

**SECTION 23 07 19**  
**HVAC PIPING INSULATION**

**PART 1 - GENERAL**

**1.1 STIPULATIONS**

- A. The specifications sections "General Conditions to the Construction Contract", "Special Conditions" and "Division 01 - General Requirements" form a part of this Section by this reference thereto, and shall have the same force and effect as if printed herewith in full.

**1.2 ADDITIONAL RELATED DOCUMENTS**

- A. Division 23 Section "Hangers and Supports for HVAC Piping and Equipment" for requirements related to pipe insulation shields, thermal-hanger shields and shield inserts, and protection saddles.

**1.3 SUMMARY**

- A. This Section includes pipe insulation; insulating cements; field-applied jackets; accessories and attachments; and sealing compounds.

**1.4 ACTION SUBMITTALS**

- A. Product Data: Identify thermal conductivity, thickness, and jackets (both factory and field applied, if any), for each type of product indicated.

**1.5 INFORMATIONAL SUBMITTALS**

- A. Installer Certificates: Signed by the Contractor certifying that installers comply with requirements.

**1.6 QUALITY ASSURANCE**

- A. Installer Qualifications: Skilled mechanics who have successfully completed a craft training program offered by the Contractor, insulation material manufacturer, or trade association relating to the installation of pipe insulation for commercial, industrial and institutional applications. Installers shall also have no less than one (1) year of relevant experience.
- B. Installation Standards: The application of insulation shall conform to the Midwest Insulation Contractors Association's (MICA) "National Commercial and Industrial Insulation Standards", 8th Edition, except where the content of this Section conflicts.
- C. Fire-Test-Response Characteristics: As determined by testing materials identical to those specified in this Section according to ASTM E 84, by a testing and inspecting agency acceptable to authorities having jurisdiction. Factory label insulation and jacket materials and sealer and cement material containers with appropriate markings of applicable testing and inspecting agency.

1. Flame-spread rating of 25 or less, and smoke-developed rating of 50 or less.
  2. Materials used outside the building are exempt from the above requirement.
- D. Minimum Insulation Thicknesses and R-Values: Conform to requirements of ASHRAE Standard 90.1-2016 and the 2018 International Energy Conservation Code (IECC), or the requirements of this Section, whichever is most demanding.

## **1.7 DELIVERY, STORAGE, AND HANDLING**

- A. Packaging: Ship insulation materials in containers marked by manufacturer with appropriate ASTM specification designation, type and grade, and maximum use temperature.
- B. Protect materials from dirt and water. If insulation materials are dirtied or wetted, they shall not be installed, or shall be removed from the piping if wetted or soiled after installation.

## **1.8 COORDINATION**

- A. Coordinate size and location of supports, hangers, and insulation shields specified in Division 23 Section "Hangers and Supports for HVAC Piping and Equipment."
- B. Coordinate clearance requirements for insulation application during the preparation of piping shop drawings and coordination drawings, and during piping system installation..

## **1.9 SCHEDULING**

- A. Schedule insulation application after testing piping systems. Insulation application may begin on segments of piping that have satisfactory test results.
- B. Schedule the insulation application of refrigerant and other below-ambient piping systems to occur during the winter months, or with the cooling system de-energized. Substrates shall be completely dry at the time of application. Do not restore cooling service until the insulation installation is complete.

# **PART 2 - PRODUCTS**

## **2.1 MANUFACTURERS**

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
  1. Glass Mineral-Fiber Insulation:
    - a. Johns Manville Corp.
    - b. Knauf Insulation.
    - c. Manson Insulation Inc.
    - d. Owens-Corning Fiberglas Corp.
    - e. Or equal as approved by the Professional.

2. Flexible Elastomeric Insulation:
  - a. Armacell LLC.
  - b. K-Flex USA.
  - c. AeroFlex USA Inc.
  - d. Or equal as approved by the Professional.
3. PVC Jackets and Fitting Covers:
  - a. Speedline.
  - b. Johns Manville.
  - c. Knauf Insulation.
  - d. Proto Corp.
  - e. Or equal as approved by the Professional.
4. Aluminum Jackets and Fitting Covers:
  - a. ITW Insulation Systems
  - b. Pabco-Childers
  - c. RPR Products Inc.
  - d. Or equal as approved by the Professional.

