SECTION 22 07 19

PLUMBING PIPING INSULATION

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Piping insulation.

B. Jackets and accessories.

1.02 RELATED REQUIREMENTS

A. Section 07 84 00 - Firestopping.

B. Section 22 10 05 - Plumbing Piping: Placement of hangers and hanger inserts.

1.03 REFERENCE STANDARDS

A. ASTM A666 - Standard Specification for Annealed or Cold-Worked Austenitic Stainless Steel Sheet, Strip, Plate, and Flat Bar.

B. ASTM B209 - Standard Specification for Aluminum and Aluminum-Alloy Sheet and Plate.

C. ASTM B209M - Standard Specification for Aluminum and Aluminum-Alloy Sheet and Plate [Metric].

D. ASTM C177 - Standard Test Method for Steady-State Heat Flux Measurements and Thermal Transmission Properties by Means of the Guarded Hot Plate Apparatus.

E. ASTM C195 - Standard Specification for Mineral Fiber Thermal Insulating Cement.

F. ASTM C449 - Standard Specification for Mineral Fiber Hydraulic-Setting Thermal Insulating and Finishing Cement.

G. ASTM C518 - Standard Test Method for Steady-State Thermal Transmission Properties by Means of the Heat Flow Meter Apparatus.

H. ASTM C534/C534M - Standard Specification for Preformed Flexible Elastomeric Cellular Thermal Insulation in Sheet and Tubular Form.

I. ASTM C547 - Standard Specification for Mineral Fiber Pipe Insulation.

J. ASTM C552 - Standard Specification for Cellular Glass Thermal Insulation.

K. ASTM C578 - Standard Specification for Rigid, Cellular Polystyrene Thermal Insulation.

L. ASTM C585 - Standard Practice for Inner and Outer Diameters of Rigid Thermal Insulation for Nominal Sizes of Pipe and Tubing (NPS System).

M. ASTM C591 - Standard Specification for Unfaced Preformed Rigid Cellular Polyisocyanurate Thermal Insulation.

N. ASTM C795 - Standard Specification for Thermal Insulation for Use in Contact with Austenitic Stainless Steel.

O. ASTM D1056 - Standard Specification for Flexible Cellular Materials--Sponge or Expanded Rubber.

P. ASTM D2842 - Standard Test Method for Water Absorption of Rigid Cellular Plastics.

Q. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials.

R. ASTM E96/E96M - Standard Test Methods for Water Vapor Transmission of Materials.

S. NFPA 255 - Standard Method of Test of Surface Burning Characteristics of Building Materials; National Fire Protection Association.

T. UL 723 - Standard for Test for Surface Burning Characteristics of Building Materials; Underwriters Laboratories Inc..

1.04 SUBMITTALS

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

B. Samples: Submit two samples of any representative size illustrating each insulation type.

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

1.05 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in manufacturing the Products specified in this section with not less than three years of experience.

B. Applicator Qualifications: Company specializing in performing the type of work specified in this section with minimum 3 years of experience, or and approved by manufacturer.

1.06 DELIVERY, STORAGE, AND HANDLING

A. Accept materials on site, labeled with manufacturer's identification, product density, and thickness.

1.07 FIELD CONDITIONS

A. Maintain ambient conditions required by manufacturers of each product.

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

PART 2 PRODUCTS

2.01 REQUIREMENTS FOR ALL PRODUCTS OF THIS SECTION

A. Surface Burning Characteristics: Flame spread/Smoke developed index of 25/50, maximum, when tested in accordance with ASTM E84, NFPA 255, or UL 723.

2.02 GLASS FIBER

A. Manufacturers:
   1. Knauf Insulation: www.knaufusa.com.
   2. Johns Manville Corporation: www.jm.com.
   3. Owens Corning Corp: www.owenscorning.com.
   4. CertainTeed Corporation; : www.certainteed.com.
   5. Substitutions: See Gilbane Project Manual.

B. Insulation: ASTM C547 and ASTM C795; rigid molded, noncombustible.
   1. 'K' value: ASTM C177, 0.24 at 75 degrees F.
   2. Maximum service temperature: 850 degrees F; 1200 degrees F; 1600 degrees F.
   3. Maximum moisture absorption: 0.2 percent by volume.

C. Insulation: ASTM C547; semi-rigid, noncombustible, end grain adhered to jacket.

1. 'K' value: ASTM C177, 0.24 at 75 degrees F.
2. Maximum service temperature: 650 degrees F.
3. Maximum moisture absorption: 0.2 percent by volume.

