

## PART 1 – GENERAL

### 1.1 RELATED DOCUMENTS

- A. Drawings and Divisions 00 and 01, apply to this Section.
- B. Related Sections:
  - 1. Division 09.
  - 2. Division 23.

### 1.2 SUMMARY

- A. This Section includes blanket and block insulation; insulating cements; field-applied jackets; accessories and attachments; and sealing compounds.

### 1.3 SUBMITTALS

- A. Product Data: Identify thermal conductivity, thickness, and jackets (both factory and field applied, if any), for each type of product indicated.

### 1.4 CODES AND STANDARDS

- A. Codes and Standards shall be the current version adopted by the Authority Having Jurisdiction.

### 1.5 QUALITY ASSURANCE

- A. Installer Qualifications: Skilled mechanics who have successfully completed an apprenticeship program or another craft training program certified by the U.S. Department of Labor, Bureau of Apprenticeship and Training.
- B. Fire-Test-Response Characteristics: As determined by testing materials identical to those specified in this Section according to ASTM E 84, by a testing and inspecting agency acceptable to authorities having jurisdiction. Factory label insulation and jacket materials and sealer and cement material containers with appropriate markings of applicable testing and inspecting agency.
  - 1. Insulation Installed Indoors: Flame-spread rating of 25 or less, and smoke-developed rating of 50 or less.
  - 2. Insulation Installed Outdoors: Flame-spread rating of 75 or less, and smoke-developed rating of 150 or less.

### 1.6 DELIVERY, STORAGE, AND HANDLING

- A. Protect insulation and jackets from moisture and dirt.

### 1.7 COORDINATION

- A. Coordinate clearance requirements with equipment Installer for insulation application.

## PART 2 – PRODUCTS

## 2.1 INSULATION MATERIALS

- A. Mineral-Fiber Blanket Thermal Insulation: Glass fibers bonded with a thermosetting resin. Comply with ASTM C 553, Type II, without facing and with all-service jacket manufactured from kraft paper, reinforcing scrim, aluminum foil, and vinyl film.
1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
    - a. Knauf Fiberglass.
    - b. Owens Corning.
    - c. Johns Manville.
    - d. Or Approved Equal
- B. Calcium Silicate Insulation: Flat-, curved-, and grooved-block sections of noncombustible, inorganic, hydrous calcium silicate with a nonasbestos fibrous reinforcement. Comply with ASTM C 533, Type I.
1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
    - a. Owens Corning.
    - b. Pabco.
    - c. Johns Manville.
    - d. Or Approved Equal

## 2.2 FIELD-APPLIED JACKETS

- A. PVC Jacket: High-impact, ultraviolet-resistant PVC; 20 mils thick; roll stock ready for shop or field cutting and forming.
1. Adhesive: As recommended by insulation material manufacturer.
  2. PVC Jacket Color: White.
- B. Aluminum Jacket: ASTM B 209, 3003 alloy, H-14 temper; aluminum roll stock, ready for shop or field cutting and forming.
1. Finish and Thickness: Stucco-embossed finish, 0.016-inch thick.
- C. Stainless-Steel Jacket: ASTM A 666, Type 304 or 316; roll stock ready for shop or field cutting and forming.
1. Thickness: 0.10-inch.

## 2.3 ACCESSORIES AND ATTACHMENTS

- A. Glass Cloth and Tape: Comply with MIL-C-20079H, Type I for cloth and Type II for tape. Woven glass-fiber fabrics, plain weave, presized a minimum of 8-oz./sq. yd.
1. Tape Width: 4 inches.
- B. Bands: 3/4-inch-wide, in one of the following materials compatible with jacket:

1. Stainless Steel: ASTM A 666, Type 316.
  2. Galvanized Steel: 0.005 inch thick.
  3. Aluminum: 0.007 inch thick.
- C. Wire: 0.080-inch, nickel-copper alloy; 0.062-inch, soft-annealed, stainless steel; or 0.062-inch, soft-annealed, galvanized steel.
- D. Adhesive-Attached Anchor Pins and Speed Washers: Galvanized steel plate, pin, and washer manufactured for attachment to duct and plenum with adhesive. Pin length sufficient for insulation thickness indicated.
1. Adhesive: Recommended by the anchor pin manufacturer as appropriate for surface temperatures of ducts, plenums, and breechings; and to achieve a holding capacity of 100 lb for direct pull perpendicular to the adhered surface.