## **2.2 INSULATION MATERIALS**

- A. General Requirements: All insulation materials shall comply with the following:
  1. Products shall not contain asbestos, lead, mercury, or mercury compounds.
  2. Products that come in contact with stainless steel shall have a leachable chloride content of less than 50 ppm when tested according to ASTM C 871.
  3. Insulation materials for use on austenitic stainless steel shall be qualified as acceptable according to ASTM C 795.
  4. Foam insulation materials shall not use CFC or HCFC blowing agents in the manufacturing process.
- B. Glass Mineral-Fiber Insulation: Glass fibers bonded with a thermosetting resin complying with the following:
  1. Pre-formed/ Pre-Molded Pipe Insulation: Comply with ASTM C 547, Type 1, with factory-applied, all-service, vapor-retarder jacket (ASJ). Minimum 40% total (pre- and post-consumer) recycled content. Density shall be no less than 3.5 PCF, per ASTM C302.
    - a. All Service Jacket (ASJ): White, kraft-paper, fiberglass-reinforced scrim with aluminum-foil backing, complying with ASTM C 1136, Type I.
      - 1) Self-sealing, pressure-sensitive, acrylic-based adhesive covered by a removable protective strip to provide a full adhesive closure system. ASJs requiring stapled closures are not acceptable.
      - 2) Water Vapor Permeance: 0.02 perms, maximum, as per ASTM E96-Procedure A (dry cup).
      - 3) Butt strips shall be fabricated of the same material, and with the same backing adhesive.

2. Blanket Insulation: Flexible, with continuous thickness (i.e. not pre-scored semi-rigid type), and the grain perpendicularly oriented to the insulated surface. Comply with ASTM C 1393, Type IIIB Category 2, 2-1/2 PCF density, both with and without facing.
    - a. The use of blankets shall be limited to pipe fittings and appurtenances for which pre-molded insulation sections are not available.
    - b. Blanket without facing shall only be used with a field-applied jacket or preformed fitting covers.
    - c. Facing shall be an all service jacket (ASJ) consisting of white, kraft-paper, fiberglass-reinforced scrim with aluminum-foil backing, complying with ASTM C 1136, Type I. Water vapor permeance shall be 0.02 perms, maximum, as per ASTM E96-Procedure A (dry cup).
  3. Fire-Resistant Adhesive: Comply with MIL-A-3316C in the following classes and grades:
    - a. Class 1, Grade A for bonding glass cloth and tape to un-faced glass-fiber insulation, for sealing edges of glass-fiber insulation, and for bonding lagging cloth to un-faced glass-fiber insulation.
    - b. Class 2, Grade A for bonding glass-fiber insulation to metal surfaces.
  4. Vapor-Retarder Mastics: Fire- and water-resistant, vapor-retarder mastic for indoor applications. Comply with MIL-C-19565C, Type II.
  5. Mineral-Fiber Insulating Cements: Comply with ASTM C 195.
  6. Mineral-Fiber, Hydraulic-Setting Insulating and Finishing Cement: Comply with ASTM C 449.
- C. Flexible Elastomeric Thermal Insulation: EPDM-based, closed-cell, flexible elastomeric insulation. NBR/PVC based insulation materials are not acceptable. Comply with ASTM C 534, Type I for tubular materials and Type II for sheet materials. 25/50 flame spread and smoke developed rating in accordance with ASTM E84. The material shall be rated for continuous service temperatures as high as 250 deg. F.
1. Water Vapor Permeance: 0.08 perms, maximum, as per ASTM E96 - Procedure A (dry cup).
  2. Adhesive: As recommended by insulation material manufacturer.
  3. Ultraviolet-Protective Coating: As recommended by insulation manufacturer.
  4. Materials shall have a maximum thermal conductivity of 0.265 Btu-in./h-ft<sup>2</sup>- °F at a 75°F mean temperature when tested in accordance with ASTM C 177 or ASTM C 518, latest revisions.
- D. Prefabricated Thermal Insulating Fitting Covers: Comply with ASTM C 450 and ASTM C 585 for dimensions used in preforming insulation to cover valves, elbows, tees, and flanges.

