SECTION 15082

EQUIPMENT INSULATION

PART 1 GENERAL

1.1 SUMMARY

A. Section Includes: Blanket, board, and block insulation; insulating cements; field-applied jackets; accessories and attachments; and sealing compounds.

B. Related Sections:
   1. Section 15081 - Duct Insulation for insulation materials and application for ducts and plenums.
   2. Section 15083 - Pipe Insulation for insulation for piping systems.

1.2 SUBMITTALS

A. General: Comply with Section 01330.

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

C. Installer Certificates: Signed by Contractor certifying that installers comply with requirements.]

1.3 QUALITY ASSURANCE

A. Installer Qualifications: Skilled mechanics, successfully completed apprenticeship program or another craft training program certified by US 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, ASTM E84, by 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.

1.4 DELIVERY, STORAGE, AND HANDLING

A. General: Comply with Section 01600.
   1. Packaging: Ship insulation materials in containers marked by manufacturer with appropriate ASTM specification designation, type and grade, and maximum use temperature.

1.5 COORDINATION

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

PART 2 PRODUCTS

2.1 MANUFACTURERS

A. Acceptable Manufacturers:
   1. Mineral-Fiber Insulation:
      a. Armstrong World Industries, Inc.
      b. CertainTeed Manson.
      c. Owens-Corning Fiberglas Corp.
      d. Accepted Substitute in accordance with Section 01600.
   2. Calcium Silicate Insulation:
      a. Owens-Corning Fiberglas Corp.
      b. Pabco.
      c. Schuller International, Inc.
      d. Accepted Substitute in accordance with Section 01600.

2.2 INSULATION MATERIALS

A. Mineral-Fiber Board Thermal Insulation: Glass fibers bonded with thermosetting resin, ASTM C612, Type IB, without facing and with all-service jacket manufactured from kraft paper, reinforcing scrim, aluminum foil, and vinyl film.

B. Mineral-Fiber Blanket Thermal Insulation: Glass fibers bonded with thermosetting resin, ASTM C553, Type II, without facing and with all-service jacket manufactured from kraft paper, reinforcing scrim, aluminum foil, and vinyl film.

C. Calcium Silicate Insulation: Flat-, curved-, and grooved-block sections of noncombustible, inorganic, hydrous calcium silicate with nonasbestos fibrous reinforcement, ASTM C533, Type I.

2.3 FIELD-APPLIED JACKETS

A. General: ASTM C921, Type 1, unless otherwise indicated.

B. ***Glass Cloth : MIL-C-20079H, Type I . Woven glass-fiber fabrics, plain weave, minimum of 8 ounces/SY.***

1.

2.4 ACCESSORIES AND ATTACHMENTS

A. Glass Cloth and Tape: MIL-C-20079H, Type I for cloth and Type II for tape. Woven glass-fiber fabrics, plain weave, presized minimum of 8 ounces/SY.

1. Tape Width: 4 inches.

B. Bands: 3/4 inch wide, in one of following materials compatible with jacket:

1. Stainless Steel: ASTM A666, Type 304; 0.020 inch thick.
2. Galvanized Steel: 0.005 inch thick.
3. Aluminum: 0.007 inch thick.
4. Brass: 0.010 inch thick.
5. Nickel-Copper Alloy: 0.005 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. Weld-Attached Anchor Pins and Washers: Copper-coated steel pin for capacitor-discharge welding and galvanized speed washer. Pin length sufficient for insulation thickness indicated.

1. Welded Pin Holding Capacity: 100 pound for direct pull perpendicular to attached surface.

2.5 VAPOR RETARDERS

A. Mastics: Materials recommended by insulation material manufacturer that are compatible with insulation materials, jackets, and substrates.

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 manufacturer's written instructions; with smooth, straight, and even surfaces; and free of voids throughout length of equipment.

B. Comply with schedules at 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 service. Use accessories that do not corrode, soften, or otherwise attack insulation or jacket in either wet or dry state.

D. Apply multiple layers of insulation with longitudinal and end seams staggered.

E. Seal joints and seams with vapor-retarder mastic on insulation indicated to receive vapor retarder.

F. Keep insulation materials dry during application and finishing. Remove and replace insulation that is wet.

G. Apply insulation with tight longitudinal seams and end joints. Bond seams and joints with adhesive recommended by insulation material manufacturer.

H. Apply insulation with least number of joints practical.

I. Apply insulation over fittings and specialties, with continuous thermal and vapor-retarder integrity, unless otherwise indicated.

J. Hangers and Anchors: Where vapor retarder is indicated, seal penetrations in insulation at hangers, supports, anchors, and other projections with vapor-retarder mastic. Apply insulation continuously through hangers and around anchor attachments.

