

*Pre-formed Fiber Glass Pipe Insulation Specification*

**SECTION 220700 - PLUMBING PIPING INSULATION**

**SECTION 230700 - HVAC PIPING INSULATION**

**PART 1.00 – GENERAL**

**1.01 SCOPE**

- A. The work covered by this specification consists of furnishing all labor, equipment, materials and accessories, and performing all operations required for the correct installation of Micro-Lok fiberglass pipe insulation on all chilled water and dual-cycle pipe systems, fittings, valves, controls and all other necessary items connected into the system subject to condensation or loss of heat when using JM Micro-Lok fiberglass pipe insulation.

**1.02 REFERENCES**

- A. ASTM C547 Specification for Mineral Fiber Pipe Insulation.  
B. NFPA 90A Standard for the Installation of Air-Conditioning and Ventilating Systems.  
C. ASTM C585 Practice for Inner and Outer Diameter of Rigid Thermal Insulation for Nominal Sizes of Pipe and Tubing (NPS System).  
D. ASTM C795 Specification for Thermal Insulation for Use in Contact with Austenitic Stainless Steel.  
E. ASTM C1136 Specification for Flexible, Low Permeance vapor retarders for Thermal Insulation.  
F. ASTM E84 or CAN ULC S102 for Surface Burning Characteristics of Building Materials.  
G. MIL-I-24244 Military Specification Insulation Material with Special Corrosion, Chloride and Fluoride Requirements.  
H. NRC 1.36 Nonmetallic Thermal Insulation for Austenitic Stainless Steel.  
I. NFPA 259 Standard Test Method for Potential Heat of Building Materials.  
J. ASTM C 1729 Standard Specification for Aluminum Jacketing for Insulation  
K. ASTM C 1767 Standard Specification for Stainless Steel Jacketing for Insulation

**1.03 SUBMITTALS**

- A. Product Data: Provide product description, list of materials and thickness for each service or equipment scheduled, locations and manufacturer's installation instructions.  
B. Shop Drawings: Submit list of insulation material and thickness to be used for each service. Include installation details for valves, fittings, pipe and all other items to be insulated.  
C. Samples: Submit samples of each insulation system to be used.

**1.04 ENVIRONMENTAL REQUIREMENTS**

- A. Maintain ambient temperatures and conditions required by

manufacturers of adhesives, mastics and insulating cements.

**1.05 QUALITY ASSURANCE**

- A. Insulation Materials: Fiberglass insulation materials must be manufactured at facilities certified and registered with an approved registrar to conform to ISO 9001 Quality Standard.
1. Pipe insulation shall be pre-formed and furnished in standard lengths with ends cut square, conforming with dimensional requirements of ASTM C585.
  2. Insulation materials shall be asbestos free.
  3. All insulating products shall have a maximum 25/50 flame spread/smoke developed rating as tested in accordance with ASTM E84.
- B. Workmanship: Where available, all insulation to be installed by a licensed and experienced applicator. Materials shall be applied in accordance with the manufacturer's recommendations.
1. All work shall comply with all applicable federal, state and local codes and laws. This shall include, but shall not be limited to, the Occupational Safety and Health Act.
  2. All work shall conform with accepted industry and trade standards for commercial and industrial insulations. Where available, it is recommended to use a National Insulation Association (NIA) certified (or other similarly certified) mechanical insulation inspector throughout the project to inspect and verify the materials and total insulation system have been installed correctly in accordance with the Johns Manville guide specifications.
  3. Surfaces to be insulated shall be clean and free of dirt, scale, moisture, corrosion, and oil and grease.
- C. Insulation materials that have become wet or contaminated shall not be installed.