## 2.3 JACKET TAPES

- A. All-Service Jacket (ASJ) Tape: White vapor-retarder tape matching factory-applied jacket with acrylic adhesive, complying with ASTM C 1136.
1. Width: 3 inches.
  2. Thickness: 11.5 mils.
  3. Adhesion: 90 ounces force/inch in width.
  4. Elongation: 2 percent.
  5. Tensile Strength: 40 lbf/inch in width.
  6. ASJ Tape Disks and Squares: Precut disks or squares of ASJ tape.

## **2.4 FIELD-APPLIED JACKETS**

- A. General: ASTM C 921, Type 1, unless otherwise indicated.
- B. PVC Jacket: High-impact, ultraviolet-resistant PVC; roll stock ready for shop or field cutting and forming, meeting ASTM 1784.
  - 1. Adhesive: As recommended by insulation material manufacturer.
  - 2. Minimum Thickness:
    - a. Indoors: 20 mils.
    - b. Outdoors: 30 mils.
    - c. Insulated diameters larger than 15" OD: 40 mils.
  - 3. PVC Jacket Color: White.
- C. PVC Fitting Covers: Factory-fabricated fitting covers manufactured from minimum 30-mil-thick, high-impact, ultraviolet-resistant white PVC.
  - 1. Shapes: 45- and 90-degree, short- and long-radius elbows, tees, valves, flanges, reducers, end caps,, traps, and mechanical joints..
  - 2. Adhesive: As recommended by insulation material manufacturer.
- D. Aluminum Jacket and Fitting Covers: Factory cut and rolled to required sizes. Comply with ASTM B 209, 3003 or 3105 alloy, H-14 temper.
  - 1. Finish and Thickness: Stucco-embossed finish, 0.016 inch thick .
  - 2. Moisture Retarder: 1-mil-thick, heat-bonded polyethylene and kraft paper on interior surface.
  - 3. Elbows and Other Fitting Covers: Preformed, including 45- and 90-degree, short- and long-radius elbows, tee covers, flange covers, valve covers, and end caps; same material, finish, and thickness as jacket.

## **2.5 ACCESSORIES AND ATTACHMENTS**

- A. Glass Cloth and Tape: Comply with MIL-C-20079H, Type I for cloth and Type II for tape. Woven glass-fiber fabrics, plain weave, pre-sized a minimum of 8 oz./sq. yd.
  - 1. Tape Width: 4 inches.
- B. Bands: 3/4-inch-wide, in one of the following materials compatible with jacket:
  - 1. Stainless Steel: ASTM A 666, Type 304; 0.020 inch thick.
  - 2. Aluminum: 0.007 inch thick.
- C. Wire: 0.080-inch, nickel-copper alloy; 0.062-inch, soft-annealed, stainless steel; or 0.062-inch, soft-annealed, galvanized steel.
- D. Staples: Outward-clinching insulation staples, nominal 3/4-inch-wide, stainless steel or Monel.

## **2.6 VAPOR RETARDERS**

- A. Mastics: Materials recommended by insulation material manufacturer that are compatible with insulation materials, jackets, and substrates.

## **PART 3 - EXECUTION**

### **3.1 EXAMINATION**

- A. Examine substrates and conditions for compliance with requirements for installation and other conditions affecting performance of insulation application.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

### **3.2 PREPARATION**

- A. Surface Preparation: Clean and dry pipe and fitting surfaces. Remove materials that will adversely affect insulation application.
- B. Do not apply insulation to wet surfaces.

