PART 1 GENERAL

1.1 SUMMARY

A. Section includes thermal insulation for piping systems including vapor retarders, jackets and accessories.

B. Related Sections:\n1. Section 01702 – Material Storage Requirements
2. Section 15060 – Hangers and Supports: Execution requirements for inserts for placement by this section.
3. Section 15075 Drawing – Mechanical Identification: Product requirements for mechanical identification for placement by this section.

PART 2 PERFORMANCE

2.1 Insulation installer shall warranty against condensation for the first year. All staining or visible insulation damage caused by condensation shall be replaced at no cost to Owner in the first year.

2.2 Closed cell foams such as Armaflex or Rubaflex are not allowed.

2.3 Polyisocyanurate & formaldehyde insulations are not permitted within conditioned, occupied, or adjacent connected spaces.

2.4 Removable blankets shall be supplied where regular maintenance or metering access is required.

2.5 At hangers, valves, and other irregular conditions outside of machine rooms and service areas, insulation details for each condition shall be provided and adherence verified in the field at conclusion of work.

2.6 Do not wrap valves until equipped with stem extensions as required to permit continuous insulation thickness and vapor barrier. Bring to attention of mechanical contractor and Brown Project Manager.

2.7 HTHW Insulation shall accommodate system thermal requirements and seasonal operating temperatures.

A. Preinsulated Permapipe is permitted for direct burial.

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1 Listing of related sections is for convenience and is not all-inclusive.
B. All insulation systems and components shall be as approved by the Central Heat Plant Chief Engineer and the Engineering Office, and approval shall be confirmed in writing by the Brown Project Manager.

2.8 MAN MADE MINERAL FIBER

A. Insulation: Mineral Fiber Pipe Insulation, Type I, Conform to ASTM C795 for application on Austenitic stainless steel.

B. Insulation: ASTM C795; semi-rigid, noncombustible, end grain adhered to jacket.
   1. ‘K’ factor: ASTM C177, 0.24 at 75 °F.
   2. Maximum service temperature: 650 °F.
   3. Maximum moisture absorption: 0.2 percent by volume.

C. Vapor Retarder Jacket:
   1. ASTM C921, White Kraft paper with glass fiber yarn, bonded to aluminized film.
   2. Moisture vapor transmission: ASTM E96; 0.02 perm-inches.

D. Tie Wire: 0.048 inch stainless steel with twisted ends on maximum 12 inch centers.

E. Vapor Retarder Lap Adhesive:
   1. Compatible with insulation.

F. Insulating Cement/Mastic:
   1. Compatible with jacket or vapor retarder.

G. Glass Fiber Fabric:
   1. Cloth: Untreated; 9 oz/sq yd weight.
   2. Blanket: 1.0 lb/cu ft density.
   3. Weave: 10 x 20.

H. Indoor Vapor Retarder Finish:
   1. Cloth: Untreated; 9 ounce per square yard weight.
   2. Vinyl emulsion type acrylic, compatible with insulation, black color.

2.9 MAN MADE MINERAL FIBER, FLEXIBLE BLANKET OR BATTS

A. Insulation: ASTM C553; Mineral Fiber Blanket Thermal Insulation for Commercial and Industrial Applications. Type I.

B. Vapor Retarder Jacket: ASTM 1136, Type II Flexible and Low Permeance Vapor Retarders for Thermal Insulation.
1. For systems operating at temperatures below ambient, close and secure seams and joints. When outward clinching staples are used, seal penetrations.

C. Tie Wire: 0.048 inch stainless steel with twisted ends on maximum 12 inch centers.

D. Vapor Retarder Lap Adhesive:
   1. Compatible with insulation.

E. Insulating Cement/Mastic:
   a. Substitutions: Section 01600 - Product Requirements.

2.10 MINERAL FIBER, FLEXIBLE Insulation for exterior of sheet metal ducts

A. Insulation: Mineral Fiber Blanket Thermal Insulation for Commercial and Industrial Applications, Type II.

B. Vapor Retarder Jacket:
   1. 0.0032 inch vinyl.
   2. Moisture vapor transmission 0.02 perm maximum.
   3. Secure with pressure sensitive tape.

