1.1 **GENERAL**

1.2 **Co-ordination Requirements**

.1 Coordinate with SFU Facilities.
.2 Coordinate with other design disciplines.

1.3 **Description**

.1 Thermal insulation for piping.

1.4 **Definitions**

.1 For purposes of this section:
   .1 CONCEALED - insulated mechanical services and equipment in hung ceilings and non-accessible chases and furred spaces.
   .2 EXPOSED - will mean "not concealed" as defined herein.

2.1 **MATERIALS AND DESIGN REQUIREMENTS**

2.2 **General - Products**

.1 Specify all components of insulation system to have maximum flame spread rating of 25 and maximum smoke developed rating of 50 in accordance with CAN4-S102. CAN/ULC-S102-M.

.2 Materials to be tested in accordance with ASTM C411.

.3 Powdered form of insulation and conduit in conduit type of piping systems for underground steam and condensate piping shall be approved by SFU Facilities.

.4 Closed cell, rigid type, of insulation with waterproof jacket is preferred for direct buried underground steam and condensate piping.

.5 Insulation systems shall be in accordance with the latest edition of the following standards unless specified:
   .3 CAN4-S102-M - Surface Burning Characteristics of Building Materials and Assemblies.
   .5 ANSI/NFPA 90B - Warm Air Heating and Air Conditioning Systems.
   .6 CGSB 51-GP-9M - Thermal Insulation, Mineral Fiber, Sleevings for Piping and Round Ducting.
   .7 CGSB 51-GP-11M - Thermal Insulation, Mineral Fiber, Blanket for Piping, Ducting, Machinery and Boilers.
2.3 Formed Mineral Fiber to 200°C

.1 Application for piping valves and fittings on:
   .1 Condensate.
   .2 Hot water heating.
   .3 Domestic hot water.
   .4 Domestic hot water recirculation.
   .5 Waste arm and p-trap at handicapped sinks.
   .6 Electric heat traced piping.

.2 Materials
   .1 CGSB 51-GP-9M, rigid mineral fiber sleeving for piping.

.3 Thermal Conductivity "k" shall not exceed 0.034 W/m.°C at 24°C mean temperature when tested in accordance with ASTM C335.

.4 Thickness Table:

<table>
<thead>
<tr>
<th>Fluid Temperature (°C)</th>
<th>Thickness Required for Nominal Pipe Sizes (NPS) (mm)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>≤ 25</td>
</tr>
<tr>
<td>151-200</td>
<td>64</td>
</tr>
<tr>
<td>121-150</td>
<td>51</td>
</tr>
<tr>
<td>96-120</td>
<td>38</td>
</tr>
<tr>
<td>51-96</td>
<td>38</td>
</tr>
<tr>
<td>30-50</td>
<td>25</td>
</tr>
<tr>
<td>Condensate returns</td>
<td>38</td>
</tr>
</tbody>
</table>

2.4 Formed Mineral Fiber with vapor barrier from 4°C to 85°C

.1 Application for piping, valves and fittings on:
   .1 Domestic cold water, temperature.
2.5 Flexible mineral fiber with vapor barrier to 85°C

.1 Application On
   .1 Underside of roof drains body.
   .2 Rainwater piping for 5m from drain.
   .3 Plumbing vents (within 2m of roof/wall penetration).
   .4 Traps subject to freezing.

.2 Material
   .1 CGSB51-GP-11M, mineral fiber blanket for piping and CGSB 51-GP-52M vapor barrier jacket and facing material.

.3 Thickness shall be all sizes, 25mm.

2.6 Flexible Elastomeric -40°C to 100 °C

.1 Application for piping, valves and fittings in mechanical rooms and above group outdoors on refrigeration suction and hot gas lines.

.2 CAN/CGSB-51.40 flexible elastomeric unicellular sheet and pipe.
   .1 Covering.

.3 Thickness.

2.7 Fastenings

.1 Tape shall be self adhesive, aluminum, ULC labeled for less than 25 flame spread and less than 50 smoke developed.

.2 Lap seal adhesive shall be quick-setting for joints and lap sealing of vapor barriers.

.3 Lagging adhesive shall be fire retardant coating.

.4 For elastomeric insulation system and underside of roof drain body use the following:
.1 Contact adhesive with quick-setting for seams and joints.
.2 Tape shall be self adhesive PVC.