K. Insulation Terminations: For insulation application where vapor retarders are indicated, seal ends with compound recommended by insulation material manufacturer to maintain vapor retarder.

L. 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-Retarder Mastics: Where vapor retarders are indicated, apply mastic on seams and joints and at ends adjacent to flanges and fittings.

M. Cut insulation according to manufacturer's written instructions to prevent compressing insulation to less than 75 percent of its nominal thickness.

N. Install vapor-retarder mastic on equipment scheduled to receive vapor retarders. Overlap insulation facing at seams and seal with vapor-retarder mastic and pressure-sensitive tape having same facing as insulation. Repair punctures, tears, and penetrations with tape or mastic to maintain vapor-retarder seal.

O. Insulate following indoor equipment:
   1. Chilled-water centrifugal pump housings.
   2. Domestic hot-water storage tanks, not factory insulated.
   3. Heating hot-water air separators (small tanks).
   4. Heating hot-water compression tanks (small tanks).
   5. Heating hot-water heat exchangers.
   6. Steam-to-water converters, not factory insulated.
   7. Condensate receivers, not factory insulated.

P. Omit insulation from following:
   1. Vibration-control devices.
   2. Testing agency labels and stamps.
   3. Nameplates and data plates.
   4. Manholes.
   5. Handholes.
   6. Cleanouts.

3.4 INDOOR TANK AND VESSEL INSULATION APPLICATION

A. Blankets, Board, 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 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. Do not weld anchor pins to ASME-labeled pressure vessels.
   b. On tank and vessel, 3 inches maximum from insulation end joints, and 16 inches OC in both directions.
   c. Do not overcompress insulation during installation.
   d. 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-retarder mastic to open joints, breaks, and punctures for insulation indicated to receive vapor retarder.

3.5 FIELD-APPLIED JACKET APPLICATION

A. Apply glass-cloth jacket directly over bare insulation or insulation with factory-applied jackets.
   1. Apply jacket smooth and tight to surface with 2-inch overlap at seams and joints.
   2. Embed glass cloth between two 0.062-inch thick coats of jacket manufacturer's recommended adhesive.
   3. Completely encapsulate insulation with jacket, leaving no exposed raw insulation.

3.6 FINISHES

A. Glass-Cloth Jacketed Insulation: Paint insulation finished with glass-cloth jacket as specified in Section 09910 - Paints.

B. Color: Final color as selected by Architect. Vary first and second coats to allow visual inspection of completed Work.

3.7 EQUIPMENT APPLICATIONS

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

B. Materials and thicknesses for systems listed below are specified in schedules at end of this Section.

3.8 INTERIOR TANK AND VESSEL INSULATION APPLICATION SCHEDULE

A. Equipment: Domestic hot-water storage tanks, not factory insulated.
   1. Operating Temperature: 55 to 140 F.
   2. Insulation Material: Mineral Fiber
   3. Insulation Thickness: ***1/2*** inch
   4. Field-Applied Jacket: Glass cloth.
   5. Vapor Retarder Required: ***No***.
   6. Finish: ***None***.

B. Equipment: Heating hot-water air separators and compression tanks.
   1. Operating Temperature: 100 to 200 F.
   2. Insulation Material: Mineral Fiber.
   3. Insulation Thickness: 1 /2 inch
   4. Field-Applied Jacket: PVC.
   5. Vapor Retarder Required: No.
   6. Finish: None.

C. Equipment: Heating hot-water heat exchangers and steam-to-water converters.

1. Operating Temperature: 100 to 450 F.
2. Insulation Material: Calcium silicate.
3. Insulation Thickness: 2 inch
4. Field-Applied Jacket: Glass cloth.
5. Vapor Retarder Required: ***No***.
6. Finish: ***None***.

D. Equipment: Heating hot-water heat exchangers, steam-to-water converters.
1. Operating Temperature: 100 to 450 F.
2. Insulation Material: Calcium silicate.
3. Insulation Thickness: 2 inch
4. Field-Applied Jacket: Glass cloth.
5. Vapor Retarder Required: ***No***.
6. Finish: ***None***.

3.9 INTERIOR FLAT-SURFACE EQUIPMENT INSULATION APPLICATION SCHEDULE

A. Equipment: Steam condensate receivers, not factory insulated.
   1. Operating Temperature: 100 to 450 F.
   2. Insulation Material: Calcium silicate.
   3. Insulation Thickness: 2 inch
   4. Field-Applied Jacket: ***Glass Cloth***
   5. Vapor Retarder Required: ***None***.
   6. Finish: Painted.

END OF SECTION