

1.0 **GENERAL**

1.1 **System Description**

- .1 There are few buildings left serviced by steam and those are serviced by steam from the Bio Energy Research and Demonstration Facility. Saturated steam is generated at 827 kPa (120 psig) for distribution to the remaining steam line running north lower mall and east up University Blvd.
- .2 There is a condensate return as part of UBC's steam distribution system. Wherever the term "steam distribution" is used, it applies to both steam supply and condensate return piping and appurtenances unless otherwise specified.
- .3 Most of the steam/condensate system is gradually being replaced by a District Energy Hot Water system. Also see Division 23, Section 23 21 05 District Hot Water Heating System.

2.0 **MATERIALS AND DESIGN REQUIREMENTS**

2.1 **Responsibilities**

- .1 UBC Energy & Water Services (EWS) is primarily responsible for operation, maintenance, and overall stewardship of the steam distribution system. The demarcation of UBC Energy & Water Services point of service is normally up to and including the PRV at each consumer. Energy & Water Services also maintain the condensate tank and pumps, whereas the steam distribution with the consumer's premises is outside EWS jurisdiction. Also refer to Condensate Pump and Tank Standard Drawing located on web page (https://technicalguidelines.ubc.ca/technical/divisional_specs.html) under Division 33's section listings.
- .2 Key positions in UBC Energy & Water Services are described in Division 33, Section 33 00 10 Underground Utilities Services of UBC Technical Guidelines.
- .3 Unless otherwise agreed in writing, the project Designer is responsible for all design, permit, and inspection requirements of Technical Safety BC (TSBC).
- .4 The project Designer must incorporate all specific requirements for metering, design and materials and execution of this section into the contract drawings in the form of job-specific notes. Only making reference to UBC Technical Guidelines in the drawings is not sufficient.

2.2 **Steam Distribution Standards and Policies**

- .1 The latest revisions of the following standards and policies shall apply to steam distribution at UBC:
 - .1 B.C. Boiler and Pressure Vessel Act and ASME B31.1 Power Piping Code; TSBC.
 - .2 UBC Sustainability Development Policy #5 (<https://universitycounsel.ubc.ca/board-of-governors-policies-procedures-rules-and-guidelines/policies/>).
 - .3 CSA standards as applicable.

2.3 Steam Distribution Service Connections

- .1 The first step to install any new or substantially modified connections to the steam distribution system at UBC is complete a Utility Service Connection Application. This and other forms can be found at <https://energy.ubc.ca/community-services/contractors-developers/>.
- .2 Any new connections to the steam distribution system will be reviewed for consistency with UBC Energy & Water Services standards as defined in the UBC Technical Guidelines. If necessary the steam distribution engineering/flow model will be updated and run by UBC Energy & Water Services at no cost to the project.
- .3 The Designer shall obtain the Steam service records by contacting the Records Clerk at Infrastructure Development, Records Section (Telephone: 604-822-9570) and develop proposed service connection location(s).

2.4 Steam Distribution Design and Materials

- .1 Steam Piping
 - .1 Maximum operating pressure shall be 1,030 kPa (150 psig), A106 Grade B seamless.
 - .2 Schedule 40 is required for pipe sizes over 2", and Schedule 80 is required for pipe sizes 2" and smaller.
 - .3 Fittings shall be A234 WPB, Schedule 40 for pipe sizes over 2", and #3000 forged-steel, socket welded for pipes 2" and smaller.
 - .4 Flanges shall be #150 raised-face, weld neck (bore to suit pipe), A105, Grade 1.
 - .5 Pressure bolting shall be A194, Grade B7.
 - .6 Support lugs shall be carbon steel.
 - .7 No cast iron or copper based metal fittings or valves are acceptable.
 - .8 All valves upstream of PRV's, including PRV bypass valve, shall be at least #150 rated and socket welded for pipe sizes 2" and smaller. Greater than 2" shall be flanged or butt welded.
 - .9 Attachment to condensate main piping shall be a tee. Optionally a Sockolet™ shall be used for pipes 2" or smaller, or Weldolet™ if greater than 2".
- .2 Condensate Piping
 - .1 Maximum operating pressure shall be 1,030 kPa (150 psig), A106 Grade B seamless. Design temperature must be a minimum of 200C (400° F).
 - .2 Schedule 80 is required for all pipe sizes in consideration of corrosion.
 - .3 Fittings shall be A234, WPB and #3000 F/S socket welded for pipes 2" and smaller.
 - .4 Flanges shall be #150 raised-face, weld neck, extra heavy (XH) A105, Grade 1.
 - .5 Pressure bolting shall be A194, Grade B7.
 - .6 Support lugs shall be carbon steel.
 - .7 No cast iron or copper based metal fittings or valves are acceptable.
 - .8 Beginning with the last condensate return valve leaving a building, all valves shall be at least #150 rated and socket welded for pipe sizes 2" and smaller. Greater than 2" shall be flanged or butt welded.
 - .9 Attachment to condensate main piping shall be a tee. Optionally a Sockolet™ shall be used for pipes 2" or smaller, or Weldolet™ if greater than 2".
- .3 Isolating valves are required in all mains and branches (incoming and outgoing) for steam and condensate.
- .4 Double block and bleed is mandatory inside steam manholes on all main steam, main condensate, and small bore piping (including steam traps).

