SECTION 23 07 19 - HVAC PIPING INSULATION

PART I - GENERAL

1.1 WORK INCLUDES
   A. Piping and Valve Insulation.
   B. Insulation Jackets.
   C. Insulation Lagging.

PART 2 - PRODUCTS

2.1 INSULATION
   A. Type F: Fiberglass, Semi-Rigid Premolded, ASTM C547 Type I.
   B. Type E: Elastomeric, Flexible Tube and Sheet, ASTM C534 Grade 1.
   C. Type C: Calcium Silicate, Rigid Premolded, 1200 deg. F maximum service temperature, ASTM C533.
   D. Type M: Mineral Wool, Semi-Rigid Premolded; 1,200 deg. F maximum service temperature, ASTM C547 Type II.
   E. Type P: Polysiocyanurate, Rigid Premolded, ASTM C591.
   F. Type PH: Phenolic, Rigid Premolded (e.g. Trymer Green), ASTM C1126 Type III.
   G. Type CG: Cellular Glass, Rigid Premolded, ASTM C552 Type II.

2.2 JACKETS, FACTORY APPLIED

2.3 JACKETS, FIELD APPLIED
   A. PVC: Polyvinyl Chloride, cut and curled sheet, 30 mil., solvent welded
   B. PVDC: Polyvinylidene Chloride Film, 60 mil (e.g. Saran 560).
   C. FM: Fiberglass Fabric with Mastic.
   D. RFC: Rewettable Fiberglass Cloth, 14.5 oz./sq. yd., 20x14 tread count, 1,000 degrees F maximum temp rating (e.g. Great Lakes Textiles - Style 1989)
   E. PW: Asphaltic laminate, fiberglass reinforcement with aluminum-foil vapor barrier, 125 mil. heat seal (e.g. PITTWRAP).

2.4 FITTING COVERS
   A. PVC, “heavy duty” factory fabricated, 24-30 mil (e.g. Zeston), solvent welded.
   B. PVDC, factory fabricated or field fabricated.

2.5 LAGGING, FIELD INSTALLED
   A. ALUM: Aluminum, .020” thick, stucco embossed finish. Fasten with aluminum or stainless steel bands on 12” centers.

2.6 LAGGING FITTING COVERS
   A. Aluminum, Factory Fabricated, .024” Thick.

2.7 REMOVABLE COVERS, CUSTOM MANUFACTURED
   A. Standard Applications, Less than 450 Degrees F.
2. Liner: 17oz Teflon Impregnated Fiberglass Fabric.
3. Insulation: 2" Type E Glass Mat.
   1" allowed for constructability if approved by AE.
5. Thread: Kevlar/Stainless Steel Thread.

B. Acoustical Applications, Less than 450 Degrees F.
2. Liner: 17oz Teflon Impregnated Fiberglass Fabric.
3. Insulation: 2" Type E Glass Mat.
5. Thread: Kevlar/Stainless Steel Thread.
6. 2 lb. mass loaded vinyl.

C. Provide where shown on drawings or otherwise indicated in documents.
[Note to AE: Clearly indicate location and type of custom covers on drawings and/or elsewhere within documents. Use sparingly; custom covers are costly and typically have long lead times.]

2.8 TAPES, ADHESIVES, COATINGS, FASTENERS
A. Provide in accordance with insulation manufacturer’s specifications and requirements.

2.9 MATERIAL PROPERTIES
A. Insulation material shall satisfy material property requirements of referenced ASTM standard. For convenient summary of referenced ASTM standards see Insulation Specification Materials Guide as presented by National Commercial and Industrial Insulation Association (NIA).

B. All insulation materials including jackets, tapes, adhesives and coatings shall meet ASTM E84 25/50 Flame Spread/Smoke Development requirements.

C. Pipe insulation located in ventilation air plenums shall be UL listed for application.

PART 3 - EXECUTION

3.1 INSTALLATION
A. General Requirements.
1. Install insulation in accordance with manufacturer’s instructions and applicable codes.

2. Install insulation in accordance with National Commercial and Industrial Insulation (NIA) Standard. [Note to AE: Any experienced insulation contractor will be familiar with this standard. It provides proper installation procedures for all types of insulation. By referencing this standard it becomes unnecessary to provide exhaustive installation procedures.]

3. Install insulation after piping has been inspected and tested unless otherwise authorized by Engineer. Piping shall be clean, dry and free of rust.