### **3.3 GENERAL APPLICATION REQUIREMENTS**

- A. Apply insulation materials, accessories, and finishes according to the manufacturer's written instructions; with smooth, straight, and even surfaces; free of voids throughout the length of piping, including fittings, valves, and specialties.
- B. Refer to schedules at the end of this Section for materials, forms, jackets, and thicknesses required for each piping system.
- C. Use accessories compatible with insulation materials and suitable for the service. Use accessories that do not corrode, soften, or otherwise attack insulation or jacket in either wet or dry state.
- D. Apply insulation with longitudinal seams at top and bottom of horizontal pipe runs.
- E. Apply multiple layers of insulation with longitudinal and end seams staggered.
- F. Seal joints and seams with vapor-retarder mastic on insulation indicated to receive a vapor retarder.
- G. Keep insulation materials dry during application and finishing.
- H. Apply insulation with tight longitudinal seams and end joints. Bond seams and joints with adhesive recommended by the insulation material manufacturer.
- I. Apply insulation with the least number of joints practical.
- J. Apply insulation over fittings, valves, and specialties, with continuous thermal and vapor-retarder integrity, unless otherwise indicated. Refer to special instructions for applying insulation over fittings, valves, and specialties.

- K. Hangers and Anchors: Where vapor retarder is indicated, seal penetrations in insulation at hangers, supports, anchors, and other projections with vapor-retarder mastic.
1. Apply insulation continuously through hangers and around anchor attachments.
  2. For insulation application where vapor retarders are indicated, extend insulation on anchor legs at least 12 inches from point of attachment to pipe and taper insulation ends. Seal tapered ends with a compound recommended by the insulation material manufacturer to maintain vapor retarder.
  3. Install insert materials and apply insulation to tightly join the insert. Seal insulation to insulation inserts with adhesive or sealing compound recommended by the insulation material manufacturer.
  4. Cover inserts with jacket material matching adjacent pipe insulation. Install shields over jacket, arranged to protect the jacket from tear or puncture by the hanger, support, and shield.
- L. Insulation Terminations: For insulation application where vapor retarders are indicated, taper insulation ends. Seal tapered ends with a compound recommended by the insulation material manufacturer to maintain vapor retarder.
- M. Apply adhesives and mastics at the manufacturer's recommended coverage rate.
- N. Apply insulation with factory-applied jackets as follows:
1. Pull jacket tight and smooth.
  2. Circumferential Joints: Cover with 3-inch-wide butt strips, of same material as insulation jacket. Secure strips with adhesive and outward clinching staples along both edges of strip and spaced 4 inches o.c. For below-ambient services, apply vapor-barrier mastic over staples.
    - a. Exception: Do not use staples on insulation for which a full adhesive closure systems is specified.
  3. Longitudinal Seams: Overlap jacket seams at least 1-1/2 inches. Apply insulation with longitudinal seams at bottom of pipe. Clean and dry surface to receive self-sealing lap.
    - a. Exception: Do not staple longitudinal laps on below ambient services.
  4. Vapor-Retarder Mastics: Where vapor retarders are indicated, apply mastic on seams and joints and at ends adjacent to flanges, unions, valves, and fittings.
  5. At penetrations in jackets for thermometers and pressure gages, fill and seal voids with vapor-retarder mastic.
- O. Roof Penetrations: Apply insulation for interior applications to a point even with top of roof flashing.
1. Seal penetrations with vapor-retarder mastic.
  2. Apply insulation for exterior applications tightly joined to interior insulation ends.
  3. Extend metal jacket of exterior insulation outside roof flashing at least 2 inches below top of roof flashing.
  4. Seal metal jacket to roof flashing with vapor-retarder mastic.
- P. Insulation Installation at Aboveground Exterior Wall Penetrations: Install insulation continuously through wall penetrations.
1. Seal penetrations with flashing sealant.

