

## SECTION 40 42 00

### INSULATION OF PROCESS PIPING AND EQUIPMENT

#### PART 1 - GENERAL

##### 1.1 DESCRIPTION

###### A. Scope:

1. CONTRACTOR shall provide all labor, material, equipment and incidentals as shown, specified and required to furnish and install insulation for the process piping systems and equipment indicated below:
  - a. Process air piping.
  - b. Outdoor chemical piping as shown on the Drawings
  - c. Associated all unions, valves and fittings

###### B. Coordination:

1. Review installation procedures under this and other Sections and coordinate the installation of items that must be installed with, or before, the insulation of process piping and equipment Work.

###### C. Related Sections:

1. Division 40, Applicable Sections on Piping and Valves

##### 1.2 REFERENCES

###### A. Standards referenced in this Section are listed below:

1. American Society for Testing and Materials, (ASTM).
  - a. ASTM C 449/C 449M, Mineral Fiber Hydraulic-Setting Thermal Insulating and Finishing Cement.
  - b. ASTM C 547, Specification for Mineral Fiber Pipe Insulation.
  - c. ASTM E 84, Test Method for Surface Burning Characteristics of Building Materials.
2. Federal Specifications, (FS).
  - a. FS HH-1-558B, Insulation Blocks, Boards, Blankets, Felts, Sleeving, Pipe Fitting Covering.
  - b. FS SS-C-160, Cement, Insulation, Thermal.
3. National Fire Protection Association, (NFPA).
  - a. NFPA 90A, Standard for the Installation of Air Conditioning and Ventilating Systems.

##### 1.3 QUALITY ASSURANCE

###### A. Manufacturer's Qualifications:

1. Manufacturer shall have a minimum of five years experience of producing

substantially similar equipment and shall be able to show evidence of at least five installations in satisfactory operation for at least five years.

- B. Component Supply and Compatibility:
  - 1. Obtain all equipment included in this Section, regardless of the component manufacturer, from a single insulation of process piping and equipment manufacturer.
  - 2. The insulation of process piping and equipment manufacturer shall review and approve or prepare all Shop Drawings and other submittals for all components furnished under this Section.
  - 3. All components shall be specifically constructed for the specified service conditions and shall be integrated into the overall assembly by the insulation of process piping and equipment manufacturer.
  
- C. Regulatory Requirements: Comply with applicable provisions and recommendations of the following, except as otherwise shown or specified.
  - 1. National Fire Protection Association, (NFPA).
  - 2. Underwriters' Laboratories, Inc., (UL). Fire hazard ratings to be verified by Underwriters' Laboratories, Inc. label or listing or a certified test report from an approved independent testing laboratory.
  - 3. Local and State Building Codes and Ordinances:
    - a. International Building Code.
    - b. Uniform Mechanical Code.
    - c. Model Energy Code.
  - 4. Permits: CONTRACTOR shall obtain and pay for all required permits, fees, inspections and approvals by authorities having jurisdiction.

#### 1.4 SUBMITTALS

- A. Action Submittals: Submit the following:
  - 1. Product Data:
    - a. Manufacturers' catalog literature, specifications, and illustrations with the following information:
    - b. Thermal properties.
    - c. Physical properties.
    - d. Fire hazard ratings.
    - e. Facing information.
    - f. Installation instructions.
    - g. Jointing recommendations for butt joints and longitudinal seam.
  - 2. Samples:
    - a. Fiberglass insulation.
    - b. Weatherproof insulation.
  
- B. Informational Submittals: Submit the following:
  - 1. Supplier Instructions:
    - a. Fabrication instructions for pipe fittings and valve insulation and coatings.

