

## PART 1 – GENERAL

### 1. SUMMARY

1.1 - Section includes: The work covered by this specification consists of all labor, equipment, materials, accessories, and performing operations required for the correct installation of insulation on all piping, fittings, valves, controls and other necessary items connected into the system operating up to 1200°F (650°C).

### 2. DEFINITIONS

- 2.1 - ASHRAE - American Society of Heating, Refrigeration and Air Conditioning Engineers.
- 2.2 - ASTM - American Society of Testing and Materials.
- 2.4 - MICA - Midwest Insulation Contractors Association.
- 2.5 - MIL - Military.
- 2.6 - NFPA - National Fire Protection Association.
- 2.7 - NRC - Nuclear Regulatory Commission.
- 2.8 - OPL - Omega Point Laboratories.
- 2.9 - OSHA - Occupational Safety and Health Act.
- 2.10 - UL - Underwriters Laboratories, Inc.
- 2.11 - CAN/CGSB - Canadian General Standards Board
- 2.12 - CAN/ULC - Underwriters Laboratories of Canada, Inc.

### 3. REFERENCES

- 3.1 - ASHRAE - National Voluntary Consensus Standard 90.1 (2019) - "Energy Standards for Buildings Except Low-Rise Residential Buildings"
- 3.2 - ASTM C450 - "Standard Practice for fabrication of Thermal Insulating fitting covers for NPS Piping and Vessel Lagging."
- 3.3 - ASTM C356 - "Standard Test Method for Linear Shrinkage of Preformed High Temperature Thermal Insulation Subjected to Soaking Heat."
- 3.4 - ASTM C547 - "Standard Specification for Mineral Fiber Pipe Insulation"
- 3.5 - ASTM C585 - "Standard Practice for Inner and Outer Diameter of Rigid Thermal Insulation for Nominal Sizes of Pipe and Tubing (NPS System)"
- 3.6 - ASTM C795 - "Specification for Thermal Insulation for Use in Contact with Austenitic Stainless Steel"
- 3.7 - ASTM C1104 - "Standard Test Method for Determining the Water Vapor Sorption of Unfaced Mineral Fiber Insulation"
- 3.8 - ASTM C1335 - "Standard Test Method for Measuring Non-Fibrous Content of Man-Made Rock and Slag Mineral Fiber Insulation"
- 3.9 - ASTM C1338 - "Standard Test Method for Determining Fungi Resistance of Insulation Materials and Facings"
- 3.10 - ASTM C1729 - "Standard Specification for Aluminum Jacketing for insulation."
- 3.11 - ASTM C1617 - "Quantitative Accelerated Laboratory

Evaluation of Extraction Solutions Containing Ions Leached from Thermal Insulation on Aqueous Corrosion of Metals"

- 3.12- ASTM E84 - "Test Method for Surface Burning Characteristics of Building Materials"
- 3.13 - CAN/CGSB-51.9 - "Mineral Fibre Thermal Insulation for Piping and Round Ducting"
- 3.14 - CAN4-S114-M - "Test Method Behavior of Materials in a Vertical Tube Furnace at 750°C"
- 3.15 - MICA - "Commercial and Industrial Insulation Standards"
- 3.16 - Mil-I-24244 - "Military Specification for Insulation Material with Special Corrosion, Chloride and Fluoride Requirements".
- 3.17 - NRC 1.36 - "Nonmetallic Thermal Insulation for Austenitic Stainless Steel"
- 3.18 - PIP - "Process Industry Practice".
- 3.19 - ISO 15665:2003 - Acoustical Insulation for Pipes, Valves & Flanges (A3, B3, C3, D3)
- 3.20 - BS EN 13472:2012 - Thermal Insulating Products For Building Equipment And Industrial Installations – Determination of Short Term Water Absorption By Partial Immersion Of Preformed Pipe Insulation

### 4. SYSTEM PERFORMANCE

- 4.1 - Insulation material furnished should meet the minimum thickness requirements of the National Voluntary Consensus Standard 90.1 (2019) established by ASHRAE. However if other factors such as condensation control or personal protection are to be considered, the selection of thickness of insulation should satisfy the controlling factor.
- 4.2 - Insulation materials furnished and installed hereunder shall meet the fire hazard requirements of applicable building codes per one of the following nominally equivalent test methods:
  - 4.2.1 - ASTM E84

### 5. SUBMITTALS

- 5.1 - Product Data
  - 5.1.1 - Provide product description, list of materials, thickness schedules for each service location and piece of equipment.
- 5.2 - Shop Drawings
  - 5.2.1 - Submit a list of insulation to be used for each service location.
- 5.3 - Samples
  - 5.3.1 - Submit samples of each insulation material to be used.

