1.0 GENERAL

1.1 System Description

.1 The University of British Columbia owns and operates its own water distribution system. The University Endowment Lands (UEL) Administration supplies water to the campus, while the UEL purchases water from Metro Vancouver. Ultimately two pipes feed UBC:

.1 24" (600 mm) water main on University Boulevard, which is the suction line supplying the UBC Water Pump Station located south of the Henry Angus Building. The discharge pressure from the pump station is set at 100 psi (689 kPa). This supplies UBC's "High-Pressure Zone."

.2 12" (300 mm) water main on 16th Avenue, which supplies UBC's "Low-Pressure Zone." The Low-Pressure Zone is separated from the High-Pressure Zone by seven pressure reducing valve (PRV) stations, one check valve and various normally closed gate valves.

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 water distribution system. Find the Guidelines' website's "Guidelines by Specification Division" link, and refer to Division 33, *'Standard Drawings and/or Detail Documents'* for the demarcation of UBC Energy & Water Services point of service for water supply to buildings, (standard dwg 1140-UT-04-WaterBldgDemarc.dwg). At the same web page, look for information on the demarcation of UBC Energy & Water Services point of service for water supply to irrigation systems, (standard dwg 1140-UT-05-WaterIrrigDemarc.dwg).

.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 the B.C. Plumbing Code.

.4 The design engineer shall obtain a construction permit from Vancouver Coastal Health for each new installation as well as for any modification of watermains in water transmission or distribution systems, including appurtenances like valves, standpipes or hydrants. These could be watermain projects for the replacement of old pipes, extension, upgrade or looping of the water network, or service connections. For details go to www.vch.ca/your-environment/water-quality/drinking-water/ under 'Water quality resources'.

.5 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 Water Distribution Standards & Policies

.1 The latest revisions of the following standards shall apply to water distribution at UBC.

.1 UBC Land Use, Permitting and Sustainability Policy - UBC Policy UP12
https://planning.ubc.ca/planning-development/policies-and-plans/campus-land-use-planning/land-use-permitting-and-sustainability-policy-ubc-policy

.2 B.C. Master Municipal Construction Documents (MMCD).
.3 B.C. Water & Waste Association (BCWWA).
.4 American Water Works Association.
.5 CSA Standards (as applicable).

.2 Where there is a difference between these, Division 33, Section 33 10 00 Water Utilities and the referenced standards, UBC Technical Guidelines shall apply.

2.3 Water Service Connections

.1 The first step to install new or substantially modified connections to the water distribution system at UBC is to complete a Utility Service Connection Application. This and other forms can be found at https://energy.ubc.ca/community-services/contractors-developers/.

.2 Note that a Plumbing Permit is also normally required by Campus & Community Planning (C&CP) Regulatory Services as the regulatory authority for plumbing requirements of the B.C. Building Code.

.3 Project design drawings shall provide building load for both peak domestic consumption in litres/second, and fire flow required in litres/second. UBC Energy & Water Services reserves the right to request the calculations used to estimate the peak consumption and fire flows.

.4 Any new connections to the water distribution system will be reviewed for consistency with UBC Technical Guideline standards. UBC Camps & Community Planning will evaluate the added load using UBC's water distribution model at no cost to the project.

.5 At the request of the project, a flow test will be performed at the adjacent hydrant to the proposed service connection and the test results are to be provided in writing.

.6 The Designer shall obtain the Water service records by contacting the Records Clerk at Infrastructure Development, Records (telephone 604-822-9570) and develop proposed service connection location(s). Service connections may be possible to more than one water main fronting the site for large, complex buildings with the approval of UBC Energy & Water Services. For large academic buildings, this is normally required by UBC Energy & Water Services.

2.4 Metering

.1 Water meters are required for all buildings as per the design requirements shown in the standard drawing 1140-UT-06B-WaterMeterStdMach10. If required, a remote reader shall be installed outside the building in an accessible location. For core campus buildings the design requirements are shown in standard drawing 1140-UT-07A-WaterMeterStdMag. See also Division 26 16 00 Section 2.4.

.2 All irrigation systems independent of buildings are required to have a meter installed at the service connection. Meter antennas shall be installed on the lid of the irrigation vault or in some other accessible location.

.3 As indicated on the drawing standards, meters and strainers 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.

.4 If the manufacturer and designer confirm that a strainer is not required upstream of a meter, a spool piece with a 1.5"-2" port, isolation valve and hose bib shall be installed in place of the strainer.

2.5 Temporary Water Connections

.1 Connections to UBC's fire hydrants are allowed with an approved Hydrant Connection Permit issued by Campus & Community Planning (telephone 604-822-*2633*). Instructions for applying are included in the Fire Hydrant Permit Application. Refer to https://planning.ubc.ca/sites/default/files/2019-11/FORM_UBC_FireHydrantApp.pdf

.2 A temporary connection to a hydrant is only permitted for a maximum of 30 days. For all other temporary water connections, a Temporary Water Connection Permit for Construction must be obtained from https://energy.ubc.ca/community-services/contractors-developers/ or call UBC Energy & Water Services (604-822-*9445*).

