SECTION 220700

PIPING INSULATION

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Piping insulation.

B. Jackets and accessories.

1.2 RELATED SECTIONS

A. Division 07 - Firestopping.

B. Division 09 - Painting: Painting insulation jacket.

C. Section 22 05 29 - Supports and Anchors for Plumbing Systems.

D. Section 22 11 16 - Plumbing Piping: Placement of hangers and hanger inserts.

E. Section 22 05 53 - Plumbing Identification.

1.3 REFERENCES

A. ASTM A167 - Standard Specification for Stainless and Heat-Resisting Chromium-Nickel Steel Plate, Sheet, and Strip.

B. ASTM B209 - Aluminum and Aluminum-Alloy Sheet and Plate.

C. ASTM C177 - Steady-State Heat Flux Measurements and Thermal Transmission Properties by Means of the Guarded-Hot-Plate Apparatus.

D. ASTM C195 - Mineral Fiber Thermal Insulation Cement.

E. ASTM C240 - Standard Test Methods of Testing Cellular Glass Insulation Block.

F. ASTM C449/C449M - Mineral Fiber Hydraulic-setting Thermal Insulating and Finishing Cement.

G. ASTM C518 - Steady-State Heat Flux Measurements and Thermal Transmission Properties by Means of the Heat Flow Meter Apparatus.

H. ASTM C534 - Preformed Flexible Elastomeric Cellular Thermal Insulation in Sheet and Tubular Form.

I. ASTM C547 - Mineral Fiber Preformed Pipe Insulation.

J. ASTM C591 - Unfaced Preformed Rigid Preformed Cellular Urethane Thermal Insulation.

K. ASTM C610 - Expanded Perlite Block and Pipe Thermal Insulation.

L. ASTM C795 - Thermal Insulation for Use in Contact with Austenitic Stainless Steel.

M. ASTM C921 - Properties of Jacketing Materials for Thermal Insulation.

N. ASTM D1056 - Flexible Cellular Materials - Sponge or Expanded Rubber.

O. ASTM D1667 - Flexible Cellular Materials - Vinyl Chloride Polymers and Copolymers (Closed Cell Foam).

P. ASTM D1784 - Rigid Poly (Vinyl Chloride) (PVC) Compounds and Chlorinated Poly (Vinyl Chloride) (CPVC) Compounds.

Q. ASTM D2842 - Water Absorption of Rigid Cellular Plastics.

R. ASTM E84 - Surface Burning Characteristics of Building Materials.

S. ASTM E96 - Water Vapor Transmission of Materials.

T. NAIMA - National Insulation Standards.

U. NFPA 255 - Surface Burning Characteristics of Building Materials.

V. UL 723 - Surface Burning Characteristics of Building Materials.

1.4 SUBMITTALS

A. Submit under the provisions of Division 01.

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

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

1.5 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in manufacturing the Products specified in this section with a minimum of three (3) years' documented experience.

B. Applicator Qualifications: Company specializing in performing the work of this section with a minimum of three (3) years' documented experience, approved by manufacturer.

1.6 REGULATORY REQUIREMENTS

A. Conform to maximum flame spread/smoke developed rating of 25/50 in accordance with ASTM E84.

1.7 DELIVERY, STORAGE, AND HANDLING

A. Deliver, store, protect, and handle products to site under provisions of Section 22 05 00.

B. Deliver materials to site in original factory packaging, labeled with the manufacturer's identification including product density and thickness.

C. Store insulation in original wrapping and protect from weather and construction traffic.

D. Protect insulation against dirt, water, chemical, and mechanical damage.

1.8 ENVIRONMENTAL REQUIREMENTS

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

2.1 GLASS FIBER

A. Manufacturers:
   1. Johns Manville.
   2. Other acceptable manufacturers offering equivalent products.
      a) Knauf.
      b) Owens-Corning.
      c) CertainTeed.

B. Insulation: ASTM C547; rigid molded, noncombustible.
   1. 'K' value: ASTM C335, 0.24 at 75 degrees F.
   2. Minimum Service Temperature: -20 degrees F.
   3. Maximum Service Temperature: 850 degrees F.
   4. Maximum Moisture Absorption: 0.2 percent by volume.

C. Vapor Barrier Jacket
   1. ASTM C921, White kraft paper reinforced with glass fiber yarn and bonded to aluminized film.
   2. Moisture Vapor Transmission: ASTM E96; 0.02 perm inches.
   3. Secure with self-sealing longitudinal laps and butt strips.
   4. Secure with outward clinch expanding staples and vapor barrier mastic.