D. Vapor Barrier Jacket: White Kraft paper with glass fiber yarn, bonded to aluminized film; moisture vapor transmission when tested in accordance with ASTM E96/E96M of 0.02 perm-inches.

E. Tie Wire: 0.048 inch stainless steel with twisted ends on maximum 12 inch centers.

F. Vapor Barrier Lap Adhesive:
1. Compatible with insulation.

G. Insulating Cement/Mastic:
1. ASTM C195; hydraulic setting on mineral wool.

H. Fibrous Glass Fabric:
1. Cloth: Untreated; 9 oz/sq yd weight.
2. Blanket: 1.0 lb/cu ft density.
3. Weave: 5x5; 10x10; or 10x20.

I. Indoor Vapor Barrier Finish:
1. Cloth: Untreated; 9 oz/sq yd weight.
2. Vinyl emulsion type acrylic, compatible with insulation, black or white color.

J. Outdoor Vapor Barrier Mastic:
1. Vinyl emulsion type acrylic or mastic, compatible with insulation, black color.

K. Outdoor Breather Mastic:
1. Vinyl emulsion type acrylic or mastic, compatible with insulation, black color.

L. Insulating Cement:
1. ASTM C449/C449M.

2.03 CELLULAR GLASS

A. Manufacturers:
1. Pittsburgh Corning Corporation: www.foamglasinsulation.com.
2. Substitutions: See Section 01 60 00 - Product Requirements.

B. Insulation: ASTM C552, Grade 1.
1. 'K' value: 0.37 at 100 degrees F.
2. Service Temperature: Up to 900 degrees F.
3. Water Vapor Permeability: 0.005 perm inch.
4. Water Absorption: 0.2 percent by volume, maximum.

2.04 EXPANDED POLYSTYRENE

A. Manufacturers:

B. Insulation: ASTM C578; rigid closed cell.
1. 'K' value: 0.23 at 75 degrees F.
2. Maximum service temperature: 165 degrees F.
3. Maximum water vapor permeance: 5.0 perms

2.05 EXPANDED PERLITE

A. Manufacturers:
1. Schundler Company: www.schundler.com.

B. Insulation: ASTM C610, molded.
   1. Maximum service temperature: 1200 degrees F.
   2. Maximum water vapor transmission: 0.1 perm.

2.06 POLYISOCYANURATE CELLULAR PLASTIC

A. Insulation Material: ASTM C591, rigid molded modified polyisocyanurate cellular plastic.
   1. Dimension: Comply with requirements of ASTM C585.
   2. 'K' value: 0.18 at 75 degrees F, when tested in accordance with ASTM C518.
   3. Minimum Service Temperature: -70 degrees F.
   4. Maximum Service Temperature: 300 degrees F.
   5. Water Absorption: 0.5 percent by volume, maximum, when tested in accordance with ASTM D2842..
   6. Moisture Vapor Transmission: 4.0 perm in.
   7. Connection: Waterproof vapor barrier adhesive.

2.07 POLYETHYLENE

A. Manufacturers:
   1. Armacell International: www.armacell.com.

B. Insulation: Flexible closed-cell polyethylene tubing, slit lengthwise for installation, complying with applicable requirements of ASTM D1056.
   1. 'K' value: ASTM C177; 0.25 at 75 degrees F.
   2. Maximum Service Temperature: 200 degrees F.
   3. Density: 2 lb/cu ft.
   4. Maximum Moisture Absorption: 1.0 percent by volume.
   5. Moisture Vapor Permeability: 0.05 perm inch, when tested in accordance with ASTM E96/E96M.
   6. Connection: Contact adhesive.

2.08 FLEXIBLE ELASTOMERIC CELLULAR INSULATION

A. Manufacturer:
   1. Armacell International: www.armacell.com.
   2. Substitutions: See Section 01 60 00 - Product Requirements.

B. Insulation: Preformed flexible elastomeric cellular rubber insulation complying with ASTM C 534 Grade 3;grade 2; grade 1 use molded tubular material wherever possible.
   1. Minimum Service Temperature: -40 degrees F.
   2. Maximum Service Temperature: 220 degrees F.
   3. Connection: Waterproof vapor barrier adhesive.