#### 2.4 THERMAL INSULATED REMOVABLE PADS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
1. Knauf Fiberglass.
  2. Owens Corning.
  3. Johns Manville.
  4. Or Approved Equal
- B. The inner and outer jacketing on the removable pads shall be silicone impregnated fiberglass.
- C. The insulation material inside the pads shall be fiberglass thermal insulating wool.
- D. Lacing hooks, and washers shall be stainless steel.
- E. Tie wire shall be stainless steel.
- F. Fasteners shall be stainless steel staples STCR 5019-3/8-inch, or equal.
- G. Thickness for all pads: 2-inch thick thermal insulating wool.

#### 2.5 VAPOR RETARDERS

- A. Vapor-Barrier Coating: Fire-and water-resistive, vapor-barrier coatings for indoor applications. Comply with MIL-C-19565C, Type II and be QPL Listed. Water Vapor Permeance: ASTM E 96 Procedure B, 0.013 perms or less at 43 mils dry.
1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
    - a. Childers.
    - b. Foster.
    - c. Vimasco.
    - d. Or Approved Equal

#### PART 3 – EXECUTION

### 3.1 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 unsatisfactory conditions have been corrected.

### 3.2 PREPARATION

- A. Surface Preparation: Clean and dry surfaces to receive insulation. Remove materials that will adversely affect insulation application.

### 3.3 GENERAL APPLICATION REQUIREMENTS

- A. Apply insulation materials, accessories, and finishes according to the manufacturer's written instructions; with smooth, straight, and even surfaces; and free of voids throughout the length of equipment.
- B. Refer to schedules at the end of this Section for materials, forms, jackets, and thicknesses required for each equipment system.
- C. Use accessories compatible with insulation materials and suitable for the service. Use accessories that do not corrode, soften, or otherwise attack insulation or jacket in either the wet or dry state.
- D. Apply multiple layers of insulation with longitudinal and end seams staggered.
- E. Keep insulation materials dry during application and finishing.
- F. Apply insulation with tight longitudinal seams and end joints. Bond seams and joints with adhesive recommended by the insulation material manufacturer.
- G. Apply insulation with the least number of joints practical.
- H. Apply insulation over fittings and specialties, with continuous thermal and vapor-retarder integrity, unless otherwise indicated.
- I. Hangers and Anchors: Where vapor retarder is indicated, seal penetrations in insulation at hangers, supports, anchors, and other projections with vapor-barrier coating. Apply insulation continuously through hangers and around anchor attachments.
- J. Insulation Terminations: For insulation application where vapor retarders are indicated, seal ends with a compound recommended by the insulation material manufacturer to maintain vapor retarder.
- K. Apply insulation with integral jackets as follows:
  - 1. Pull jacket tight and smooth.
  - 2. Joints and Seams: Cover with tape and vapor retarder as recommended by insulation material manufacturer to maintain vapor seal.
  - 3. Vapor-Barrier Coating: Where vapor retarders are indicated, apply coating on seams and joints, and at ends adjacent to flanges and fittings.

- L. Cut insulation according to manufacturer's written instructions to prevent compressing insulation to less than 75 percent of its nominal thickness.
- M. Seal joints and seams with vapor-barrier coating on insulation indicated to receive a vapor retarder. Overlap insulation facing at seams and seal with vapor-barrier coating and pressure-sensitive tape having same facing as insulation. Repair punctures, tears, and penetrations with tape or coating to maintain vapor-retarder seal. Install vapor-retarder on the following equipment.
  - 1. Chilled water air separators and compression tanks.
  - 2. Aboveground thermal (ice) storage and low temperature brine tanks.
- N. Insulate the following equipment:
  - 1. Chilled-water air separators.
  - 2. Chilled-water compression tanks.
  - 3. Chilled-water centrifugal pump housings.
  - 4. Aboveground, thermal (ice) storage tanks, not factory insulated.
  - 5. Low-temperature brine tanks.
  - 6. Domestic hot-water storage tanks, not factory insulated.
  - 7. Heating hot-water air separators.
  - 8. Heating hot-water compression tanks.
  - 9. Heating hot-water heat exchangers.
  - 10. Steam-to-water converters, not factory insulated.
  - 11. Condensate receivers, not factory insulated.
  - 12. Deaerators, not factory insulated.
- O. Omit insulation from the following:
  - 1. Vibration-control devices.
  - 2. Testing agency labels and stamps.
  - 3. Nameplates and data plates.
  - 4. Manholes.
  - 5. Handholes.
  - 6. Cleanouts.

