SECTION 22 0716
PLUMBING EQUIPMENT INSULATION

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Equipment insulation.

B. Covering.

C. Breeching insulation.

1.02 RELATED REQUIREMENTS

A. Section 09 9113 - Exterior Painting: Painting insulation covering.

B. Section 09 9123 - Interior Painting: Painting insulation covering.

C. Section 22 0553 - Identification for Plumbing Piping and Equipment.

D. Section 22 1005 - Plumbing Piping: Placement of hangers and hanger inserts.

E. Section 23 2113 - Hydronic Piping: Placement of hangers and hanger inserts.

F. Section 23 2114 - Hydronic Specialties.

G. Section 23 2300 - Refrigerant Piping: Placement of inserts.

1.03 REFERENCE STANDARDS

A. ASTM B209 - Standard Specification for Aluminum and Aluminum-Alloy Sheet and Plate; 2014.

B. ASTM B209M - Standard Specification for Aluminum and Aluminum-Alloy Sheet and Plate [Metric]; 2014.

C. ASTM C177 - Standard Test Method for Steady-State Heat Flux Measurements and Thermal Transmission Properties by Means of the Guarded-Hot-Plate Apparatus; 2013.

D. ASTM C518 - Standard Test Method for Steady-State Thermal Transmission Properties by Means of the Heat Flow Meter Apparatus; 2010.

E. ASTM C534/C534M - Standard Specification for Preformed Flexible Elastomeric Cellular Thermal Insulation in Sheet and Tubular Form; 2014.

F. ASTM C552 - Standard Specification for Cellular Glass Thermal Insulation; 2015.

G. ASTM C553 - Standard Specification for Mineral Fiber Blanket Thermal Insulation for Commercial and Industrial Applications; 2013.

H. ASTM C592 - Standard Specification for Mineral Fiber Blanket Insulation and Blanket-Type Pipe Insulation (Metal-Mesh Covered) (Industrial Type); 2013.

I. ASTM C612 - Standard Specification for Mineral Fiber Block and Board Thermal Insulation; 2014.

J. ASTM C1410 - Standard Specification for Cellular Melamine Thermal and Sound-Absorbing Insulation; 2014.

K. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials; 2015a.

L. ASTM E96/E96M - Standard Test Methods for Water Vapor Transmission of Materials; 2014.

M. UL 723 - Standard for Test for Surface Burning Characteristics of Building Materials; Current Edition, Including All Revisions.

1.04 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements, for submittal procedures.

B. Product Data: Provide product description, thermal characteristics, list of materials and thickness for equipment scheduled.

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 documented experience.

B. Applicator Qualifications: Company specializing in performing the type of work specified in this section with minimum 3 years of experience.

1.06 DELIVERY, STORAGE, AND HANDLING

A. Accept materials on site in original factory packaging, labeled with manufacturer's identification, including product density and thickness.

B. Protect insulation from weather and construction traffic, dirt, water, chemical, and mechanical damage, by storing in original wrapping.

1.07 FIELD CONDITIONS

A. Maintain ambient temperatures and conditions required by manufacturers of adhesives, mastics, and insulation cements.

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

PART 2 PRODUCTS

2.01 REGULATORY REQUIREMENTS

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

2.02 CELLULAR MELAMINE

A. Manufacturers:
   1. Techlite Insulation Systems; _____: www.techlite.net.

B. Insulation: Flexible preformed open-cell polymeric foam tubing, slit lengthwise for installation, complying with applicable requirements of ASTM C1410.
   1. 'K' Value: ASTM C177; 0.25 at 75 degrees F.
   2. Minimum Service Temperature: Minus 40 degrees F.
   3. Maximum Service Temperature: 350 degrees F.
   4. Density: 0.56 lb/cu ft.
   5. Jacketing material to be field-applied.

2.03 GLASS FIBER, FLEXIBLE

A. Manufacturers:
   1. CertainTeed Corporation; _____: www.certainteed.com.
   2. Johns Manville Corporation; _____: www.jm.com.
   3. Knauf Insulation; _____: www.knaufinsulation.com.
   4. Owens Corning Corp; _____: www.owenscorning.com.
   5. Substitutions: See Section 01 6000 - Product Requirements.

B. Insulation: ASTM C553; flexible, noncombustible.
   1. 'K' Value: 0.36 at 75 degrees F, when tested in accordance with ASTM C177 or ASTM C518.
   2. Maximum Service Temperature: 450 degrees F.
   3. Maximum Water Vapor Absorption: 5.0 percent by weight.

C. Vapor Barrier Jacket: Kraft paper reinforced with glass fiber yarn and bonded to aluminized film.
   1. Moisture Vapor Permeability: 0.02 perm inch, when tested in accordance with ASTM E96/E96M.
   2. Secure with self-sealing longitudinal laps and butt strips.

D. Vapor Barrier Lap Adhesive: Compatible with insulation.

2.04 GLASS FIBER, RIGID

A. Manufacturer:

1. CertainTeed Corporation; _____: www.certainteed.com.
2. Johns Manville Corporation; _____: www.jm.com.
3. Knauf Insulation; _____: www.knaufinsulation.com.
4. Owens Corning Corp; _____: www.owenscorning.com.
5. Substitutions: See Section 01 6000 - Product Requirements.

