

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 all operations required for the correct installation of insulation on all piping, fittings, valves, controls and other necessary items for systems 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 - IIC Code** - International Code Council.  
**2.4 - IIG** - Industrial Insulation Group, LLC.  
**2.5 - Intertek** - Intertek Testing Services NA, Inc.  
**2.6 - ISO** - International Organization for Standardization.  
**2.7 - MICA** - Midwest Insulation Contractors Association.  
**2.8 - MIL** - Military.  
**2.9 - NFPA** - National Fire Protection Association.  
**2.10 - NRC** - Nuclear Regulatory Commission.  
**2.11 - OSHA** - Occupational Safety and Health Act.  
**2.12 - UL** - Underwriters Laboratories, Inc.  
**2.13 - ULC/CAN** - Underwriters Laboratories of Canada, Inc.  
**2.14 - WHMIS** - Work Hazardous Materials Information Systems - Canada.

### **3. REFERENCES**

- 3.1 - ASHRAE** - National Voluntary Consensus Standard 90.1 (2004) - "Energy Standards for Buildings Except Low-Rise Residential Buildings"  
**3.2 - ASTM C165** - "Test Method for Measuring Compressive Properties of Thermal Insulations"  
**3.3 - ASTM C 1617** - "Standard Practice for Quantitative Accelerated Laboratory Evaluation of Extraction Solutions Containing Ions Leached from Thermal Insulation on Aqueous Corrosion of Metals"  
**3.4 - ASTM C450** - "Standard Practice for Fabrication of Thermal Insulating Fitting Covers for NPS Piping and Vessel Lagging"  
**3.5 - ASTM C533** - "Specification for Calcium Silicate Block and Pipe Thermal Insulation"  
**3.6 - ASTM C585** - "Standard Practice for Inner and Outer Diameter of Rigid Thermal Insulation for Nominal Sizes of Pipe and Tubing (NPS System)"  
**3.7 - ASTM C795** - "Specification for Thermal Insulation for Use in Contact with Austenitic Stainless Steel"  
**3.8 - ASTM E84** - "Test Method for Surface Burning Characteristics of Building Materials"  
**3.9 - ASTM E136** - "Test Method for Behavior of Materials in a Vertical Tube Furnace at 750°C"

- 3.10 - CAN4-S114-M** - "Standard Test Method for Determination of Non Combustibility in Building Materials"  
**3.11 - CAN/ULC-S102-M88** - "Standard Method of Test for Surface Burning Characteristics of Building Materials and Assemblies"  
**3.12 - MICA** - "Commercial and Industrial Insulation Standards"  
**3.13 - Mil-I-24244** - "Military Specification for Insulation Material with Special Corrosion, Chloride and Fluoride Requirements"  
**3.14 - NFPA 255** - "Method of Test of Surface Burning Characteristics of Building Materials"  
**3.15 - NRC 1.36** - "Nonmetallic Thermal Insulation for Austenitic Stainless Steel"  
**3.16 - PIP** - "Process Industry Practice"  
**3.17 - 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, and IIC Building Codes. 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:  
**4.2.1** - ASTM E 136  
and one of the following applicable standards:  
**4.2.2** - ASTM E84  
**4.2.3** - UL 723  
**4.2.4** - CAN/ULC-S102-M88  
**4.2.5** - NFPA 255

### **5. SUBMITTALS**

- 5.1 - Product Data**  
**5.1.1** - Provide product description, list of materials, manufacturer's installation instructions and 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. Include installation details for valves, fittings, pipe and all other items to be insulated.  
**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, 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 - Preformed calcium silicate pipe and block insulation.
    - 1.1.1.1 - IIG Thermo-12 Gold.
    - 1.1.1.2 - IIG Thermo-12 Gold Mitered Fittings.
    - 1.1.1.3 - Approved alternate.
  - 1.1.2 - Adhesive for calcium silicate to calcium silicate joints.
    - 1.1.2.1 - IIG CalBond Gold™
    - 1.1.2.2 - Approved alternate.
  - 1.1.3 - Insulating cement to fill voids.
    - 1.1.3.1 - IIG CalCoat 127™
    - 1.1.3.2 - Approved alternate.
  - 1.1.4 - Weatherproof coating for use over insulation where breathing is required.
    - 1.1.4.1 - IIG Insulkote® ET
    - 1.1.4.2 - Approved alternate.

### 2. MATERIALS

- 2.1 - IIG Thermo-12 Gold preformed calcium silicate pipe and block insulation with XOX Corrosion Inhibitor.
  - 2.1.1 - Complies with ASTM C533 Type 1 or 1A.
  - 2.1.2 - Color coded to identify product as asbestos free.
  - 2.1.3 - Furnished in standard lengths of 36"(0.92m) with square cut ends.

- 2.1.4 - Conforms to the dimensional requirements of ASTM C585.
- 2.1.5 - Rated maximum service temperature of 1200°F (650°C).
- 2.1.6 - Maximum density of 15 lbs/ft<sup>3</sup>.
- 2.1.7 - Compressive strength of 100 psi minimum when tested in accordance with ASTM C165.
- 2.1.8 - Rated as 0 flame spread and 0 smoke developed when tested in accordance with ASTM E84, UL 723, CAN/ULC-S102-M88 or NFPA 255.
- 2.1.9 - Certified to meet the requirements of ASTM C795 for use over stainless steel.
- 2.1.10 - Rated as noncombustible when tested in accordance with ASTM E136.
- 2.1.11 - Containing Corrosion Inhibitor Properties as demonstrated by testing in accordance to ASTM C 1617.

