

PART 1 GENERAL**1.01 DESCRIPTION**

- A. The requirements of this section apply to the insulation of plumbing systems specified elsewhere in these specifications.
- B. The requirements of Section 22 0500, Common Plumbing Materials and Methods, also apply to this section.

1.02 QUALITY ASSURANCE

- A. Minimum Insulation Thickness and Thermal Performance: Comply with Chapter 13 provisions of the State of Oregon Structural Specialty Code.
- B. Composite (Insulation, Jacket or Facing and Adhesives) Fire and Smoke Hazard Ratings: Not to exceed a flame spread of 25 or smoke development of 50.
- C. Component Ratings of Accessories (Adhesives, Mastics, Cements, Tapes, Finishing Cloth for Fittings): Same as "B" requirements above and permanently treated. No water soluble treatments.

1.03 SUBMITTALS

- A. Submit catalog data and performance characteristics for each product specified.

1.04 PRODUCT DELIVERY, STORAGE AND HANDLING

- A. General: In addition to the requirements specified in Section 22 0500, the following apply:
 - 1. Deliver insulation, coverings, cements, adhesives and coatings to the site in factory-fabricated containers with the manufacturer's stamp or label affixed showing fire hazard ratings of the products. Store insulation in original wrappings and protect from weather and construction traffic.
 - 2. Protect insulation against dirt, water, chemical and mechanical damage. Do not install damaged insulation. Remove such insulation from project site.

PART 2 PRODUCTS**2.01 ACCEPTABLE MANUFACTURERS**

- A. Insulation Manufacturers: Johns Manville, Owens-Corning, Knauf, Certain Teed, Armstrong, Pabco, Imcoa or Nomaco. Johns Manville products are listed unless indicated otherwise.
- B. Adhesive Manufacturers: Foster, 3M, Insul-Coustic, Borden, Kingco or Armstrong.

2.02 PIPING INSULATION

- A. Interior and Exterior Piping Systems 32 to 180 Deg. F: Glass fiber preformed pipe insulation with a minimum K-value of 0.23 at 75 deg. F, a minimum density of 3.5 pounds per cubic foot within all-service vapor barrier jacket, vinyl or pre-sized finish and pressure sensitive seal. Johns Manville "Micro-Lok."
- B. Exterior Installations: Same as for interior installations except 0.016" stainless steel.

- C. Pipe Temperatures Minus 30 to 180 Deg. F: Flexible, preformed, pre-slit, self-sealing elastomeric pipe insulation up to 2-1/8" ID, thermal conductivity of 0.27 BTU/hr. sq. ft./in. at 75 deg. F and vapor transmission rating of 0.2 perms/inch. On cold surfaces, apply in thickness necessary to prevent condensation on the surface at 85 deg. F and 70% RH. Armstrong "Armaflex 2000" or, in concealed locations, Imcoa or Nomaco also approved.

2.03 EQUIPMENT INSULATION

- A. Equipment Temperatures Below 70 Deg. F: Flexible, closed cell, elastomeric sheet insulation of 5.5 #/cubic feet density and 0.27 thermal conductivity at 75 deg. F. Armstrong "Armaflex."
- B. Equipment Temperatures From 70 to 450 Deg. F: Glass fiber 3 pound density insulation with a 0.23 thermal conductivity at 75 deg. F. Johns Manville "814 Spin-Glas" with "FSK" jacket or finished as recommended by manufacturer.
- C. Equipment Temperatures From 350 to 1200 Deg. F: Molded high temperature calcium silicate minimum 12.5 pound density and 0.4 thermal conductivity at 200 deg. F mean temperature. Glass cloth finish, Claremont Diplag or finished as recommended by insulation manufacturer.
- D. Exterior Tanks and Equipment Insulation Covering: Same as interior insulation with weatherproof metal or finished as recommended by insulation manufacturer.