B. Insulation: ASTM C612 or ASTM C592; rigid, noncombustible.
1. 'K' Value: 0.25 at 75 degrees F, when tested in accordance with ASTM C177 or ASTM C518.
2. Maximum Service Temperature: 850 degrees F.
3. Maximum Water Vapor Absorption: 5.0 percent by weight.
4. Maximum Density: 8.0 lb/cu ft.

C. Vapor Barrier Jacket:
1. Kraft paper reinforced with glass fiber yarn and bonded to aluminized film.
2. Moisture Vapor Permeability: 0.02 perm inch, when tested in accordance with ASTM E96/E96M.
3. Secure with self-sealing longitudinal laps and butt strips.

D. Vapor Barrier Lap Adhesive: Compatible with insulation.

2.05 FLEXIBLE ELASTOMERIC CELLULAR INSULATION

A. Manufacturer:
1. Aeroflex USA, Inc; _____: www.aeroflexusa.com.
2. Armacell LLC; _____: www.armacell.us.
3. K-Flex USA LLC; _____: www.kflexusa.com.

B. Insulation: Preformed flexible elastomeric cellular rubber insulation complying with ASTM C534/C534M Grade 3, in sheet form.
1. Minimum Service Temperature: Minus 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.

2.06 JACKETS

A. PVC Plastic:
1. Manufacturers:
a. Johns Manville Corporation; _____: www.jm.com.
b. Techlite Insulation Systems; _____: www.techlite.net.
c. Substitutions: See Section 01 6000 - Product Requirements.
2. Jacket: Sheet material, off-white color.
a. Minimum Service Temperature: Minus 40 degrees F.
b. Maximum Service Temperature: 150 degrees F.
c. Moisture Vapor Permeability: 0.02 perm inch, when tested in accordance with ASTM E96/E96M.
d. Thickness: 10 mil.
e. Connections: Brush on welding adhesive.
3. Covering Adhesive Mastic: Compatible with insulation.

B. Aluminum Jacket: ASTM B209 (ASTM B209M) formed aluminum sheet.
1. Thickness: 0.016 inch sheet.
2. Finish: Smooth.
3. Joining: Longitudinal slip joints and 2 inch laps.
4. Metal Jacket Bands: 3/8 inch wide; 0.015 inch thick aluminum.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that equipment 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. Factory Insulated Equipment: Do not insulate.

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

D. Apply insulation close to equipment by grooving, scoring, and beveling insulation. Fasten insulation to equipment with studs, pins, clips, adhesive, wires, or bands.

E. Fill joints, cracks, seams, and depressions with bedding compound to form smooth surface. On cold equipment, use vapor barrier cement.

F. Insulated equipment containing fluids below ambient temperature: Insulate entire system.

G. Install cellular melamine with factory applied jackets with a manufacturer-approved adhesive along seams, both straight lap joints and circumferential lap joints.
   1. Install seal over seams with factory-approved room temperature vulcanization (RTV) silicone sealant to ensure a positive vapor barrier seal in outdoor and sanitary wash down environments.

H. For fiberglass insulated equipment containing fluids below ambient temperature, provide vapor barrier jackets, factory-applied or field-applied, and finish with glass cloth and vapor barrier adhesive.

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

J. For hot equipment containing fluids over 140 degrees F, insulate flanges and unions with removable sections and jackets.

K. Fiberglass insulated equipment containing fluids above ambient temperature: Provide standard jackets, with or without vapor barrier, factory-applied or field-applied. Finish with glass cloth and adhesive.

L. Inserts and Shields:
   1. Application: Equipment 1-1/2 inches diameter or larger.
   2. Shields: Galvanized steel between hangers and inserts.
   3. Insert location: Between support shield and equipment 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.

M. Finish insulation at supports, protrusions, and interruptions.

N. Equipment in Mechanical Equipment Rooms or Finished Spaces: Finish with canvas jacket sized for finish painting.

O. Exterior Applications:
   1. Provide vapor barrier jacket or finish with glass mesh reinforced vapor barrier cement.
   2. Cover with aluminum, stainless steel, or _____.

P. Cover glass fiber insulation with metal mesh and finish with heavy coat of insulating cement.

Q. Nameplates and ASME Stamps: Bevel and seal insulation around; do not insulate over.

R. Equipment Requiring Access for Maintenance, Repair, or Cleaning: Install insulation so it can be easily removed and replaced without damage.

3.03 SCHEDULES

A. Plumbing Systems:
   1. Domestic Hot Water Storage Tanks:
      a. Glass Fiber, Flexible Insulation: ____ inches thick.
      b. Cellular Foam Insulation: ____ inches thick.

B. Heating Systems:
   1. Heat Exchangers/Converters:
   2. Air Separators:
   3. Expansion Tanks:
   4. Hot Thermal Storage Tanks:
   5. Boiler Feed Water Storage Tanks:
   6. Steam Condensate Receivers:
   7. Condensate Tanks:
   8. Deaerators:
   9. Flue Gas Breeching:
   10. Stacks to Roof:
   11. Boiler and Flue Boxes:
   12. Boiler Drum Heads:

C. Cooling Systems:
   1. Air Separators:
   2. Expansion Tanks:
   3. Chiller Cold Surfaces (Not Factory Insulated):
   4. Cold Thermal Storage Tanks:
   5. Equipment Exposed to Freezing with Heat Tracing:

END OF SECTION 22 0716