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pipng and equipment for condensation control and energy conservation. This guideline is for insulation in the form of rigid half-shell pieces for piping and rigid sheets for equipment. This guideline is also for vapor retarder in the form of a thin flexible film and adhesive tape.

SECTION 15086

MECHANICAL INSULATION

Part 1 GENERAL

1.01 SUMMARY

- A. Section Includes: Mechanical insulation for personnel protection and energy conservation applications on piping and equipment operating from +200°F to +300°F, including but not limited to, low and medium pressure steam.
- B. Related Sections
 - 1. Pipe Hangers: Division 15, Section 60, Hangers & Supports
 - 2. Equipment Insulation: Division 15, Section 83, Equipment Insulation
 - 3. Vapor Retarders: Division 7, Section 260, Vapor Retarders

1.02 REFERENCES

- A. American Society for Testing and Materials (ASTM):
 - 1. ASTM C591 – Standard Specification for Unfaced Preformed Rigid Cellular Polyisocyanurate Thermal Insulation
 - 2. ASTM C755 – Standard Practice for Selection of Vapor Retarders for Thermal Insulation
 - 3. ASTM C1136 – Standard Specification for Flexible, Low Permeance Vapor Retarders for Thermal Insulation
- B. National Fire Protection Association (NFPA):
 - 1. NFPA 90A - Standard for the Installation of Air Conditioning and Ventilating Systems

1.03 SYSTEM DESCRIPTION

- A. A complete mechanical insulation system consisting of insulation, an optional protective jacket, and associated sealants and tapes which will secure the outer surface of the insulation system and provide the desired level of energy conservation or personnel protection.

1.04 SUBMITTALS

- A. Product Data: Identify required insulation thickness and other relevant insulation dimensions (pipe or equipment size). Identify protective jacketing type and thickness (if required).

1.05 QUALITY ASSURANCE

- A. Fire Test Performance: Each component of the insulation system shall be tested for flame spread and smoke generation via test method ASTM E84, UL 723, or NFPA 255. This flame/smoke performance shall meet the requirements of applicable building codes.
- B. Installer Qualifications: Insulation contractor installing this insulation system must be experienced with similar type systems and products.

1.06 DELIVERY, STORAGE, AND HANDLING

- A. Packaging: All insulation material shall be delivered to project site in original, unbroken factory packaging labeled with product designation and thickness.
- B. Shipment: Shipment of materials from the manufacturer to the project location shall be in weathertight transportation.
- C. Storage: Insulation materials delivered to the jobsite shall be stored so as to protect the materials from moisture and weather during storage and installation. Insulation material shall be protected from long exposure to UV light from the sun.

1.07 PROJECT CONDITIONS:

- A. All testing of piping systems shall be completed prior to the installation of the insulation system.
- B. All pipe shall be clean, dry, and free of foreign substances prior to application of the insulation system.

Part 2 PRODUCTS

2.01 PIPE INSULATION FOR SERVICE TEMPERATURE RANGE OF +200°F TO +300°F

A. Manufacturers:

a) HiTherm N.A.

B. Products: Nominal 2lb/ft³ rigid polyisocyanurate Insulation fabricated to shape from bun stock.

- a. Rigid Polyisocyanurate Insulation--similar to PIR455 manufactured by HiTherm N.A.

C. Product Testing:

- a. Product has a thermal Conductivity of 0.168 btu-in/hr-ft²-°F or lower aged 90 days at 140°F.

2.02 PROTECTIVE MECHANICAL JACKETING

A. Protective Mechanical Jacketing is optional on indoor below ambient services and shall be required in indoor, above ambient services. Protective Jacketing is required in all outdoor installations.

1. Indoor Applications: Protective jacketing, if used, shall be 0.010 to 0.030 inch thick PVC.

- a. Polyvinyl chloride (PVC) jacket and fitting covers shall have high impact strength, UV resistant rating or treatment and moderate chemical resistance.

2. Outdoor Applications: Jacketing shall be RPR or SMI Insulation Systems' metal cladding made from aluminum alloys 3033, 110 or 3105 meeting ASTM B-209 with H-14 temper, 0.016" thick polysurlyn on the inner side. Consult manufacturer for appropriate recommendations.

- a. Aluminum Jacket securing bands shall be Type 304 stainless steel. Bands shall be 1/2 inch wide for pipe under 12 inch diameter and 3/4 inch wide for pipe over 12 inch in diameter.

2.03 ADHESIVES

A. Contact Adhesives

- 1. Adhesive may be any of, but not limited to, the neoprene based, rubber based, or elastomeric type that have a maximum flame spread index of 25 and maximum smoke index of 50 when tested in accordance with ASTM E84. The adhesive shall not adversely affect, nor shall it cause any corrosive effect on metal to which it is applied.

Part 3 EXECUTION

3.01 MANUFACTURER'S INSTALLATION INSTRUCTIONS

- A. Comply with manufacturer's installation guidelines.

3.02 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 any unsatisfactory conditions have been corrected.

3.03 PREPARATION

- A. Prepare mechanical system in accordance with sections 1.07 of this guideline.

3.04 INSTALLATION

- A. Except as otherwise specified, material shall be installed in accordance with manufacturer's installation guidelines.
- B. All insulation shall be tightly butted and free of voids and gaps. Vapor Retarder, if factory applied for ease of installation, must be sealed with SSL on longitudinal joints. No vapor retarder tape shall be used on butt joints to allow for the evaporation of any moisture. All fasteners and bands shall be neatly aligned and overall work must be of high quality appearance and workmanship.
- C. **Install pre-fabricated insulation fittings on elbows, tees, and valves first. Insulation at fittings shall be the same type and thickness as on straight pipe sections.**
- D. Lap joint of vapor retarder, if factory applied for ease of installation, to be sealed using SSL tape.
- E. Insulation sections in hanger saddles shall be 2lb/ cu ft polyisocyanurate for pipes less than 16 NPS. At 10 feet hanger spacing and on pipes 16 NPS and larger, the bottom insulation sections in hanger saddles shall be 3lb/cu ft **rigid polyisocyanurate foam insulation** for resistance to compression . Saddles shall wrap the insulation in an arc between 120° and 180° depending upon the load.
- F. **When vapor retarder film is used, and when the pipe size is 4" in diameter or greater, a 1"-wide or greater filament tape with a 25% (1-1/4 wraps) circumferential overlap is recommended to be wrapped around the outside of the vapor retarder on 18" centers.**

3.05 UNDERGROUND INSTALLATION

- A. Trench to be constructed with stone bedding. Trench to be sand backfilled.
- B. Rigid polyisocyanurate foam insulation to be wrapped with a tough puncture resistant vapor retarder jacketing. No outer mechanical jacketing is required.
- C. Acceptable Vapor Retarders
 - 1. Rubberized bituminous membrane material with a minimum 50 mils thickness.
 - a. Submit manufacturer's data for approval.
 - 2. Vapor barrier jacketing must operate at temperatures of +300°F to +400°F minimum.

NOTE: In hot water/steam applications, the insulation thickness required for personnel protection and heat flow limitation is standard. This will vary with the geography and climatic conditions. For polyisocyanurate Insulation, typically for an outdoor installation with ambient temperature of 90°F and 90% Relative Humidity a thickness of 1.0" or 1.5" is advised. Similarly, for an indoor, conditioned air installation with ambient temperature of 75°F and 70% Relative Humidity a thickness of 1.0 or 1.5" of polyiso is advised. These values are provided for typical commercial applications.