### 6. QUALITY ASSURANCE

- 6.1 - All work shall conform to accepted industry and trade standards for commercial and industrial insulations and to manufacturer's recommendations. Where available, it

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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.

- 6.2 - Insulation shall be installed by skilled and experienced applicators who are regularly engaged in commercial or industrial insulation work.
- 6.3 - Damaged, wet or contaminated insulation shall not be installed.

**7. DELIVERY, STORAGE and HANDLING**

- 7.1 - Deliver all materials to the job site in factory containers with manufacturer's label showing manufacturer, product name and fire hazard information.
- 7.2 - Protect the insulation from dirt, water, chemical attack and mechanical damage before, during and after installation.

**8. PROJECT AND SITE CONDITIONS**

- 8.1 - Maintain job site temperature and conditions before, during and after installation as required by the manufacturer of the insulation, cement, adhesives and coatings, etc.
- 8.2 - Installed Insulation that has not been weatherproofed and is not protected by a roof and walls shall be protected from precipitation by weatherproof sheeting. Do not install more insulation material than can be weatherproofed the same day it is installed.

**PART 2 – PRODUCTS**

**1. MANUFACTURERS**

- 1.1 - Johns Manville
  - 1.1.1 - Mineral wool pipe insulation.
    - 1.1.1.1 - MinWool-1200 Type II- Molded, for use to 1200°F (650°C). Grade B - Requires heat-up schedule.
    - 1.1.1.2 - MinWool-1200 Precision v-groove Preformed Pipe Insulation-Type III- Precision v-groove, for use to 1200°F (650°C). Grade B - Requires heat-up schedule.
    - 1.1.1.3 - MinWool-1200 Precision v-groove Field-Formed Pipe Insulation-Type III- Precision v-groove, for use to 1200°F (650°C). Grade B - requires heat up schedule
    - 1.1.1.4 - Approved alternate.

**2. MATERIALS**

- 2.1 - MinWool-1200® molded mineral wool pipe insulation and MinWool-1200® v-grooved Preformed and Field-Formed mineral wool pipe insulation.

- 2.1.1 - Complies with ASTM C547 Types I, II, III, IV and Grade A and B.
- 2.1.2 - Furnished in standard lengths of 36" (0.92m) with square cut ends.
- 2.1.3 - Conforms to the dimensional requirements of ASTM C585.
- 2.1.4 - Rated maximum service temperature of up to 1200°F (650°C).
- 2.1.5 - Does not exceed 25 flame spread and 50 smoke developed when tested in accordance with ASTM E84
- 2.1.6 - Certified to meet the requirements of ASTM C795 for use over stainless steel.

**3. FIELD APPLIED JACKETS**

**3.1 - Aluminum Jacketing**

- 3.1.1 - Use type T-3003 H-14 sheet with either a smooth or embossed finish and a factory applied protective inner layer.
- 3.1.2 -

<b>Aluminum Jacketing</b>	
Insulation (OD) in	Minimum Jacket Thickness (in)
<=8	0.016
over 8 thru 11	0.020
over 11 thru 24	0.024
over 24 thru 36	0.032
over 36	0.040

**3.2 - Stainless Steel Jacketing**

- 3.2.1 - Use 0.010" (0.025mm) type 304 sheet with a smooth finish and with or without a factory applied protective inner layer.

**3.3 - Zeston UV Resistant PVC Jacketing**

- 3.3.1 - May be applied in lieu of metal jacketing provided the jacketing manufacturer's limitations with regard to pipe size, surface temperature and thermal expansion and contraction are followed.