2.04 INSULATION ACCESSORIES

- A. Insulation Compounds and Materials: Provide rivets, staples, bands, tapes, adhesives, cements, coatings, sealers, welded studs, etc., as recommended by the manufacturer for the insulation and conditions specified. No staples allowed on cold water piping systems.
- B. Interior Tanks and Equipment Insulation Covering: Finished metal jacket or as recommended by the manufacturer for insulation material specified.
- C. PVC Protective Jacketing and Valve and Pipe Fitting Covers: Johns Manville Zeston 2000, Proto LoSmoke, or Ceel-Co Ceel-Tite 100 Series with precut fitting fiberglass insulation or approved.
- D. Jacket Lap Sealing Adhesives: Foster Drion 85-75 contact cement or approved substitute.
- E. Saddles and Shields: Install to prevent crushing of insulation at support points.
 - 1. Protection Saddles: MSS Type 39.
 - 2. Protection Shields: MSS Type 40.
 - 3. Preinsulated Pipe Supports: Calcium silicate load bearing metal jacketed inserts. Pipe Shields Inc. or accepted substitute.
 - a. Pipe supported on rods - Models A1000, A2000, A3000, A4000.
 - b. Pipe supported on flat surfaces - Models A1000, A2000, A3000, A4000.
 - c. Pipe supported on pipe rolls - Models A3000, A4000, A5000.
 - d. Vertical riser clamp – Models E1000, E1100, E1200.
- F. Removable/Reusable Insulation Covers:
 - 1. Insulation Filler: Install 2-1/4# - 4#/cu. ft. glass fiber, 6# - 8#/ cu. ft. mineral wool or glass fiber/type E felted (9#/cu. ft.) flexible blankets and pads for large, irregular shaped equipment such as pump casings, bolting flanges, etc. For small common shapes such as valves, elbows, flanges, etc., install preformed flexible glass fiber pipe wrap, preformed glass fiber pipe covering or glass fiber/type E felted (9#/cu. ft.) insulation.

2. Hot Encasement: Glass fiber cloth plain or silicon coated on both sides, knitted stainless steel mesh, glass fiber cloth laminate with aluminum, or stainless steel foil or hex wire mesh.
3. Cold Encasement: Glass fiber cloth silicon coated both sides, knitted stainless steel mesh, glass fiber cloth laminate with aluminum or stainless steel foil or glass fiber cloth with nickel wire insertion, silicon coated both sides.
4. Stitching: Glass fiber thread/PVC coated, staples - galvanized or stainless steel, galvanized or stainless steel hog rings, 0.010" - 0.15" dia/dead soft stainless steel wire.
5. Attachments and Securements:
 - a. Quilting: Stainless 2-hole washers, both sides with twisted 0.035" - 0.051" wire loops, 12 ga. stainless spindle/washer/ speed clip assembly or stainless 0.035" - 0.051" wire loops.
 - b. Lacing and Hooks: Stainless 2-hole 12 gage bent wire lacing hooks, stainless 2-hole dished washer assembly with twisted 0.035" - 0.051" wire loops, 12 gage stainless spindle washer with built-in hook and speed clip or stainless 1-hole dished and flat washer riveted through the cloth.

PART 3 EXECUTION

3.01 PIPING INSULATION

- A. General: Do not insulate underground piping except at joints and fittings on preinsulated piping unless indicated otherwise. At contractor's option and in accordance with Part 2 of this section, elastomeric insulation may be installed on domestic water piping in thicknesses equivalent to the glass fiber insulation. Installation shall comply with the manufacturer's recommendation with joints and seams completely sealed.
- B. Domestic Water Piping:
 1. Insulate with glass fiber pipe covering, 1" thick for cold water piping and for 1" and smaller hot water piping; 1-1/2" for 1-1/4" and larger hot water piping.
 2. Insulate hot water return piping same as cold water piping.
 3. Insulate all water piping exposed to outside weather and freezing temperatures with 1" thickness of glass fiber pipe covering with weather-proof metal jacket. Apply insulation after heat cable is installed.
- C. Interior Rain Drains:
 1. Concealed: Insulate with 1" thick one pound density glass fiber blanket and continuous vapor barrier jacket.
 2. Exposed: Insulate with 3.5 pound density glass fiber insulation with continuous vapor barrier jacket.
 3. Cold climates: Insulate over heat tape where indicated.
- D. Waste Lines: Insulate all pipe exposed to outside temperatures with 3/4" thick glass fiber pipe insulation with a vapor barrier jacket.
- E. Pipe Fittings:
 1. Insulate and finish all fittings including valve bodies, bonnets, unions, flanges and expansion joints with precut fiberglass insulation and preformed PVC covers sealed to adjacent insulation jacket for continuous vapor barrier covering over all fittings.
 2. Use 1/2" thick Armaflex or Aerotube foamed plastic at flexible pipe connections on chilled and/or cold water lines. No insulation on other flexible pipe connections.
 3. Provide removable/reusable insulation covers on 4" and larger valves, unions, flanges, pump casings, strainers and similar fittings or equipment requiring periodic service.

- F. Protective Covering: Install continuous protective PVC or metal covering on all piping and fittings in mechanical rooms, accessible tunnels, attic spaces, accessible ceilings, etc., where insulation may be subject to damage. Install with rivets or cement seams and joints.
- G. Piping Insulation Lap Seams and Butt Joints: Install insulation jacket in accordance with manufacturer's recommendation and without staples on cold water lines. Where jacket joint and lap seams have not adhered, remove affected section of insulation and reinstall or apply lap sealing adhesive in accordance with manufacturer's instructions.

END OF SECTION