4. Insulate all piping systems conveying fluids with temperature above 105 deg. F, below 60 deg. F or below dew point of ambient air. When fluid is below dewpoint of ambient air, insulation shall have uninterrupted vapor barrier.

5. Provide continuity of insulation and vapor barrier through penetrations unless code prohibits.
6. Do not use staples or screws to fasten insulation on chilled water or other cold piping.

7. Insulate all components of piping systems for both cold and hot applications. This includes fittings, unions, flanges, strainers, expansion joints and specialties. This includes valve bodies, bonnets, control valves and pressure regulating valves. The common practice of leaving valves, unions, flanges and strainers uninsulated in hot piping systems is not allowed.

Exceptions: Steam traps, steam condensate pump bodies, expansion tanks, filter bodies, coil headers; HW “coil packs”, control valves/balance valves at terminal heating units (e.g. reheat coils, fin tube). CHW components above drain pans, instrumentation/piping. Other appropriate exceptions may be presented to AE for approval prior to proceeding with work.

8. Insulate valves in a manner that allows full operation without damaging or compromising insulation or vapor barrier.

9. Install metal shields at all hangers and supports. Shields shall be galvanized sheet metal, half round with flared edges. Length and thickness gauge shall be as follows:

<table>
<thead>
<tr>
<th>Pipe Size</th>
<th>Shield Size</th>
</tr>
</thead>
<tbody>
<tr>
<td>6&quot; or less</td>
<td>12&quot; long x 18 gauge</td>
</tr>
<tr>
<td>8&quot; to 14&quot;</td>
<td>18&quot; long x 16 gauge</td>
</tr>
<tr>
<td>16&quot; to 24&quot;</td>
<td>24&quot; long x 14 gauge</td>
</tr>
</tbody>
</table>

10. Provide high-density inserts at hangers and supports to prevent compression of insulation. Insert shall be calcium silicate or phenolic as appropriate for application. Insert shall be 180 degree cylindrical segment same length as associated metal shield. Rectangular blocks, plugs, or wood material are not acceptable unless approved by AE for specific application. Exception: Inserts are not required for piping ¾" and smaller when used with metal shields.

11. Approved option: Strut-mount pipe clamps and clevis hangers with pre-manufactured polymer inserts designed to receive butted insulation internally may be used in lieu of other insulated pipe support systems. Inserts shall support piping independent of insulation to avoid crushing. Installed system shall provide equal thermal and vapor barrier performance as systems with continuous unbroken insulation. Clamps and hangers shall be metallic construction. Approved manufacturers: Klo-Shure, Anvil, Holdrite.

   Note: Metal shields are not required with clevis hangers of this type.

   [Note to AE: We have only recently been exposed to this product. Although we lack substantial experience with it, we currently view it to have notable advantages over other systems.]

12. Provide protective lagging on insulated piping extending to or through floors or curbs. Lagging shall be .032” thick aluminum sheet, mechanically secured. Extend minimum 12” above floor/curb.

B. Specific Requirements for Insulation Type.

1. Type F: Fiberglass, Semi-Rigid Premolded.
   a. Use PVC fitting covers (e.g. Zeston) with precut insulation inserts.

2. Type E: Elastomeric, Flexible Tube and Sheet.
   a. Fully adhere insulation to pipe at joints and terminations to prevent moisture transfer along pipe. Adhere around entire circumference of pipe.
   b. Form fit and fully adhere insulation at valves, specialties, instrumentation and appurtenances. Fully adhere insulation at all points vulnerable to ingress of moisture.
3. Type CS: Calcium Silicate; Rigid Premolded.
   a. Attach with 18 gage SS tie wires on 12" centers.
   b. Use single layer for less than 3" thick. For thickness 3" and greater, use two layers, stagger jointed. Wire each layer individually.
   c. Cover pipe and fitting insulation with rewettable fiberglass cloth.
   a. Insulate fittings with like material, factory or field fabricated. Install PVC (e.g. Zeston) fitting covers over insulation.
5. Type P: Polysiocyanurate, Rigid Premolded
   a. Use fittings of like material, factory or field fabricated.
   b. Place vapor barrier over fitting; install finished fitting cover (i.e. tape fitting before installing cover).
6. Type CG: Cellular Glass, Rigid Premolded.
   a. Install buried CG insulation with PW jacket per manufacturer’s instructions to maintain warranty. Install to adequately accommodate pipe movement. Provide joint sealant (e.g. PITTCOTE) for applications below ambient temperature (e.g. chilled water)
7. Type PH: Phenolic, Rigid Premolded.
   a. Use fittings of like material, factory or field fabricated.
   b. Place vapor barrier over fitting; install finished fitting cover (i.e. tape fitting before installing cover).