2.8 Insulation Cement

.1 To CAN/CGSB-51.12.

2.9 Jackets

.1 PVC Fittings and Jacketing (minimum 0.3 mm thick) shall be used wherever possible, and comply with:
  .1 CAN/CGSB – 51.53-95
  .2 ASTM E-84 Surface Burning Characteristics, 25/50 Flame/Smoke.

2.10 Removable Prefabricated Insulation and Enclosures

.1 General Performance
  .1 High temperature insulation blanket formed of silica aerogel and reinforced with a non-woven, glass-fiber batting or material with similar performance.
  .2 Insulation must be hydrophobic
  .3 Estimated maximum use temperature 200°C (392°F)
  .4 Insulation thickness as required to achieve a touch temperature of less than 50°C
  .5 All material shall be non-asbestos

.2 Construction
  .1 Sewn with lock stitch at a minimum of 4 to 6 stitches per inch. The thread must be able to withstand the skin temperatures without degradation and have a break point of at least 15.87 kg (35 lbs).
  .2 Hog rings, staples and wire are not an acceptable methods of closure.
  .3 No raw cut jacket edges shall be exposed after install.
  .4 Jackets shall be fastened using hook and loop (Velcro) straps and D-rings.
  .5 Provide a permanently attached Laser Etched nameplate (2” x 3.5”) on each jacket to identify its location and item number.
  .6 The insulation shall be designed to minimize the convection current in the space between the hot metal surface and the inner layer of insulation.
  .7 All jacket pieces which match mating seams must include an extended 2” flap constructed from the exterior fabric (or equivalent) and shall be secured using hook & loop closure (i.e. Velcro) parallel to the seam.
  .8 Insulation must be sewn as integral part of the jacket to prevent shifting of the insulation. Insulation pins are NOT an allowable method of preventing the insulation from shifting and shall NOT be used.

.3 Components to be Jacketed
  .1 Ball valves
  .2 Circuit setting valves
  .3 Control valves
  .4 Flanges and unions
  .5 Gate valves
  .6 Globe valves
  .7 Pressure relief valves
  .8 Wye strainers

.4 Preferred vendor of insulation jackets shall be Thermaxx Insulation Jackets.
3.1 **EXECUTION**

3.2 Application

.1 Specify application after required tests have been completed and approved by Engineer. Insulation and surfaces shall be clean and dry when installed and during application of any finish. Apply insulation materials, accessories and finishes in accordance with manufacturer's recommendations and as specified herein.

.2 Insulation on roof drain body shall be held in place with 100% coverage of adhesive and wire ties.

.3 On piping with insulation and vapor barrier, install a half round high density insulation under hanger shield. Maintain integrity of vapor barrier over full length of pipe without interruption at sleeves, fittings and supports. Insulation is to stop on either side of a fire separation penetration and the piping is to be properly fire stopped.

3.3 Installation


.2 Preformed: sectional up to NPS 12, sectional or curved segmented above NPS 12.

.3 Multi-layered shall be staggered layers with butt joint construction.

.4 Vertical pipe over NPS 3 shall be insulation supports welded or bolted to pipe directly above lowest pipe fitting. Thereafter, locate on 4.5 m centers.

.5 Expansion joints in insulation shall terminate single layer and each layer of multiple layers in straight cut at intervals recommended by manufacturer. Leave void of 25 mm between terminations. Pack void lightly with P3 flexible mineral insulation, or provide alternate insulation/jacket system. Alternatively consider fiberglass weave jacket with loose insulation and cam snap fasteners.

.6 Seal and finish exposed ends and other terminations with insulating cement.

.7 Expansion joints in piping shall provide for adequate movement of expansion joint without damage to insulation or finishes.

.8 Orifice plate mounting flanges, flanges and unions at equipment, expansion joints, valves, other components requiring regular maintenance shall omit insulation and bevel away from studs and nuts to permit use of tools without damage to insulation install insulation and finish to permit easy disassembly and replacement without damage to adjacent insulation and finishes.

.9 Insulation is not required for chrome plated piping, valves and fittings.

3.4 Fastenings

.1 Secure pipe insulation by tape at each end and centre of each section, but not greater than 900 mm on centers.

***END OF SECTION***