## 1.5 DELIVERY, STORAGE AND HANDLING

- A. Packing, Shipping, Handling and Unloading:
1. Deliver materials to the Site to ensure uninterrupted progress of the Work. Deliver anchor bolts and anchorage devices which are to be embedded in cast-in-place concrete in ample time to prevent delay of that Work.
  2. Material shall be packed and shipped in corrugated carton.
- B. Storage and Protection:
1. Store materials to permit easy access for inspection and identification. Keep all material off the ground, using pallets, platforms, or other supports. Protect steel members and packaged materials from corrosion and deterioration.
  2. Store all materials in covered storage off the ground and prevent condensation and in accordance with the manufacturer's recommendations for long-term storage.
  3. Store material in clean, dry area, out of the weather.
  4. Material shall be tightly covered to protect against dirt, water, mechanical injury or chemical damage.
  5. Material shall remain in original cartons until time of installation.
- C. Acceptance at Site:
1. All boxes, crates and packages shall be inspected by CONTRACTOR upon delivery to the Site. CONTRACTOR shall notify ENGINEER, in writing, if any loss or damage exists to equipment or components. Replace loss and repair damage to new condition in accordance with manufacturer's instructions.

## PART 2 - PRODUCTS

### 2.1 DESIGN CRITERIA

- A. Insulation systems including covering, mastics, adhesives, sealers and facings shall have the following fire hazard classifications:
1. Flame Spread: 25 maximum.
  2. Fuel Contributed: 50 maximum.
  3. Smoke Developed: 50 maximum.

### 2.2 MATERIALS

- A. Fiberglass Insulation:
1. Type: Heavy-density sectional pipe insulation with vapor barrier and self-sealing lap.
  2. Density: Four pounds per cubic foot.
  3. R-Value Minimum: 4.0 hr.-ft<sup>2</sup>-°F/BTU.
  4. Fittings: Molded fiberglass.

5. Jointing Materials: Manufacturer's recommended adhesives and tape.
  6. Valve Insulation: Miter cut nesting size covering segments of same thickness as pipeline, for insulation of valves.
  7. Products and Manufacturers: Provide one of the following:
    - a. Owens Corning Fiberglass Corporation, Fiberglass 25ASJ/SSL.
    - b. Certain-Teed Products Corporation, Certain Teed snap-on ASJ-SSL.
    - c. Or equal.
- B. Process Air Piping Insulation:
1. Type: Insulation shall be 2-1/2-inch thick semi-rigid fiberglass board with a 0.016-inch thick aluminum all-weather jacket for interior and exterior piping, fittings and valves.
  2. Maximum Thermal Conductivity: 0.30 BTU-in./hr.- ft<sup>2</sup>-°F at 100°F mean temperature.
  3. Minimum Compressive Strength: 125 lbf/ ft<sup>2</sup>.
  4. Application: Insulation shall be installed on all process air piping, fitting and valves as shown. Insulation for fittings and valves shall be mitered from the same insulation material used on process air piping.
  5. Products and Manufacturers: Provide one of the following:
    - a. Owens-Corning Fiberglass Pipe and Tank Insulation.
    - b. Insul-Wrap 850 by Insul-Therm.
    - c. Or equal.
- C. Mechanical Equipment Insulation:
1. Type: Semi-rigid fiberglass board.
  2. Minimum Thickness: Three-inches.
  3. Insulation Jacket: All service jacket.
  4. Density: Three lbs. per cubic foot.
  5. Fasteners: 3/4-inch by 0.015-inch stainless steel bands.
  6. Wrapping: One-inch wire mesh.
  7. Finish: Two, 1/2-inch thick coats of insulating cement with open weave glass cloth.
  8. Lagging Adhesive:
    - a. Products and Manufacturers: Provide one of the following:
      - 1) Foster Products Division, Sealfast 30-36.
      - 2) Or equal.
    - b. Type: Asbestos free, fire retardant coating.
    - c. References:
      - 1) MIL-A-3361B, Class 1, Grade A.
      - 2) NFPA 90A.
  9. Insulating Cement:
    - a. Products and Manufacturers: Provide one of the following:
      - 1) Ryder Sales: Thermokote 1.
      - 2) Insulation Industries Inc., Smooth Kote.
      - 3) Or equal.
    - b. Type: Asbestos free, hydraulic setting refractory type insulating cement,

