

Sections 15080, 15084 and 15086

## **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.
- 2.3 - IIG** - Industrial Insulation Group, LLC
- 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 (2004) - "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 Pre-Formed 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 C665**- "Standard Specification for Mineral-Fiber Blanket Insulation for Light Frame Construction and Manufactured Housing"
- 3.7 - ASTM C795** - "Specification for Thermal Insulation for Use in Contact with Austenitic Stainless Steel"
- 3.8 - ASTM C1104** - "Standard Test Method for Determining the Water Vapor Sorption of Unfaced Mineral Fiber Insulation"
- 3.9 - ASTM C1335** - "Standard Test Method for Measuring Non-Fibrous Content of Man-Made Rock and Slag Mineral Fiber Insulation"

- 3.10 - ASTM C1338** - "Standard Test Method for Determining Fungi Resistance of Insulation Materials and Facings"
- 3.11 - ASTM E84** - "Test Method for Surface Burning Characteristics of Building Materials"
- 3.12 - ASTM E136** - "Test Method for Behavior of Materials in a Vertical Furnace at 750°C"
- 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 - CAN/ULC-S102-M88** - "Test for Surface Burning Characteristics of Building Materials"
- 3.16 - MICA** - "Commercial and Industrial Insulation Standards"
- 3.17 - Mil-I-24244** - "Military Specification for Insulation Material with Special Corrosion, Chloride and Fluoride Requirements".
- 3.18 - NFPA 255** - "Method of Test for Surface Burning Characteristics of Building Materials"
- 3.19 - NRC 1.36** - "Nonmetallic Thermal Insulation for Austenitic Stainless Steel"
- 3.20 - PIP** - "Process Industry Practice".
- 3.21 - UL 723** - "Test for Surface Burning Characteristics of Building Materials"

### **4. SYSTEM PERFORMANCE**

- 4.1** - Insulation material furnished should meet the minimum thickness requirements of the National Voluntary Consensus Standard 90.1 (2004) 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
  - 4.2.2** - UL 723. CAN/ULC-S102-M88
  - 4.2.3** - NFPA 255

### **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.
- 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.

## PART 2 PRODUCTS

### 1. MANUFACTURERS

#### 1.1 - Industrial Insulation Group, LLC

- 1.1.1 - Mineral wool pipe insulation.
  - 1.1.1.1 - IIG MinWool-1200.
  - 1.1.1.2 - IIG MPT Molded Pre-Formed Pipe Insulation.
  - 1.1.1.3 - IIG MPT Molded Field Pre-Formed Pipe Insulation.
  - 1.1.1.4 - Approved alternate.

### 2. MATERIALS

- 2.1 - IIG MinWool-1200® Molded Pre-Formed mineral wool pipe insulation and MPT® Molded Pre-Formed and Field Pre-Formed mineral wool pipe insulation.
  - 2.1.1 - Complies with ASTM C547 Types I, II, III, IV and Grade A.
  - 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 1200°F (650°C).
  - 2.1.5 - Does not exceed 25 flame spread and 50 smoke developed when tested in accordance with ASTM E84, UL 723, CAN/ULC-S102-M88 or NFPA 255.
  - 2.1.6 - Certified to meet the requirements of ASTM C795 for use over stainless steel.
  - 2.1.7 - Rated as noncombustible when tested in accordance with ASTM E136.

## 3. FIELD APPLIED JACKETS

### 3.1 - Aluminum Jacketing

- 3.1.1 - Use a 0.016" (0.045mm) type T-3003 H-14 sheet with either a smooth or embossed finish and a factory applied protective inner layer.

### 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 - 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

- 4.5.1 - Adhesive compatible with mineral fiber insulation.

### 4.5 - Weatherproofing.

- 4.5.1 - Compatible mastic.

### 4.6 - Insulation

- 4.6.1 - MPT Mitered Elbows and Tees for bends.
- 4.6.2 - MPT Field Formed Insulation for fittings and valves.
- 4.6.3 - IIG Thermo-12 Gold use as supports.
- 4.6.4 - IIG 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 neither the insulation nor the vapor/weather barrier is 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.

**2.1.2** - On cold systems the vapor barrier shall be continuous including material covered by the hanger saddle.

- 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** - IIG Super Firetemp

**2.3.1.2** - IIG Thermo-12 Gold

**2.3.1.3** - IIG 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** - IIG Thermo-12 Gold

**2.4.1.2** - IIG Super Firetemp

**2.4.1.3** - IIG 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 insulation and jacket seams out of sight where 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 wide enough to provide weatherproofing.

**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.

- 2.10** - For below ambient mechanical equipment rooms or finished spaces, finish with PVC or metal jacketing and fitting covers.

**2.11** - Maintain a vapor barrier in all applications by properly sealing all joints, penetrations and other openings.

**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** - IIG MinWool-1200 pipe insulation glued together with compatible adhesive and wired in place.

**2.15.2** - MPT 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.

### 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.

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Industrial Insulation Group, LLC is a Calsilite/Johns Manville joint venture. IIG manufactures Thermo-12 Gold® pipe and block insulation as well as a variety of other insulation products including IIG Thermo-12 RainJacket™ Insulation, Sproule WR-1200™ expanded perlite pipe and block insulation, Super Firetemp® fireproofing board, MinWool-1200 pipe and block, high temperature adhesives and insulating finishing cement.