**1.06 DELIVERY, STORAGE AND HANDLING**

- A. Deliver all materials (insulation, coverings, tapes, cements, adhesives, jacketing, coatings, etc.) to the job site in factory containers with manufacturer's label showing manufacturer, product name and where applicable, the ASTM E84 performance information. For all materials that list fire hazard information, technical data sheets shall be provided.
- B. Protect insulation from dirt, water, chemical attack and mechanical damage before, during, and after installation.
- C. Installed insulation that has not been weatherproofed and that is not protected by roof and walls shall be protected from precipitation by waterproof sheeting installed by the contractor. Wet or damaged insulation shall not be installed and, if installed, shall be removed and replaced by the contractor at no additional cost.

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## PART 2.00 – PRODUCTS

### 2.01 MANUFACTURERS

- A. Pre-formed fiber glass pipe insulation: Johns Manville's Micro-Lok® HP, Micro-Lok® or Micro-Lok® HP Ultra with all service vapor retarder jacket (ASJ), with white kraft paper or poly-exterior surface, a self-sealing longitudinal closure lap (SSL), and butt strips or approved alternate.
- B. PVC insulation jacketing: Johns Manville's Zeston® or approved alternate.
- C. Fitting insulation insert: Johns Manville's Hi-Lo® Temp fiber glass insulation insert or approved alternate. PVC tape: Johns Manville's Z-Tape® or approved alternate.
- D. Metal jacketing: Johns Manville's Metal Jacketing and Fittings.

### 2.02 PIPE INSULATION, FITTINGS, AND JACKETING MATERIAL

- A. All piping shall be insulated with a pre-formed fiber glass pipe insulation, complying with ASTM C547, Class 3 (to 850°F [454°C]), rigid, molded, noncombustible (plain) or limited combustibility (jacketed) pipe insulation.
  1. Thermal Conductivity ("k"): 0.23 Btu • in/ (hr • ft2 • °F) at 75°F mean temperature (0.033 W/m•°C at 24°C) per ASTM C518.
  2. Maximum Service Temperature: 850°F (454°C)
  3. Rated to a maximum 25/50 FS/SD per ASTM E84, CAN ULC S102.
  4. When being used over austenitic stainless steel, product must comply with the requirements ASTM C795.
  5. All-Service vapor retarder Jacket (ASJ): A white, kraft paper or poly exterior, reinforced with a glass fiber yarn and bonded to an aluminum foil with self-sealing longitudinal closure laps (SSL) and butt strips.
  6. Install Micro-Lok HP, Micro-Lok and Micro-Lok HP Ultra insulation at the thickness required to prevent condensation as indicated in project drawing as calculated by the NAIMA 3E Plus® program for most severe pipe operating conditions.
  7. Material shall be limited-combustible as defined in NFPA 90A with a potential heat value not exceeding 3,500 btu/lb (8141 kJ/kg) when tested in accordance with NFPA 259.
  8. When being used over stainless steel product must comply with the requirements of ASTM 795, MIL-I-24244 or NRC 1.36
- B. Field-Applied Protective Jackets and Fittings:
  1. PVC Plastic: Zeston 2000 Series. One piece, molded type fitting covers and jacketing material, gloss white.
    - a. Securement: Pressure sensitive adhesive, PVC weld cement, or matching vinyl tape. Tacks may be used to hold PVC jacketing and fittings in place on above ambient systems only. For chilled systems, tacks are not recommended.
    - b. Fittings, valves, tees, etc., shall be insulated with

- c. Hi-Lo Temp fiber glass insulation, and needs to be covered with Zeston 2000 insulated fitting covers.
  - c. 20 mil (0.5 mm)/30 mil (0.8 mm)/40 mil (1.0 mm) stock thickness.
  - d. UV Resistant. (White only)
  - e. For below ambient systems, seal joints with Perma-weld adhesive or Z-Tape.
  - f. Refer to Zeston PVC CI-35 for installation guidelines.
  - g. Jacketing shall have an ASTM E84 flame spread/ smoke development rating of maximum 25/50.
2. Aluminum Jacketing and Fittings:
    - a. Compliant with ASTM C1729, Type I, Grade 1, Class A, 0.016" (0.41 mm) thick cut and roll or rolls with smooth or embossed finish, with 2" (51 mm) longitudinal and circumferential laps.
    - b. Two-piece pressed fitting covers ASTM C1729, Type I, Grade 3, Class A 0.024" (0.61mm) thick all with factory heat laminated Polyfilm Moisture Barrier (PFMB) on interior surface.
    - c. Securement: Bands only. No screws, rivets or any other securement device capable of puncturing the underlying vapor retarder shall be used on a chilled system.