- non-corrosive to ferrous metals.
- c. Reference:
  - 1) ASTM C 449/C 449M.
  - 2) Federal Specification SS-C-160 Type III GRF.
- 10. Products and Manufacturers: Provide one of the following:
  - a. Certain-Teed Products Corporation, Snap Wrap.
  - b. Owens-Corning Fiberglass Corporation, Pipe Wrap.
  - c. Or equal.
- D. Weatherproof Insulation Jacket (for insulated pipes and equipment located outdoor exposed to outside ambient conditions):
  - 1. Type: Smooth embossed aluminum metal jacket.
  - 2. Thickness: 0.016-inches.
  - 3. Moisture Barrier: Polycraft.
  - 4. Fastening: Pre-formed "Z"-lock seam with 2-inch butt strap with sealant.
  - 5. Bands: 1/2-inch aluminum bands with wing seals.
  - 6. Fittings:
    - a. Type: Pre-fabricated aluminum fittings.
    - b. Thickness: 0.016-inches.
  - 7. Manufacturers: Provide products of one of the following:
    - a. Certain-Teed Products Corporation.
    - b. Childers Products Company, Lock-On and Slip-On.
    - c. Or equal.
- E. Flexible-Elastomeric Thermal Insulation (for exposed sample piping and chemical feed tubing where shown):
  - 1. Type: Expanded close cell structure elastomeric thermal insulation.
  - 2. Thermal Conductivity: 0.25 Btu-inch/hr. - ft<sup>2</sup>-°F.
  - 3. Density: Six lbs. per cubic feet.
  - 4. Products and Manufacturers: Provide one of the following:
    - a. Halstead Industries, Type "Insul-tube".
    - b. Or equal.

## 2.3 SOURCE QUALITY CONTROL

- A. Source Quality Control: Perform the following tests and inspections at the factory:
  - 1. Flame spread.
  - 2. Smoke developed.
  - 3. Fuel contributed.

## PART 3 - EXECUTION

### 3.1 INSPECTION

- A. Ensure that surfaces of all equipment including pipes, valves, and fittings are clean

and dry before applying insulation.

### 3.2 PREPARATION

- A. Ensure that piping and equipment has been tested, inspected and released for application of insulation.

### 3.3 INSTALLATION

- A. Pipe insulation shall be continuous through walls and floor openings, except where walls or floors are required to be firestopped or required to have a fire resisting rating.
- B. Where hangers are in direct contact with piping the hanger and supporting rod shall be wrapped with foil-faced blanket insulation and vapor sealed. Hanger rod insulation and vapor barrier shall extend up to the rod a minimum distance equal to the diameter of the pipe.
- C. Install insulation so as to make surfaces smooth, even, and substantially flush with adjacent insulation.
- D. Follow manufacturer's application instructions for all materials used.
- E. Provide insulation protection shields for insulated piping supported by pipe hangers.
- F. Install and coat insulation in accordance with the manufacturer's recommendations.
- G. After applying initial equipment insulation, wrap equipment and insulation with wire mesh and apply two separate coats of insulating cement. Apply one coat of insulating finish cement. When dry, apply one coat of fire retardant lagging adhesive. Embed a layer of open weave glass cloth overlapping all seams by 2-inches, and finish with a second coat of fire retardant lagging adhesive.
- H. Weatherproofing for Outdoor Pipe and Equipment Insulation:
  - 1. Piping: Apply field applied jacket with moisture barrier around pipe or equipment and slip edge into preformed Z lock position to shed water. Butt next jacket section leaving approximately 3/8-inch gap. Place preformed 2-inch butt strap with sealant over the seam and secure with 1/2-inch aluminum band and wing seal.
  - 2. Fittings: Apply prefabricated metal fittings identical in composition to pipe jacketing.

### 3.4 FIELD QUALITY CONTROL

- A. Ensure that insulation is dry when installed, and before and during application of any finish.

B. Protection:

1. All material applied in one day shall have the vapor barrier applied the same day and any exposed ends shall be temporarily protected with a moisture barrier and sealed to the pipe.

3.5 SCHEDULE

A. Refer to Schedule below for minimum thickness of pipe insulation:

<u>Process Air Pipe Size (inches)</u>	<u>Minimum Insulation Thickness (inches)</u>
All	2-1/2
 <u>Process Pipe Size (inches)</u>	
1/2 thru 1:	1
1-1/4 thru 4:	1-1/2
5 and up:	2
 Sample Piping/Chem Feed Tubing:	 3/4 thick (unless otherwise noted) preformed flexible elastomeric "insul-tube" pipe insulation with vapor barrier and sealing tapes w/weatherproof jacket.

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