C. Vapor Retarder Tape:
   1. Kraft paper reinforced with glass fiber yarn and bonded to aluminized film, with pressure sensitive rubber based adhesive.

D. Outdoor Vapor Retarder Mastic:
   1. Vinyl emulsion type acrylic or mastic, compatible with insulation, black color.

E. Tie Wire: Annealed steel, 16 gage.

2.11 MINERAL FIBER, RIGID Insulation for exterior of sheet metal ducts

A. Insulation: ASTM C612 Mineral Fiber Block and Board Insulation, Type I A

B. Vapor Retarder Jacket:
   1. 0.0032 inch vinyl.
   3. Secure with pressure sensitive tape or two coats of vapor barrier mastic and glass tape.

C. Vapor Retarder Tape:
   1. Kraft paper reinforced with glass fiber yarn and bonded to aluminized film, with pressure sensitive rubber based adhesive.

D. Indoor Vapor Retarder Finish:
2. Vinyl emulsion type acrylic, compatible with insulation, black color.

2.12 CELLULAR GLASS
A. Insulation: Type II – pipe and tubing insulation, Class 2 - Jacketed.
   1. ‘K’ factor: ASTM C177 or ASTM C518, 0.29 at 75 °F.

2.13 GLASS FIBER
A. Insulation: noncombustible.
   1. ‘K’ factor: ASTM C177 or ASTM C518, 0.24 at 75 °F.
   2. Maximum Service Temperature: 450 °F.
   3. Maximum Moisture Absorption: 0.1 percent by volume.
   4. Density: 2.0 lb/cu ft.
B. Vapor Retarder Jacket: ASTM C1136 Flexible, Low Permeance Vapor Retarders for Thermal Insulation, Type II.
C. Facing: 1 inch galvanized steel hexagonal wire mesh stitched on one face of insulation.
D. Vapor Retarder Lap Adhesive:
   1. Compatible with insulation.
E. Insulating Cement/Mastic:

2.14 HYDROUS CALCIUM SILICATE
A. Calcium Silicate Block and Pipe Thermal Insulation: Type II – for use on surfaces up to 1200 F.
B. Tie Wire: 0.048 inch stainless steel with twisted ends on maximum 12 inch centers.

2.15 Other types allowed with written permission of brown project manager.

2.16 JACKETS.
A. Pipe Jacket: One piece molded type fitting covers and sheet material, off-white color.
   1. Thickness: 15 mil.
   2. Connections: Tacks.
B. Equipment Jacket: Sheet material, off-white color.
   1. Minimum Service Temperature: -40 °F.
   2. Maximum Service Temperature: 150 °F.
   3. Moisture Vapor Transmission: ASTM E96; 0.002 perm-inches.
4. Thickness: 15 mil.

C. ABS Plastic:
1. Jacket: One piece molded type fitting covers and sheet material, off-white color.
   a. Minimum service temperature: -40 °F.
   b. Maximum service temperature of 180 °F.
   c. Moisture vapor transmission: ASTM E96; 0.012 perm-inches.
   d. Thickness: 30 mil.
   e. Connections: Brush on welding adhesive.

D. Canvas Jacket: UL listed.
2. Fire retardant lagging adhesive. Composite of insulation, jacket and lagging adhesive having flame spread index not greater than 25 and smoke developed index not greater than 50.
3. Lagging Adhesive:
   a. Compatible with insulation.

E. Aluminum Jacket:
1. Thickness: 0.020 inch thick sheet.
2. Finish: Smooth.
4. Fittings: 0.016 inch thick die shaped fitting covers with factory attached protective liner.
5. Metal Jacket Bands: 3/8 inch wide; 0.015 inch thick aluminum or 0.010 inch thick stainless steel.

F. Stainless Steel Jacket: Type 302 stainless steel.
1. Thickness: 0.016 inch.
2. Finish: Smooth.
3. Metal Jacket Bands: 3/8 inch wide; 0.010 inch thick stainless steel.


END OF SECTION