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 CG: Cellular Glass, Rigid Premolded, ASTM C552 Type II.
   D. Type C: Calcium Silicate, Rigid Premolded, 1200 deg. F maximum service temperature, ASTM C533.
   E. Type PH: Phenolic, Rigid Premolded (e.g. Trymer Green), ASTM C1126 Type III.

2.2 JACKETS, FACTORY APPLIED

2.3 JACKETS, FIELD APPLIED
   A. PVC: Polyvinyl Chloride, cut and curled sheet, 30 mil.
   B. 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).

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

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

2.7 LAGGING FITTING COVERS
   A. Aluminum, factory fabricated, .024” thick.

2.8 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.

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 AE. 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 domestic cold water or other cold piping.

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

8. Provide removable covers on control valves and balance valves.

   Note: It is acknowledged that good judgment may identify beneficial exceptions to requirements in Paragraphs 8 and 9 above (e.g. leaving specific components at reheat coils uninsulated). In such cases, exceptions shall be approved by AE prior to proceeding with work.

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

10. 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>

11. Provide high-density inserts at hangers and supports to prevent compression of insulation. Inserts 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. Exception: Inserts are not required for piping ¾” and smaller when used with metal shields.

12. 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.
13. 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 CG: Cellular Glass, Rigid Premolded.
      a. Install CG insulation with PW jacket per manufacturer’s instructions to maintain warranty. Install to adequately accommodate pipe movement.

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 applies to all pipe sizes.

<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>Domestic Cold Water</td>
<td>F or E</td>
<td>(4)</td>
<td>F: ASJ E: None</td>
<td>None</td>
</tr>
<tr>
<td>Domestic Hot Water and Circulation ≥ 105°F</td>
<td>F</td>
<td>(1)(2)</td>
<td>F: ASJ E: None</td>
<td>None</td>
</tr>
<tr>
<td>Domestic Tempered Water and Circulation &lt; 105°F</td>
<td>None</td>
<td>NA</td>
<td>NA</td>
<td>None</td>
</tr>
<tr>
<td>Domestic Cold Water Exposed in Finished Areas (e.g. Kitchens, Restrooms)</td>
<td>For E</td>
<td>F: (1)(2) E: (4)</td>
<td>F: ASJ+PVC E: PVC</td>
<td>None</td>
</tr>
<tr>
<td>Domestic Hot Water Exposed in Finished Areas (e.g. Kitchens, Restrooms)</td>
<td>F</td>
<td>(1)(2)</td>
<td>ASJ+PVC</td>
<td>None</td>
</tr>
<tr>
<td>Outdoor Domestic Cold Water</td>
<td>E</td>
<td>(5)</td>
<td>None</td>
<td>ALUM</td>
</tr>
<tr>
<td>Outdoor Domestic Hot Water</td>
<td>F</td>
<td>(1)(2)</td>
<td>ASJ</td>
<td>ALUM</td>
</tr>
<tr>
<td>Roof Drain (Body)</td>
<td>E</td>
<td>(5)</td>
<td>None</td>
<td>None</td>
</tr>
<tr>
<td>Application</td>
<td>Temp</td>
<td>Pipe Size</td>
<td>Reference#</td>
<td></td>
</tr>
<tr>
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<td>-------</td>
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<tr>
<td></td>
<td></td>
<td>3/4&quot; &amp; Smaller</td>
<td>1 - 1 1/4&quot;</td>
<td>1 1/2 - 3&quot;</td>
</tr>
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<td></td>
<td></td>
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<td>1</td>
<td>1.5</td>
</tr>
<tr>
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<td>141-200F</td>
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<td>1.0</td>
<td>1.0</td>
</tr>
<tr>
<td>(2)</td>
<td>106-140F</td>
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<td>NA</td>
<td>NA</td>
</tr>
<tr>
<td>(3)</td>
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<tr>
<td>(4)</td>
<td>32-60F</td>
<td>1.0</td>
<td>1.0</td>
<td>1.0</td>
</tr>
<tr>
<td>(5)</td>
<td>32-60F</td>
<td>0.5</td>
<td>0.5</td>
<td>0.5</td>
</tr>
</tbody>
</table>

Insulation thickness shall satisfy ASHRAE Standard 90.1 at a minimum.

END OF SECTION 22 07 19

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