**4. ACCESSORIES**

**4.1 - Tie Wire**

- 4.1.1 - 16 gauge (1.6mm) or 18 gauge (1.8mm) Type 304 stainless steel.

**4.2 - Bands**

- 4.2.1 - 0.5" x 0.020" (13 x 0.5mm) type 304 stainless steel.
- 4.2.2 - 0.5" x 0.020" (13 x 0.5mm) T-3003 H-14 aluminum.

**4.3 - Screws**

- 4.3.1 - Galvanized or Stainless steel sheet metal screws #6, #8 or #10 by 3/8" (10mm) long. Hex or pan head.

**4.4 - Adhesives**

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- 4.5.1 - Adhesive compatible with mineral fiber insulation.
- 4.5 - Weatherproofing.
  - 4.5.1 - Compatible mastic.
- 4.6 - Insulation
  - 4.6.1 - MinWool-1200 Mitered Elbows and Tees for bends.
  - 4.6.2 - MinWool-1200 Field Formed Insulation for fittings and valves.
  - 4.6.3 - Johns Manville Thermo-1200 for use as supports.
  - 4.6.4 - Johns Manville Super Firetemp for use as supports.
  - 4.6.5 - Sproule WR-1200 for use as supports.
- 4.7 - Accessory materials shall be installed in accordance with project drawings and specifications, manufacturer's instructions and in conformance with the current edition of MICA - "Commercial & Industrial Insulation Standards", Process Industry Practices, or other recognized standard.

### PART 3 – EXECUTION

#### 1. EXAMINATION

- 1.1 - Verify that testing of piping has been completed and that the piping is ready for the insulation to be installed.
- 1.2 - Verify that all surfaces are clean, dry and free from dirt, scale, moisture, oil and grease prior to the insulation.
- 1.3 - Verify that it is physically possible to install the insulation in accordance with project drawings, operation performance parameters and the limitations of this specification.

#### 2. INSTALLATION

- 2.1 - All piping shall be supported in such a manner that the insulation is not compromised by the hanger or the effects of the hanger.
  - 2.1.1 - Hanger spacing shall be such that the circumferential joint must be outside the hanger.
- 2.2 - Where pipe shoes and roller supports are required, insulation shall be inserted in the pipe shoe to minimize heat loss.
  - 2.2.1 - Where possible the pipe shoe shall be sized to be flush with the outer diameter of the pipe insulation.
- 2.3 - Piping systems between 1.5" (38mm) and 3" (75mm) in diameter may be supported by placing saddles of the proper length and spacing under the insulation.
  - 2.3.1 - The insert may be formed from:
    - 2.3.1.1 - Johns Manville Super Firetemp®
    - 2.3.1.2 - Johns Manville Thermo-1200®
    - 2.3.1.3 - Johns Manville Sproule WR-1200®
    - 2.3.1.4 - Approved high density material rated to the application service temperature.
- 2.4 - For piping systems larger than 3" (75mm) in diameter that operate at temperatures above 200°F (93°C), high density inserts shall be used underneath all supports.