C. Additional Requirements for Outdoor Installations
   1. Provide tightly fitted metal lagging with overlapped sections properly oriented for prevailing weather.
   2. Mechanically attach lagging sections. Seal all seams and penetrations watertight.

3.2 APPLICATION SCHEDULE

Schedule as presented below applies to all pipe sizes. [Note to AE: Polysocyanurate does not appear in the table below for in indoor applications given that it does not satisfy ASTM 25/50 Flame Spread/Smoke Development requirements. For the most part, polysiocyanurate insulation has been replaced by phenolic insulation for similar indoor applications. Phenolic insulation material satisfies the 25/50 requirements.]

<table>
<thead>
<tr>
<th>Application</th>
<th>Insulation Type</th>
<th>Thickness Ref.# (see Thickness Schedule)</th>
<th>Jacket / Covering</th>
<th>Lagging</th>
</tr>
</thead>
<tbody>
<tr>
<td>Steam, Condensate and Pumped Condensate in Walk-through Tunnel</td>
<td>M</td>
<td>(1) Steam (2) Cond.</td>
<td>ASJ</td>
<td>ALUM</td>
</tr>
<tr>
<td>Same Service, to Match Existing Insulation System</td>
<td>CS</td>
<td>(1) Steam (2) Cond.</td>
<td>Rewettable FG Cloth</td>
<td>None</td>
</tr>
<tr>
<td>Steam, Condensate and Pumped Condensate in Shallow Trench Tunnel</td>
<td>M</td>
<td>(1) Steam (2) Cond.</td>
<td>None</td>
<td>ALUM</td>
</tr>
<tr>
<td>Steam, Condensate and Pumped Condensate in Building</td>
<td>F</td>
<td>(1) Steam (2) Cond.</td>
<td>ASJ</td>
<td>None</td>
</tr>
<tr>
<td>Steam Vent Above 7’ AFF</td>
<td>None</td>
<td>NA</td>
<td>--</td>
<td>--</td>
</tr>
</tbody>
</table>
### 3.3 THICKNESS SCHEDULE

<table>
<thead>
<tr>
<th>Application Schedule Reference#</th>
<th>Temp Reference</th>
<th>3/4&quot; &amp; Smaller</th>
<th>1 - 1 ¼&quot;</th>
<th>1 ½ - 3&quot;</th>
<th>4 - 6&quot;</th>
<th>8&quot; &amp; Larger</th>
</tr>
</thead>
<tbody>
<tr>
<td>(1)</td>
<td>251-350°F</td>
<td>1.5</td>
<td>2.5</td>
<td>3.0</td>
<td>3.0</td>
<td>3.0</td>
</tr>
<tr>
<td>(2)</td>
<td>201-250°F</td>
<td>1.5</td>
<td>1.5</td>
<td>2.0</td>
<td>2.0</td>
<td>2.0</td>
</tr>
<tr>
<td>(3)</td>
<td>141-200°F</td>
<td>1.0</td>
<td>1.0</td>
<td>1.0</td>
<td>1.5</td>
<td>1.5</td>
</tr>
<tr>
<td>(4)</td>
<td>106-140°F</td>
<td>0.5</td>
<td>0.5</td>
<td>1.0</td>
<td>1.0</td>
<td>1.0</td>
</tr>
<tr>
<td>(5)</td>
<td>61-105°F</td>
<td>NA</td>
<td>NA</td>
<td>NA</td>
<td>NA</td>
<td>NA</td>
</tr>
</tbody>
</table>

*Note to AE: Indicate in the Construction Documents where PVC jacket shall be applied as a protective covering to prevent physical damage to insulated pipes.*
Insulation thickness shall satisfy ASHRAE Standard 90.1 at a minimum. Exception: Insulation thickness on instrumentation/appurtenance piping may be reduced to 0.5” minimum as required for tight clearances and other practical limitations.

END OF SECTION 23 07 19

This section of the U of I Facilities Standards establishes minimum requirements only. It should not be used as a complete specification.