### 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 - Glass or Fabric Cloth
  - 3.3.1 - Use minimum eight ounce, 10x10 mesh glass fabric or other fabric that is noncombustible and compatible with IIG Thermo-12 Gold insulation.

### 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 or 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
  - 4.4.1 - IIG CalBond Gold for calcium silicate to calcium silicate joints.
  - 4.4.2 - IIG CalCoat 127 to fill voids.
  - 4.4.3 - Approved alternate
- 4.5 - Weatherproofing.
  - 4.5.1 - IIG Insulkote ET for weatherproof coating.
- 4.6 - Insulation
  - 4.6.1 - IIG Thermo-12 Gold Mitered Fittings for bends.
- 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 installing 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 work activities shall be conducted in accordance with all applicable codes and laws.
- 2.2** - All insulation shall be installed by a skilled and experienced applicator.
- 2.3** - All work shall conform to accepted industry and trade standards for commercial and industrial insulations.
- 2.4** - 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.
  - 2.4.1** - Hanger spacing shall be such that the circumferential joint must be outside the hanger.
- 2.5** - Where pipe shoes and roller supports are required, insulation shall be inserted in the pipe shoe to minimize heat loss.
  - 2.5.1** - Where possible the pipe shoe shall be sized to be flush with the outer diameter of the pipe insulation.
- 2.6** - On vertical applications, insulation support rings shall be used with no more than 15' (4.58m) spacing between them or as indicated on contract drawings.
  - 2.6.1** - Locate insulation and jacket seams out of sight where possible.
- 2.7** - For piping and equipment operating at or above 600°F (315°C) or insulation thicknesses above 3" (75mm), use double layer insulation.
  - 2.7.1** - Stagger both longitudinal and circumferential joints to reduce the impact of the thermal expansion and contraction.
- 2.8** - For single layer applications, circumferential joints shall be staggered.
  - 2.8.1** - Where long unbroken stretches of insulation are encountered, expansion joints may be required as noted on the contract drawings.
- 2.9** - 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:
  - 2.9.1** - 16 gauge (1.6mm) Type 304 stainless steel wire.

**2.9.1.1** - If the insulation is less than 12" (300mm) in diameter, 18 gauge (1.8mm) Type 304 Stainless Steel wire can be used.

**2.9.2** - 0.5" x 0.020" (13 x 0.5mm) Type 304 stainless steel bands and clips.

**2.9.3** - All wire and bands must be placed on maximum 12" (300mm) centers.

**2.10** - Metal jacketing is required for exterior piping systems corrosive environments and for piping systems placed 10' (3m) or more above the floor in mechanical equipment rooms or in furnished spaces.

**2.10.1** - Place all jacket seams so water incursion cannot occur.

**2.11** - Use of minimum 10x10 weave mesh glass cloth covered by two 1/8" (3.2mm) thick layers of IIG InsulKote ET can be used as an alternative to metal jacket in some exterior applications.

**2.11.1** - Apply the second layer of InsulKote ET after the first has dried completely.

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

**2.13** - All valve stems must be sealed with caulking to allow free movement of the stem but still provide a seal against moisture incursion.

**2.14** - Apply equipment insulation as smooth as possible by grooving, scoring and beveling insulation as necessary.

**2.15** - Bevel and seal the ends of insulation to equipment, flanges and piping.

**2.16** - For fittings and valves use

**2.16.1** - IIG Thermo-12 pre-mitered fittings or fabricated from IIG Thermo-12 pipe and block insulation mitered and glued using IIG CalBond Gold adhesive.

**2.16.2** - Approved insulating cement such as IIG CalCoat 127.

**2.17** - 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.

**2.17.1** - Jacketing shall match that used on surrounding pipe.

**2.17.2** - Rough cut ends shall be coated with a suitable weather or vapor resistant mastic as dictated by the system location and service.

**2.17.3** - On hot systems where fittings are to be left exposed, insulation ends should be beveled away from bolts for easy access.

**2.17.4** - Fill joints, cracks, seams and depressions with insulating cement such as IIG CalCoat 127 or approved alternate.

**2.18** - Neatly finish insulation at supports, protrusions and interruptions.

**2.19** - Do not insulate over nameplates or ASME stamps.

**2.20** - 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 initial startup follow all manufacturer recommended start up procedures

### **4. INSULATION PROTECTION**

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

**4.2** - The insulation contractor shall advise the general and/or mechanical contractor as to the requirements for protecting the insulation from damage and deterioration for the duration of the construction period.

### **5. SAFETY PRECAUTIONS**

**5.1** - The insulation contractor shall conduct all job site operations in compliance with applicable provisions given by OSHA or WHMIS as well as with all states or provinces and local safety and health codes and regulations that may apply.

**5.2** - The installation installers shall be properly protected during installation of the insulation. Protection when handling and applying insulation materials shall include, but not limited to:

**5.1.1** - Disposable dust respirations

**5.1.2** - Gloves

**5.1.3** - Hard Hats

**5.1.4** - Eye Protection

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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.