| Outer Insulation Diameter (in) | Minimum Aluminum Jacket Thickness |                      |
|--------------------------------|-----------------------------------|----------------------|
|                                | Rigid Insulation                  | Non-Rigid Insulation |
| ≤8                             | 0.016 (0.41)                      | 0.016 (0.41)         |
| Over 8 thru 11                 | 0.016 (0.41)                      | 0.020 (0.51)         |
| Over 11 thru 24                | 0.016 (0.41)                      | 0.024 (0.61)         |
| Over 24 thru 36                | 0.020 (0.51)                      | 0.032 (0.81)         |
| >36                            | 0.024 (0.61)                      | 0.040 (1.01)         |

Table 1

3. Stainless Steel Jacketing and Fittings:
  - a. Compliant with ASTM C1767, Type I, Grade 1 or 2, Class A, 0.010" (0.25 mm) thick cut and roll or rolls with smooth or embossed finish, with 2" (51 mm) longitudinal and circumferential laps with factory heat laminated PFMB on interior surface, Type 304 or 316 stainless steel.
  - b. Two-piece pressed fitting covers ASTM C1767, Type I, Grade 2, Class E thickness of 0.016" (0.41 mm); Type 316 (stainless steel elbows do not have factory-applied, heat laminated PFMB).
  - c. Securement: Bands only. No screws, rivets or any other securement device capable of puncturing the underlying vapor retarder shall be used.

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## C. Accessories:

1. Stainless steel bands, ½" x 0.020" (13 mm x 0.5 mm), grade 304L.
2. Stainless steel sheet metal screws, #6, 8 or 10, ¾" (10 mm) long, hex or pan head. (Not for use with below ambient applications)
3. Aluminum bands, ½" x 0.020" (13 mm x 0.5 mm), alloy T-3003 H-14.
4. Galvanized steel sheet metal screws, #6, 8, 10, ¾" (10 mm) long, hex or pan head. (Not for use with below ambient applications)
5. vapor retarder mastic of equal to or less than 0.02 perms (ASTM E96, method A)

anchors, etc., that are secured directly to cold surfaces must be adequately insulated and vapor sealed to prevent condensation.

7. Stapling is not recommended. If staples are used they shall be sealed with a vapor retarder mastic or covered with a butt strip.
8. The butt end of every fourth pipe insulation section and the ends or raw edges of insulation terminations at equipment connections, fitting and fire stop systems should be sealed with vapor retarder mastic with a perm rating of equal to or less than 0.02 (ASTM E96, method A). (Local codes and practices vary regarding the periodic sealing of butt-ends of fiberglass pipe insulation systems, and while Johns Manville believes it is a best practice to limit the risk of moisture drive within the system that can result from damage following installation, they are not a requirement of a functioning and well-designed chilled-water fiberglass pipe insulation system)
9. Rigid insulation inserts shall be installed on pipe sizes 1-½" (38 mm) or larger under outside hangers. The thickness of inserts shall be equal to the thickness of the adjoining insulation and shall be provided with vapor retarder seals.
10. Insulation inserts shall not be less than the following lengths:

| Pipe Size |          | Length |     |
|-----------|----------|--------|-----|
| IN.       | MM.      | IN.    | MM. |
| 1 ½-2 ½   | 40-65    | 10     | 254 |
| 3-6       | 80-150   | 12     | 305 |
| 8-10      | 200-250  | 16     | 406 |
| 12 & up   | 300 & up | 22     | 559 |