- 2.4.1 - Inserts may be formed from:
  - 2.4.1.1 - Johns Manville Thermo-1200
  - 2.4.1.2 - Johns Manville Super Firetemp
  - 2.4.1.3 - Johns Manville Sproule WR-1200
  - 2.4.1.4 - Approved high density material rated to the application service temperature.
- 2.5 - On vertical applications, insulation support rings shall be used with no more than 9' (2.7m) spacing between them or as indicated on contract drawings.
  - 2.5.1 - Locate jacketing seams in such a manner as to shed water and on the leeward side of prevailing winds wherever possible.
- 2.6 - For piping and equipment operating at or above 600°F (315°C) or insulation thicknesses above 3" (75mm), use double layer insulation.
  - 2.6.1 - Stagger both longitudinal and circumferential joints to reduce the impact of the thermal expansion and contraction.
- 2.7 - For single layer applications, circumferential joints shall be staggered.
  - 2.7.1 - Where long unbroken stretches of insulation are encountered, expansion joints may be required as noted on the contract drawings.
- 2.7 - Insulation shall be firmly fastened in place with all joints (longitudinal and circumferential) butted tightly and mechanically held in place using one, or a combination of the following materials:
  - 2.7.1 - 16 gauge (1.6mm) stainless steel wire.
    - 2.7.1.1 - If the insulation is less than 12" (300mm) in diameter, 18 gauge (1.8mm) wire can be used.
  - 2.7.2 - 0.5" x 0.020" (13 x 0.5mm) stainless steel bands and clips.
  - 2.7.3 - All wire and bands must be placed on maximum 12" (300mm) centers.
- 2.8 - For piping systems placed 10' (3m) or more above the floor in mechanical equipment rooms or in finished spaces, metal jacket and fitting covers or approved equivalent is required.
  - 2.8.1 - Place all jacket seams on the underside of the pipe.
- 2.9 - Exterior applications and corrosive environments require metal jacketing.
  - 2.9.1 - When using metal jacketing in exterior applications: All butt joints and longitudinal overlaps shall be overlapped by a minimum of 2".
  - 2.9.2 - Jacketing shall be secured using 0.5" (13mm) stainless steel bands on 12" (300mm) centers or using sheet metal screws on 4" (100mm) centers.
  - 2.9.3 - Place all jacket seams such that water incursion cannot occur.
- 2.11 - Maintain a vapor barrier in all applications by properly sealing all joints, penetrations and other openings.

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- 2.12 - All valve stems must be sealed with caulking to allow free movement of the stem but still provide a seal against moisture incursion.
- 2.13 - Apply equipment insulation as smooth as possible by grooving, scoring and beveling insulation as necessary.
- 2.14 - Bevel and seal the ends of insulation to equipment, flanges and piping.
- 2.15 - Fittings and valves shall be covered with insulation fittings fabricated from:
  - 2.15.1 - Johns Manville MinWool-1200 glued together with compatible adhesive and wired in place.
  - 2.15.2 - MinWool-1200 Precision Cut Elbows and Tees.
- 2.16 - Flanges, couplings and valve bonnets shall be covered with an oversized pipe insulation section sized to provide the same insulation thickness as the surrounding pipe sections.
  - 2.16.1 - Jacketing shall match that used on adjacent pipe.
- 2.17 - Rough cut ends shall be coated with a suitable weather or vapor resistant mastic as dictated by the system location and service.
- 2.18 - On hot systems where fittings are to be left exposed, insulation ends should be beveled away from bolts for easy access.
- 2.19 - Fill joints, cracks and seams with mineral fiber or approved alternate.
- 2.20 - Neatly finish insulation at supports, protrusions and interruptions.
- 2.21 - Do not insulate over nameplates or ASME stamps. Instead form a tight insulation seal around them.
- 2.22 - When equipment with insulation requires periodic opening for maintenance, repair or routine inspection, install the insulation in such a way that it can be easily removed and put back in place without damage.

**3. FIELD QUALITY CONTROL**

- 3.1 - Upon completion of the installation of the insulation and before start up, visually inspect and verify that the insulation has been installed correctly.
- 3.2 - Upon trial initial start up, follow all manufacturer's recommended start up procedures.

<b>Heat-up Schedule</b>	
Hour	Temperature (F)
1	300
2	400
3	500
4	600
5	700
6	800
7	900
8	1000
9	1100
10	1200
10+	1200

**4. INSULATION PROTECTION**

- 4.1 - Replace damaged insulation which cannot be satisfactorily repaired.

**5. SAFETY PRECAUTIONS**

- 5.1 - The insulation installers shall be properly protected during installation of the insulation. Protection when handling and applying insulation materials shall include but not be limited to:
  - 5.1.1 - Disposable dust respirators
  - 5.1.2 - Gloves
  - 5.1.3 - Hard hats
  - 5.1.4 - Eye protection
- 5.2 - The insulation contractor shall conduct all job site operations in compliance with applicable provisions given by OSHA as well as with all state and local safety and health codes and regulations that may apply.

**ADDITIONAL INFORMATION AND SDS**

Please visit our website at [www.jm.com/industrial](http://www.jm.com/industrial).



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