended by the manufacturer.

3.06 PROTECTION AND REPLACEMENT

- A. Replace damaged insulation which cannot be repaired satisfactorily, including units with vapor barrier damage and moisture saturated units.

- B. Protection: Insulation Installer shall advise Contractor of required protection for insulation work during remainder of construction period, to avoid damage and deterioration.

END OF SECTION

THIS PAGE INTENTIONALLY LEFT BLANK