C. Elastomeric Foam Adhesive: Air dried, contact adhesive, compatible with insulation.

2.09 JACKETS

A. PVC Plastic.
   1. Manufacturers:
      a. Johns Manville Corporation: www.jm.com.
      b. Substitutions: See Section 01 60 00 - Product Requirements.
   2. Jacket: One piece molded type fitting covers and sheet material, off-white color.
      a. Minimum Service Temperature: 0 degrees F.
      b. Maximum Service Temperature: 150 degrees F.
      c. Moisture Vapor Permeability: 0.002 perm inch, maximum, when tested in accordance with ASTM E96/E96M.
      d. Thickness: 20 mil; 30 mil.

e. Connections: Brush on welding adhesive, tacks, pressure sensitive color matching vinyl tape.

3. Covering Adhesive Mastic:

B. ABS Plastic:
1. Jacket: One piece molded type fitting covers and sheet material, off-white color.
a. Minimum Service Temperature: -40 degrees F.
b. Maximum Service Temperature of 180 degrees F.
c. Moisture Vapor Permeability: 0.012 perm inch, when tested in accordance with ASTM E96/E96M.
d. Thickness: 30 mil.
e. Connections: Brush on welding adhesive.

C. Canvas Jacket: UL listed 6 oz/sq yd plain weave cotton fabric treated with dilute fire retardant lagging adhesive.
1. Lagging Adhesive:
a. Compatible with insulation.

D. Aluminum Jacket: ASTM B209 (ASTM B209M) formed aluminum sheet.
1. Thickness: 0.016 inch, 0.020 inch sheet.
2. Finish: Smooth, embossed.
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.
6. Metal Jacket Bands: 3/8 inch wide; 0.010 inch thick stainless steel.

E. Stainless Steel Jacket: ASTM A 666, Type 304 or 316 stainless steel.
1. Thickness: 0.010 inch.
2. Finish: Smooth.
3. Metal Jacket Bands: 3/8 inch wide; 0.010 inch thick stainless steel.

PART 3 EXECUTION

3.01 EXAMINATION

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

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

3.02 INSTALLATION

A. Install in accordance with manufacturer's instructions.

B. Install in accordance with NAIMA National Insulation Standards.

C. Exposed Piping: Locate insulation and cover seams in least visible locations.

D. Insulated pipes conveying fluids below ambient temperature: Insulate entire system including fittings, valves, unions, flanges, strainers, flexible connections, pump bodies, and expansion joints.

E. Glass fiber insulated pipes conveying fluids below ambient temperature:
1. Provide vapor barrier jackets, factory-applied or field-applied. Secure with self-sealing longitudinal laps and butt strips with pressure sensitive adhesive. Secure with outward clinch expanding staples and vapor barrier mastic.
2. Insulate fittings, joints, and valves with molded insulation of like material and thickness as adjacent pipe. Finish with glass cloth and vapor barrier adhesive or PVC fitting covers.

F. For hot piping conveying fluids 140 degrees F or less, do not insulate flanges and unions at equipment, but bevel and seal ends of insulation.

G. For hot piping conveying fluids over 140 degrees F, insulate flanges and unions at equipment.

H. Glass fiber insulated pipes conveying fluids above ambient temperature:
   1. Provide standard jackets, with or without vapor barrier, factory-applied or field-applied. Secure with self-sealing longitudinal laps and butt strips with pressure sensitive adhesive. Secure with outward clinch expanding staples.
   2. Insulate fittings, joints, and valves with insulation of like material and thickness as adjoining pipe. Finish with glass cloth and adhesive or PVC fitting covers.

I. Inserts and Shields:
   1. Application: Piping 1-1/2 inches diameter or larger.
   2. Shields: Galvanized steel between pipe hangers or pipe hanger rolls and inserts.
   3. Insert location: Between support shield and piping and under the finish jacket.
   4. Insert configuration: Minimum 6 inches long, of same thickness and contour as adjoining insulation; may be factory fabricated.
   5. Insert material: Hydrous calcium silicate insulation or other heavy density insulating material suitable for the planned temperature range.

J. Continue insulation through walls, sleeves, pipe hangers, and other pipe penetrations. Finish at supports, protrusions, and interruptions. At fire separations, refer to Section 07 84 00.

K. Pipe Exposed in Mechanical Equipment Rooms or Finished Spaces (less than 10 feet above finished floor): Finish with PVC jacket and fitting covers.

L. Exterior Applications: Provide vapor barrier jacket. Insulate fittings, joints, and valves with insulation of like material and thickness as adjoining pipe, and finish with glass mesh reinforced vapor barrier cement. Cover with aluminum jacket with seams located on bottom side of horizontal piping.