2. For applications requiring only indoor insulation, terminate insulation inside wall surface and seal with joint sealant. For applications requiring indoor and outdoor insulation, install insulation for outdoor applications tightly joined to indoor insulation ends. Seal joint with joint sealant.
  3. Extend jacket of outdoor insulation outside wall flashing and overlap wall flashing at least 2 inches.
  4. Seal jacket to wall flashing with flashing sealant.
- Q. Below Grade Exterior Wall Penetrations: For penetrations of below-grade exterior walls, terminate insulation flush with mechanical sleeve seal. Seal terminations with vapor-retarder mastic.
- R. Interior Wall and Partition Penetrations: Apply insulation continuously through walls and floors.
- S. Fire-Rated Wall and Partition Penetrations: Apply insulation at penetrations of fire-rated walls, and partitions to conform to applicable UL requirements. Seal with firestop material.
- T. Floor Penetrations: Apply insulation at penetrations of floor assemblies to conform to applicable UL requirements. Seal with firestop material.
1. For insulation with vapor retarders, seal insulation with vapor-retarder mastic where floor supports penetrate vapor retarder.

### **3.4 GLASS MINERAL-FIBER INSULATION APPLICATION**

- A. Apply insulation to straight pipes and tubes as follows:
1. Secure each layer of preformed pipe insulation to pipe with wire, tape, or bands without deforming insulation materials.
  2. Where vapor retarders are indicated, and for services operating below ambient conditions:
    - a. Seal longitudinal seams and end joints with vapor-retarder mastic.
    - b. Apply vapor retarder to ends of insulation at intervals not exceeding 12 feet to form a vapor retarder / water dam between pipe insulation segments to prevent extended moisture migration should the vapor barrier in one segment become compromised.
    - c. Vapor / water dams shall also be at valves, grooved couplings, flanges, elbows, tees, and similar fittings as recommended in Section 2 of NAIMA's "Guide to Insulating Chilled Water Piping Systems with Mineral Fiber Pipe Insulation", 1st Edition (2015).
  3. For insulation with factory-applied jackets, secure laps with butt strips with factory applied adhesive.
  4. For insulation with factory-applied jackets with vapor retarders, do not staple longitudinal tabs but secure tabs with additional adhesive as recommended by the insulation material manufacturer and seal with vapor-retarder mastic.
- B. Apply insulation to flanges as follows:
1. Apply pre-formed pipe insulation to outer diameter of pipe flange.
  2. Make width of insulation segment the same as overall width of the flange and bolts, plus twice the thickness of the pipe insulation.
  3. Fill voids between inner circumference of flange insulation and outer circumference of adjacent straight pipe segments with mineral-fiber blanket insulation.
  4. Apply glass cloth jacket material with manufacturer's recommended adhesive, overlapping seams at least 1 inch, and seal joints with vapor-retarder mastic.



C. Apply insulation to fittings and elbows as follows:

1. Apply pre-molded insulation sections of the same material as straight segments of pipe insulation when available. Secure according to manufacturer's written instructions.
2. When pre-molded insulation elbows and fittings are not available, apply mitered sections of pipe insulation to a thickness equal to adjoining pipe insulation. Secure insulation materials with wire, tape, or bands.
3. Cover fittings with fitting covers. Overlap covers on pipe insulation jackets at least 1 inch at each end. Secure fitting covers with manufacturer's attachments and accessories. Seal seams with tape and vapor-retarder mastic.
4. For large sizes or odd shapes where fitting covers are not available, use ICA Hamfab, or equivalent, custom pre-molded insulators, and finish over with glass-cloth jacket and sealing mastic.

D. Apply insulation to valves and specialties as follows:

1. Apply pre-molded insulation sections of the same material as straight segments of pipe insulation when available. Secure according to manufacturer's written instructions.
2. Arrange insulation to permit access to packing and to allow valve operation without disturbing insulation. For strainers, arrange insulation for access to strainer basket without disturbing insulation.
3. Apply insulation to flanges as specified for flange insulation application.
4. Use pre-formed fitting covers for valve sizes where available. Secure fitting covers with manufacturer's attachments and accessories. Seal seams with tape and vapor-retarder mastic.
5. For larger sizes and odd shapes where fitting covers are not available, seal insulation with use ICA Hamfab, or equivalent, custom pre-molded insulators, and finish over with glass-cloth jacket and jacket and sealing compound recommended by the insulation material manufacturer.

### **3.5 FLEXIBLE ELASTOMERIC THERMAL INSULATION APPLICATION**

A. Seal all seams, butt joints, termination points, and open ends with the manufacturer's approved sealant to prevent air / moisture intrusion.