D. Tie Wire: 18 gage stainless steel with twisted ends on maximum 12-inch centers.

E. Vapor Barrier Adhesive: Install vapor barrier adhesive of type recommended by insulation manufacturer.

2.2 CELLULAR FOAM

A. Manufacturers:
   1. Armstrong Armaflex.
   2. Other acceptable manufacturers offering equivalent products.
      a) Aeroflex Aerocel.
      b) Imcoa-Imcolock.

B. Insulation: ASTM C534; flexible, cellular elastomeric, molded or sheet.
   1. 'K' Value: ASTM C177 or C518; 0.28 at 75 degrees F.
   2. Minimum Service Temperature: -40 degrees F.
   3. Maximum Service Temperature: 220 degrees F.
   4. Maximum Moisture Absorption: ASTM D1056; 1.0 percent by volume.
   5. Moisture Vapor Transmission: ASTM E96; 0.17 perm inches.
   6. Maximum Flame Spread: ASTM E84; 25.
   7. Maximum Smoke Developed: ASTM E84; 50 (pipe), 100 (sheet).
   8. Connection: Waterproof vapor barrier adhesive.

C. Elastomeric Foam Adhesive: Install adhesive as recommended by the insulation manufacturer.

2.3 JACKETS

A. PVC Plastic
   1. Manufacturers:
      a) Zeston.
      b) Prato.
      c) Foster Products.
   2. Jacket: ASTM C921, 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 Transmission: ASTM E96; 0.002 perm inches.
      d) Maximum Flame Spread: ASTM E84; 25.
      e) Maximum Smoke Developed: ASTM E84; 50.
      f) Thickness: 20 mil.
      g) Connections: Brush on welding adhesive and pressure sensitive color matching vinyl tape.
   3. Covering Adhesive Mastic: Install mastic as recommended by the covering manufacturer.

B. Canvas Jacket: UL listed.
   1. Fabric: ASTM C921, 6 oz/sq yd, plain weave cotton treated with dilute fire-retardant lagging adhesive.
   2. Lagging Adhesive: Install adhesive as recommended by insulation manufacturer.

C. Aluminum Jacket: ASTM B209.
   1. Thickness: 0.020 inch.
   2. Finish: Smooth.
   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.

PART 3 EXECUTION

3.1 EXAMINATION

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

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

3.2 INSTALLATION

A. Install materials in accordance with the manufacturer's instructions.

B. On exposed piping, locate insulation and cover seams in least visible locations.

C. Insulated dual temperature pipes or cold pipes conveying fluids below ambient temperature:
   1. Provide vapor barrier jackets, factory applied, or field applied.
   2. Insulate fittings, joints, and valves with molded insulation of like material and thickness as adjacent pipe.
   3. Finish with glass cloth and vapor barrier adhesive.
   4. PVC fitting covers may be used.
   5. Continue insulation through walls, sleeves, pipe hangers, and other pipe penetrations.
   6. Insulate the entire system including fittings, valves, unions, flanges, strainers, flexible connections, pump bodies, and expansion joints.

7. Install vapor stop (dam) at maximum 20 feet intervals and at all fittings per manufacturer's installation recommendations.

D. For insulated pipes conveying fluids above ambient temperature:
   1. Provide standard jackets, with or without vapor barrier, factory applied, or field applied.
   2. Insulate fittings, joints, and valves with insulation of like material and thickness as adjoining pipe.
   3. Finish with glass cloth and adhesive.
   4. PVC fitting covers may be used.
   5. 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.
   6. For hot piping conveying fluids over 140 degrees F, insulate flanges and unions at equipment.

E. 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.

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

G. For pipe exposed in mechanical equipment rooms or in finished spaces, finish with P.V.C. jacket sized for finish painting.

H. For 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.

I. For 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.

3.3 TOLERANCE

A. Substituted insulation materials shall provide thermal resistance within 10 percent at normal conditions, as materials indicated.

3.4 GLASS FIBER INSULATION SCHEDULE

	PIPING SYSTEMS	PIPE SIZE Inch	THICKNESS Inch
A.	Plumbing Systems		
	Domestic Cold Water	all sizes	½"
	Domestic Hot Water and	Up to 1.5"	1"
	Hot Water Recirculation	1.5" and above	1½"
	Roof Drainage run Horizontal Above Grade	all sizes	½"
	Floor Drains Above Grade Mechanical Rooms Drains, Traps and Horizontal Piping	all sizes	½"
	Condensate Drains	all sizes	½"
B.	Heating and Cooling Systems		
	Equipment Drains	all sizes	½"

3.5 CELLULAR FOAM INSULATION

	Plumbing System	PIPE SIZE Inch	THICKNESS Inch
	Domestic Water Piping under Slab	all sizes	½"
	Condensate Drains	all sizes	½"
B.	Heating and Cooling Systems		
	Equipment Drains	all sizes	½"

END OF SECTION