- .5 Steam meters are required for all newly construction or substantially modified buildings at UBC. Steam meters shall be installed inside buildings, and located upstream of the pressure reducing valves (PRV). For core buildings use Endress & Hauser and for billable buildings use Foxboro. Refer to Standard Documents – 1130-UT-05-SteamMeterStd-Foxboro.dwg and 1130-UT-SteamMeterStd-Endress.dwg, the locations of which are referenced in section 2.1.1 above. As indicated on the drawing standard, the meter, computer, and transmitter are to be procured and supplied by UBC Energy & Water Services. The project will provide a purchase order for Energy & Water Services to purchase the meter hardware. There will be no additional markup or procurement fees.
- .6 Condensate return shall be a pumped, open system and shall conform to UBC's condensate pump system standard - refer to Standard Documents - CondPumpStd.pdf.
- .7 A copy of design approval by TSBC shall be provided to UBC Energy & Water Services Manager, Mechanical Utilities (Senior Mechanical Engineer) and Campus Chief Engineer.
- .8 A copy of hydrostatic tests required by TSBC shall be provided to UBC Energy & Water Services Manager, Mechanical Utilities and Campus Chief Engineer.
- .9 Manholes shall be constructed with one or two side openable tops.
- .10 Insulation of piping, valves and expansion joints shall conform to UBC Energy & Water Services requirements (available upon request submitted to UBC Energy & Water Services).
- .11 All underground steam and condensate piping shall be installed in inverted concrete channel with removable lid, all joints sealed with tar. Perforated cast iron drainpipe, connected to the storm sewer shall be installed under all steam distribution trenches.
- .12 Steam trap assemblies inside steam manholes shall conform to UBC Energy & Water Services Standard. Refer to Standard Documents - SteamTrapStd.pdf.
- .13 Welding: procedures and welder certification as per ASME B31.1 applies to all steam and condensate piping, equipment, and pipe supports. There shall be no splatter, arc strikes, or center punch marks on piping.
- .14 Zinc coated components shall not be in contact (welded, bolted, or loose) with any part of the piping.
- .15 Substances containing chlorine or which will decompose to hydrogen chloride (i.e. coating to prevent adhesion of weld splatter) shall not be applied to any part of the piping.

3.0 EXECUTION REQUIREMENTS

- .1 Minimum soil cover to be 700 mm.
- .2 Minimum 750 mm horizontal clearance required from all other services, except for condensate.
- .3 Cross electrical duct-bank above and leave vertical space for any future expansion. Crossing angle shall be 90° degree. If future expansion is not required, leave minimum 200 mm vertical clearance from the top of electrical duct-bank and place minimum 50 mm Temperlite overlapping minimum 250 mm on each side.
- .4 The insulation of piping, valves and expansion joints shall conform to these requirements:

- .1 Steam pipes to be insulated with 2" thick "Temperlite"* , c/w minimum 0.016" thick corrugated aluminum jacketing.
- .2 Condensate pipes to be insulated with 1-1/2" thick "Temperlite", c/w minimum 0.016" thick corrugated aluminum jacketing.
- .3 "Temperlite" insulation should stop minimum 2" before any flange joint to allow easy removal of bolts/nuts. Where the insulation stops, it should be tapered at 45° angle and clad with smooth aluminum end caps.
- .4 All valves and expansion joints should be insulated with removable heat jackets fabricated from 1" thick "Fibrox" mat on stainless steel mesh, covered with #1702 silicone cloth. Each heat jacket should cover at least 2" of adjacent "Temperlite" insulation on both sides of the valves or the expansion joint.
- .5 Pipe-covering protection saddles shall be used for high temperature service ($\geq 50^{\circ} \text{C}$), Model Grinnell Fig. 161 or equal.
- .6 On completion of the job, the surface temperature is to be inspected in six locations with a heat gun and records provided to Mechanical Utilities Engineer.

* UBC Energy & Water Services may consider alternative insulating material with similar or better properties.

- .5 When steam pipes are not installed in concrete channel, use pipe bedding and backfilling as follows:
 - .1 For pipe bedding use clean granular pipe bedding, graded gravel, 19 mm(-), MMS type 1:
 - .1 Bottom thickness shall be a quarter of pipe diameter but minimum 100 mm.
 - .2 Top shall be minimum 300 mm.
 - .3 Sides shall be minimum 225 mm to maximum 300 mm.
 - .2 For trench backfill, native backfill may be used if free of rock greater than 100 mm.
- .6 Shutdowns must be requested in writing adhering to UBC's campus-wide shutdowns procedures. Refer to Service Shutdown Request at <https://buildingoperations.ubc.ca/resources/policies-procedures-forms/>.
- .7 Operating valves on the steam-condensate distribution system shall only be performed by UBC Energy & Water Services.

END OF SECTION