B. Apply vapor retarder to ends of insulation at intervals not exceeding 12 feet to form a vapor retarder / water dam between pipe insulation segments to prevent extended moisture migration should the vapor barrier in one segment become compromised.

C. Apply insulation to straight pipes and tubes as follows:

1. Follow manufacturer's written instructions for applying insulation.
2. Seal longitudinal seams and end joints with manufacturer's recommended adhesive. Cement to avoid openings in insulation that will allow passage of air to the pipe surface.

D. Apply insulation to flanges as follows:

1. Apply pipe insulation to outer diameter of pipe flange.
2. Make width of insulation segment the same as overall width of the flange and bolts, plus twice the thickness of the pipe insulation.
3. Fill voids between inner circumference of flange insulation and outer circumference of adjacent straight pipe segments with cut sections of sheet insulation of the same thickness as pipe insulation.

4. Secure insulation to flanges and seal seams with manufacturer's recommended adhesive. Cement to avoid openings in insulation that will allow passage of air to the pipe surface.
- E. Apply insulation to fittings and elbows as follows:
1. Apply mitered sections of pipe insulation.
  2. Secure insulation materials and seal seams with manufacturer's recommended adhesive. Cement to avoid openings in insulation that will allow passage of air to the pipe surface.
- F. Apply insulation to valves and specialties as follows:
1. Apply pre-formed valve covers manufactured of the same material as pipe insulation and attached according to the manufacturer's written instructions.
  2. Apply cut segments of pipe and sheet insulation to valve body. Arrange insulation to permit access to packing and to allow valve operation without disturbing insulation. For strainers, fabricate removable sections of insulation arranged to allow access to strainer basket.
  3. Apply insulation to flanges as specified for flange insulation application.
  4. Secure insulation to valves and specialties and seal seams with manufacturer's recommended adhesive. Cement to avoid openings in insulation that will allow passage of air to the pipe surface.

### **3.6 FIELD-APPLIED JACKET INSTALLATION**

- A. Where PVC jackets and/or fitting covers are indicated, install with 1-inch overlap at longitudinal seams and end joints; for horizontal applications. Seal with manufacturer's recommended adhesive.
1. Apply two continuous beads of adhesive to seams and joints, one bead under lap and the finish bead along seam and joint edge.
  2. Jacketing shall be adhered to insulation with contact adhesive and 1-1/2" wide tape at all seams.
  3. Tightly butt sections together and seal joints with mastic to visually conceal joints. Use long sections to keep joints to a minimum. Install jacketing so that seams are concealed from view.
  4. Conform to manufacturer's installation recommendations.
- B. Where metal jackets and/or fitting covers are indicated, install with 2-inch overlap at longitudinal seams and end joints. Overlap longitudinal seams arranged to shed water. Seal end joints with weatherproof sealant recommended by insulation manufacturer. Secure jacket with stainless-steel bands 12 inches o.c. and at end joints.

### **3.7 FIELD-APPLIED JACKET APPLICATION SCHEDULE**

- A. Exterior Piping: Apply full aluminum jacket and fitting covers for all insulated exterior piping.
- B. Interior, Exposed: Apply full PVC jacket and fitting covers for all insulated interior piping exposed to view in finished areas of the building, in mechanical rooms for portions of the piping system within 7 feet of the floor, and elsewhere the piping is exposed and subject to abuse. Apply PVC fitting covers to all exposed, interior insulated piping.
- C. Interior, Concealed: Apply PVC fitting covers to all concealed, interior insulated piping.

### **3.8 FINISHES**

- A. Flexible Elastomeric Thermal Insulation: After adhesive has fully cured, apply two (2) coats of the insulation manufacturer's recommended vinyl acrylic protective coating prior to applying any specified field-applied jackets. The coating shall have a white color and shall be K-Flex '374 Protective Coating', or approved equal. Perform surface preparation and cleaning and coating application in strict accordance with the manufacturers recommendations.