Table 2

11. Galvanized metal shields shall be applied between hangers or supports and the pipe insulation. Shields shall be formed to fit the insulation and shall extend up to the center line of the pipe and shall be of the length specified for the insulation hanger inserts less than 4" (102 mm) to allow for vapor-retarding butt joints on each side of the shields.
12. Specified adhesives, mastics and coatings shall be applied at the manufacturer's recommended minimum coverage.
13. When PVC jacketing is used, care shall be taken to ensure that the surface temperature of the fitting will be kept below 140°F (60°C) by the use of the proper thickness of insulation and by keeping the PVC cover away from contact with, or exposure to, sources of direct or radiant heat.
- E. For indoor piping in conditioned and concealed spaces exposed to physical abuse or to high humidity, such as mechanical rooms:

## PART 3.00 - EXECUTION

### 3.01 EXAMINATION

- A. Verify that testing of piping has been completed and that the piping is ready for installation of insulation.
- B. Verify that all surfaces are clean, dry and free from dirt, scale, moisture, corrosion, oil and grease.
- C. Verify that it is physically possible to install the fiber glass pipe insulation in accordance with project drawings, operation performance parameters and limitations of this specification.

### 3.02 INSTALLATION – CHILLED WATER AND DUAL-CYCLE PIPE SYSTEM INSULATIONS

- A. All work activities shall be conducted in accordance with all applicable federal, state and local codes and laws. This shall include, but not be limited to, the Occupational Safety and Health Act.
- B. All insulation shall be installed by a licensed applicator and applied in accordance with the manufacturer's recommendations.
- C. All work shall conform with accepted industry and trade standards for commercial and industrial insulations.
- D. General installation requirements for indoor piping:
  1. Pre-formed fiber glass pipe insulation with ASJ and SSL jacket or poly exterior shall be applied to piping with all joints tightly fitted to eliminate voids.
  2. Longitudinal jacket laps and butt strips shall be smoothly secured according to manufacturer's recommendations.
  3. When adhered, the lap and butt strips must be pressurized by rubbing firmly with a plastic squeegee to ensure positive closure.
  4. In dual-cycle systems, the installed insulation thickness shall be enough that the outside insulation surface temperature shall be kept below 140°F (60°C).
  5. All pipe insulation shall be continuous through wall and ceiling openings and sleeves, except where fire-stop materials are required.
  6. Insulation on all surfaces must be applied with a continuous, unbroken vapor seal. Hangers, supports,