M. Buried Piping: Provide factory fabricated assembly with inner all-purpose service jacket with self-sealing lap, and asphalt impregnated open mesh glass fabric, with one mil thick aluminum foil sandwiched between three layers of bituminous compound; outer surface faced with a polyester film.

N. Heat Traced Piping: Insulate fittings, joints, and valves with insulation of like material, thickness, and finish as adjoining pipe. Size large enough to enclose pipe and heat tracer. Cover with aluminum jacket with seams located on bottom side of horizontal piping.

3.03 SCHEDULES

3.04 INTERIOR INSULATION APPLICATION SCHEDULE

A. Service: Domestic hot, recirculated hot water and solar piping.
   1. Operating Temperature: 60 to 140 deg F.
   2. Insulation Material: Flexible elastomeric or glass fiber.
   3. Insulation Thickness: Apply the following insulation thicknesses:
      a. Pipe, All Sizes: 1.0 inch.
   4. Jacket: None.
   5. Vapor Retarder Required: No.
   6. Finish: None.

B. Service: Domestic cold water.
   1. Operating Temperature: 35 to 60 deg F.
   2. Insulation Material: Flexible elastomeric or glass fiber.
   3. Insulation Thickness: Apply the following insulation thicknesses:

a. Pipe, 1” or less: 0.5 inch.
b. Pipe, 1¼” to 2” : 0.5 inch.
c. Pipe, 2-1/2” to 4”: 1.0 inch.
d. Pipe, 5” and up : 1.0 inch.

4. Jacket: Foil and paper.
5. Vapor Retarder Required: Yes.
6. Finish: None.

C. Service: Rainwater conductors.
1. Operating Temperature: 32 to 100 deg F.
2. Insulation Material: Mineral fiber.
3. Insulation Thickness: Apply the following insulation thicknesses:
a. Pipe, 3” and up: 1.0 inch.
4. Jacket:
a. Concealed Piping - None
b. Exposed Piping - PVC
5. Vapor Retarder Required: Yes.
6. Finish: None.

D. Service: Roof drain bodies.
1. Operating Temperature: 32 to 100 deg F.
2. Insulation Material: Mineral fiber.
3. Insulation Thickness: 1.0 inch.
4. Jacket:
a. Concealed - None
b. Exposed - PVC
5. Vapor Retarder Required: Yes.
6. Finish: None

E. Service: Sanitary waste piping where heat tracing is installed.
1. Operating Temperature: 35 to 100 deg F.
2. Insulation Material: Mineral fiber.
3. Insulation Thickness: Apply the following insulation thicknesses:
a. Pipe, 3” and up: 1.0 inch.
4. Jacket: Aluminum.
5. Vapor Retarder Required: Yes.
6. Finish: None.

F. Service: Condensate drain piping.
1. Operating Temperature: 35 to 75 deg F.
2. Insulation Material: Flexible elastomeric.
3. Insulation Thickness: 0.5 inch.
4. Jacket: None.
5. Vapor Retarder Required: Yes.
6. Finish: None.

G. Service: Exposed sanitary drains and domestic water supplies and stops for fixtures for the disabled.
1. Operating Temperature: 35 to 120 deg F.
2. Insulation Material: Molded closed cell vinyl.
3. Insulation Thickness: 3/16 inch.
4. Vapor Retarder Required: No.
5. Finish: None.

3.05 EXTERIOR INSULATION APPLICATION SCHEDULE

A. This application schedule is for aboveground insulation outside the building. Loose-fill insulation, for belowground piping, is specified in Division 2 piping distribution Sections.

B. Service: Domestic water.
   1. Operating Temperature: 60 to 180 deg F.
   2. Insulation Material: Cellular glass, with jacket
   3. Insulation Thickness: Apply the following insulation thicknesses:
      a. Pipe, 1” or less: 2.0 inch.
      b. Pipe, 1-1/4” and larger: 2.0 inch.
   4. Jacket: Aluminum.
   5. Vapor Retarder Required: No.
   6. Finish: None.

C. Service: Storm water.
   1. Operating Temperature: 32 to 100 deg F.
   2. Insulation Material: Flexible elastomeric.
   3. Insulation Thickness: Apply the following insulation thicknesses:
      a. Pipe, 1-1/4” to 2”: 0.5 inch.
      b. Pipe, 2-1/2” and up: 1.0 inch.
   4. Field-Applied Jacket: Aluminum.
   5. Vapor Retarder Required: Yes.
   6. Finish: None.

END OF SECTION