### **3.9 PIPING SYSTEM APPLICATIONS**

- A. Insulation materials and thicknesses are specified in schedules at the end of this Section.
- B. Items Not Insulated: Unless otherwise indicated, do not field-apply insulation to the following systems, materials, and equipment:
  - 1. Flexible connectors on heating hot water systems.
  - 2. Vibration-control devices.
  - 3. Unions, except on piping exposed in finished spaces, and on services operating below ambient temperature. Where unions are insulated, provide a label on the piping jacket identifying the union's location.
  - 4. Automatic temperature control valves, size 1" and smaller, on heating hot water systems.
  - 5. Backflow preventers.
  - 6. Do not insulate the portion of valves and other pipeline appurtenances that the manufacturer has specifically recommended against insulating.
  - 7. Specialty valves receiving factory insulation kits as specified in Division 23 Section "Hydronic Piping".
  - 8. Items receiving custom fitted removable thermal insulation blankets specified in Division 23 Section "HVAC Equipment Insulation".
- C. Insulate fittings and flanges as per the connecting piping.
- D. Insulate and jacket shut off valves (e.g. ball, gate, butterfly, etc.), strainers, check valves, and similar pipeline appurtenances as per the connecting piping.
  - 1. Exceptions: As noted above, and where those items are specified to have custom fitted removable thermal insulation blankets in Division 23 Section "HVAC Equipment Insulation".
- E. Provide labels on piping jacketing at check valves, unions, and other obscured appurtenances so their locations can be identified afterwards.

### **3.10 INTERIOR INSULATION APPLICATION SCHEDULE**

- A. This application schedule is for aboveground insulation inside the building.
- B. Refer to the "Field-Applied Jacket Application Schedule" article herein for field applied insulation jackets.
- C. Refer to the "Finishes" article herein for field applied finishes on flexible elastomeric insulation.
- D. Where a vapor retarder is indicated below, provide a fully vapor sealed installation with no voids.

- E. Service: Domestic cold water make-up.
  - 1. Insulation Material: Glass mineral fiber with ASJ or Flexible elastomeric.
  - 2. Insulation Thickness: 1 inch.
  - 3. Vapor Retarder Required: Yes.
- F. Service: Air conditioning condensate drain piping.
  - 1. Insulation Material: Glass mineral fiber with ASJ or Flexible elastomeric.
  - 2. Insulation Thickness: 1/2 inch.
  - 3. Vapor Retarder Required: Yes.
- G. Service: Heating hot-water supply and return piping.
  - 1. Insulation Material: Glass mineral fiber with ASJ.
  - 2. Insulation Thickness: Apply the following insulation thicknesses:
    - a. Pipe, 1-1/2 inches' diameter and smaller: 1-1/2 inches.
    - b. Pipe, 2 inches' diameter and larger: 2 inches.
  - 3. Vapor Retarder Required: No.
- H. Service: Steam supply, steam condensate, blowdown, drain, and vent piping.
  - 1. Insulation Material: Glass mineral fiber with ASJ.
  - 2. Insulation Thickness: Apply the following insulation thicknesses:
    - a. Low Pressure Systems:
      - 1) Piping 3 inches' diameter and smaller: 2-1/2 inches.
      - 2) Piping 4 inches' diameter and larger: 3 inches.
  - 3. Vapor Retarder Required: No.
- I. Service: Refrigerant piping.
  - 1. Insulation Material: Flexible elastomeric.
  - 2. Insulation Thickness: 1 inch.
  - 3. Vapor Retarder Required: Yes.

### **3.11 EXTERIOR INSULATION APPLICATION SCHEDULE**

- A. This application schedule is for above-ground insulation outside the heated and cooled envelope of the building.
- B. Refer to the "Field-Applied Jacket Application Schedule" article herein for field applied insulation jackets.
- C. Where a vapor retarder is indicated below, provide a fully vapor sealed installation with no voids.
- D. Service: Refrigerant piping.
  - 1. Insulation Material: Flexible elastomeric.
  - 2. Insulation Thickness: 2 inches.

3. Vapor Retarder Required: Yes.
4. Heat Tracing Required: No.

**END OF SECTION**