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1. Finish pipe insulation with Zeston PVC Cut & Curled™ jacketing.
  2. Fittings, valves and flanges shall be insulated to the same thermal performance (R-Value) as the pipe insulation with Hi-Lo Temp insulation inserts or fabricated fitting insulation and covered with Zeston 2000 PVC insulated fitting covers.
  3. All joints in the Zeston PVC Cut & Curled jacketing and Zeston fitting covers shall be sealed with Zeston PVC Z-Tape.
- F. Outdoor piping systems:
1. The insulation shall be finished with Johns Manville aluminum, stainless steel jacketing or Zeston Series PVC jacketing.
  2. Aluminum or stainless steel jacket shall be overlapped 2" to 3" (51 mm to 76 mm) and held in place with metal bands.
  3. Elbows and tees for metal jacketed systems shall be finished with matching two-piece metal fitting covers.
  4. Zeston PVC jacketing shall be white 30 mil (0.8 mm) stock thickness. It shall be secured by overlapping and sealing all joints with Zeston Perma-Weld® solvent welding adhesive per manufacturer's recommended installation procedures.
  5. Fittings, valves and flanges shall be insulated to the same thermal performance (R-value) as the pipe insulation with Hi-Lo Temp insulation inserts or fabricated fitting insulation and covered with Zeston 300 PVC insulated fitting covers or pre-formed metal fitting covers. All PVC jacketing joints shall be sealed using Zeston Perma-Weld solvent welding adhesive per manufacturer's recommended installation procedures.
- B. Indoor piping: this portion of the installation procedure is applicable for piping in all indoor areas, including concealed spaces, mechanical rooms and inhabited areas.
1. Pre-formed fiber glass pipe insulation with all service jacket or poly exterior shall be applied to piping with all joints tightly fitted to eliminate voids.
  2. Longitudinal jacket laps and butt strips shall be smoothly secured according to the manufacturer's recommendations.
  3. When adhered, the lap and butt strips must be pressurized by rubbing firmly with a plastic squeegee or the back of a knife blade to ensure positive closure.
  4. The installed thickness shall be enough that the surface temperature shall be kept below 140°F (60°C).
  5. For pipe exposed in mechanical equipment rooms or in finished spaces less than 10' (3 m) above finished floor, finish with Zeston 2000 Cut & Curled PVC or aluminum jacket.
  6. Fittings, valves and flanges shall be insulated with Zeston 2000 PVC insulated fitting covers and Hi-Lo temp insulation inserts per the manufacturer's recommendations.
- C. Outdoor piping systems operating up to 850°F (454°C):
1. Micro-Lok pipe insulation shall be installed over clean, dry pipe with all joints firmly butted together. If a vapor retarder is required, jacket system shall be sealed.
  2. The insulation shall be finished using a metal jacketing with a PFMB or with Zeston PVC jacketing, in 30 mil (0.8 mm) thickness. Metal jacketing shall be overlapped with 2" to 3" (51 mm to 76 mm) and held in place with sheet metal screws or metal bands. The Zeston PVC jacketing shall be secured by overlapping and sealing all joints with Zeston Perma-Weld solvent welding adhesive, per manufacturer's recommended installation procedures.
  3. All insulation fittings for metal jacketed systems shall be finished with matching two-piece metal fitting covers.
  4. When Zeston 200 PVC Insulated Fitting Covers are used, care shall be taken to ensure that the surface temperature of the fitting will be kept below 140°F (60°C) by the use of a proper thickness of insulation and by keeping the PVC cover away from contact with, or exposure to, sources of direct or radiant heat.

### 3.03 INSTALLATION – ABOVE AMBIENT CONDITIONS

- A. System Insulation:
1. All pipe insulation shall be continuous through wall and ceiling openings and sleeves, except where fire stop materials are required.
  2. All surface finishes are to be extended to protect all surfaces, ends and raw edges of insulation.
  3. Rigid insulation inserts shall be installed on pipe sizes 1-½" (38 mm) or larger under outside hangers. Inserts shall be of equal thickness to the adjoining insulation and shall be provided with vapor retarder seals where required.
  4. Insulation inserts shall not be less than the following lengths:

| Pipe Size |          | Length |     |
|-----------|----------|--------|-----|
| IN.       | MM.      | IN.    | MM. |
| 1½–2½     | 40–65    | 10     | 254 |
| 3–6       | 80–150   | 12     | 305 |
| 8–10      | 200–250  | 16     | 406 |
| 12 & up   | 300 & up | 22     | 559 |

Table 3

### 3.04 FIELD QUALITY CONTROL

- A. Upon completion of installation of the insulation and before system start-up, visually inspect and verify that the insulation has been correctly installed.

## END OF SECTION



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Technical specifications as shown in this literature are intended to be used as general guidelines only. Please refer to the Safety Data Sheet and product label prior to using this product. The physical and chemical properties of the Micro-Lok Products listed herein represent typical, average values obtained in accordance with accepted test methods and are subject to normal manufacturing variations. They are supplied as a technical service and are subject to change without notice. Any references to numerical flame spread or smoke developed ratings are not intended to reflect hazards presented by these or any other materials under actual fire conditions. Check with the Regional Sales Office nearest you for current information.

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