### 3.4 TANK AND VESSEL INSULATION APPLICATION

- A. Blankets and Block Applications for Tanks and Vessels: Secure insulation with adhesive and anchor pins and speed washers.
  - 1. Apply adhesives according to manufacturer's recommended coverage rates per square foot, for 100 percent coverage of tank and vessel surfaces.
  - 2. Groove and score insulation materials to fit as closely as possible to the equipment, including contours. Bevel insulation edges for cylindrical surfaces for tight joint. Stagger end joints.
  - 3. Protect exposed corners with secured corner angles.
  - 4. Install adhesive-attached or self-adhesive anchor pins and speed washers on sides of tanks and vessels as follows:
    - a. On tank and vessel, 3 inches maximum from insulation end joints, and 16 inches o.c. in both directions.
    - b. Do not overcompress insulation during installation.

- c. Cut and miter insulation segments to fit curved sides and dome heads of tanks and vessels.
5. Impale insulation over anchor pins and attach speed washers.
6. Cut excess portion of pins extending beyond speed washers or bend parallel with insulation surface. Cover exposed pins and washers with tape matching insulation facing
7. Secure each layer of insulation with stainless-steel bands.
8. Stagger joints between insulation layers at least 3 inches.
9. Apply insulation in removable segments on equipment access doors and other elements that require frequent removal for service.
10. Bevel and seal insulation ends around manholes, handholes, ASME stamps, and nameplates.
11. Apply vapor-barrier coating to open joints, breaks, and punctures for insulation indicated to receive vapor retarder.

### 3.5 FIELD-APPLIED JACKET APPLICATION

- A. PVC Jackets: Apply jacket with longitudinal seams along top and bottom of tanks and vessels for horizontal applications. Secure and seal seams and end joints with manufacturer's welding adhesive.
  1. Apply two continuous beads of adhesive to seams and joints, one bead under lap and the finish bead along the seam and joint edge.
  2. Apply PVC jackets for exposed equipment in mechanical rooms [below 8-feet from floor].
- B. Metal Jackets:
  1. Apply 2-inch overlap at longitudinal seams and end joints.
  2. Secure jacket with bands 12 inches o.c. and at end joints.
  3. Apply stainless steel jackets for exposed equipment in food service areas.
  4. Apply aluminum jackets for exposed exterior equipment.
    - a. Overlap longitudinal seams arranged to shed water.
    - b. Seal end joints with weatherproof sealant recommended by insulation manufacturer.

### 3.6 EQUIPMENT APPLICATIONS

- A. Insulation materials and thicknesses are specified in schedules at the end of this Section.

### 3.7 TANK AND VESSEL INSULATION APPLICATION SCHEDULE

- A. Equipment: Chilled-water air separators and compression tanks.
  1. Insulation Material: Mineral-fiber blanket.
  2. Insulation Thickness: 1-inch.
  3. Insulation Conductivity Range: 0.23 – 0.27 BTU-in/(hr.ft<sup>2</sup>.°F).
- B. Equipment: Aboveground, thermal (ice) storage and low-temperature brine tanks.
  1. Insulation Material: Mineral-fiber blanket.
  2. Insulation Thickness: 1-inch.

3. Insulation Conductivity Range: 0.23 – 0.27 BTU-in/(hr-ft<sup>2</sup>·°F).
- C. Equipment: Domestic hot-water storage tanks.
1. Insulation Material: Mineral-fiber blanket.
  2. Insulation Thickness: 1-1/2-inch.
  3. Insulation Conductivity Range: 0.24 – 0.28 BTU-in/(hr-ft<sup>2</sup>·°F).
- D. Equipment: Heating hot-water air separators and compression tanks.
1. Insulation Material: Mineral-fiber blanket.
  2. Insulation Thickness: 1-1/2-inch.
- E. Equipment: Heating hot-water heat exchangers, steam-to-water converters, and deaerators.
1. Insulation Material: Calcium silicate.
  2. Insulation Thickness: 4-inch.
  3. Insulation Conductivity Range: 0.32 – 0.34 BTU-in/(hr-ft<sup>2</sup>·°F).
- 3.8 INTERIOR FLAT-SURFACE EQUIPMENT INSULATION APPLICATION SCHEDULE
- A. Equipment: Steam condensate receivers.
1. Insulation Material: Calcium silicate.
  2. Insulation Thickness: 4-inch.
  3. Insulation Conductivity Range: 0.32 – 0.34 BTU-in/(hr-ft<sup>2</sup>·°F).
- 3.9 PUMP INSULATION APPLICATION SCHEDULE
- A. Equipment: Chilled water pumps.
1. Insulation Material: Thermal insulated removable pad.

**END OF SECTION**