2.6 Service Connections and Water Mains

.1 Water service connections shall be designed per UBC Energy & Water Services standard. Refer to Standard Documents – 1140-UT-03WaterEntry drawing.

.2 All services should connect to the mainline distribution system at locations within roadways or utility corridors approved by UBC EWS.

.3 The Project is responsible for permanent capping of un-used stub-outs at the connections to the main lines.

.4 For Slab on Grade see 1140-UT-08WaterEntrySOG drawing.

.5 If the building's main water station inside the mechanical room is on the roof, a 1.5 inch hose connection on the combined fire/domestic water service shall be installed at ground level in an accessible location.

.6 Design consultants shall provide new irrigation service connection tie-in details including chamber location and size, pipe size, material, isolation valve (minimum 2" diameter off main), meter, strainer, backflow preventer and chamber drain connection to the storm system. When a solenoid valve is required to activate water flows, a water hammer arrestor shall be installed upstream of the solenoid valve. Refer to Irrigation Water Supply Vault Standard Drawing 1140-UT-11 for details. Also visit https://energy.ubc.ca/community-services/contractors-developers/ for the required Irrigation Chamber Service Connection Application form.

.7 Pipe shall be Class 50 ductile iron pipe manufactured to AWWA C151; cement mortar lined to AWWA C104 and coated 1 mil. thick asphalt.

.8 Copper, up to 75 mm diameter, type K, joints brazed only.

.9 Joints shall be single rubber gasket for push-on bell and spigot type joints to AWWA C111, Tyton or approved equal.

.10 Flanged joints shall be AWWA C110; flat faced conforming to ANSI B16.1, Class 125.

.11 Fittings shall be ductile to AWWA C110 *or C153* suitable for pressure rating of 2415 kPa. Cement mortar lined to AWWA C104. Minimum design pressure for piping 1,210 kPa.

.12 Bolts shall be medium carbon steel or Martensitic steel, ASTM A325 heavy hex finished, hot-dip galvanized to ASTM A153. Coarse threads shall have Class 2A tolerance before galvanizing. Bolt sizes to AWWA110.

.13 Nuts shall be heavy steel hex carbon steel to ASTM A563 Grade C hot-dip galvanized to ASTM A153.

.14 Tie rods shall be continuously threaded, quenched and tempered alloyed steel to ASTM A354, Grade BC, hot-dip galvanized to ASTM A153.

.15 Joint Restraint Devices:
- .1 All pipe joints are to be restrained with wedge action restrainers meeting AWWA C111 or C153;
- .2 For pipes 300 mm diameter and larger, boltless restrained joints, meeting AWWA C111 or C153, may be used with EWS approval;
- .3 All fittings are to be mechanically restrained with wedge action restrainers meeting AWWA C111 or C153.

.16 Much of UBC's existing water system is not fully restrained. When connecting to the existing system, if it cannot be verified that the pipe is fully restrained, design considerations are required to protect the existing infrastructure from any resultant thrust. Assume all existing pipes are **not** fully restrained unless directed otherwise by a UBC EWS Engineer.

.17 Thrust blocks are required when impacts to the existing system cannot be eliminated with joint restraints.

2.7 Valves and Valve Boxes

.1 Gate Valves shall be manufactured to AWWA C509, ductile iron body, resilient seated, non-rising steam, hub or flanged ends.

.2 Stem seal shall be O-ring type. Valves to be complete with 50 mm square nut for underground operation. Manufacturer shall be Clow or equal approved by *UBC* Energy & Water Services.

.3 Circular valve boxes shall be Nelson-type as manufactured by Terminal City or Dobney Foundry. Valve box riser pipe to be 150 mm diameter PVC DR35.

.4 Isolation valves should be installed on each branch of all mainline tees and crosses or as approved by UBC EWS.

.5 Mainline isolation valves should be located such that each service and hydrant lead can be isolated.

.6 Maximum distance between isolating distribution valves to be 100 m.

.7 Maximum depth of valve knuckle or extension rod top to be 600 mm.

2.8 Hydrants

.1 Fire Hydrants to be 150 mm diameter Terminal City type C-71-P hydrants subjected to hydrostatic pressure test of 2070 kPa in compliance with AWWA C502.

.2 Maximum hydrant to hydrant spacing is 100 m.

.3 Minimum size of pipe connection 150 mm.

.4 Fire hydrant shall have isolating valve not more than 6 m in front of it.

.5 For hydrant installation requirements see standard dwg. 1140-UT-02FireHydrantDetail.dwg.

2.9 Heavy Equipment Loads on Buried Pipe

.1 Loads on shallow buried pipe shall be evaluated in the design and construction planning phases. AWWA M41, Section 4.3 can be used as a guide for this evaluation.

3.0 EXECUTION REQUIREMENTS

3.1 Preparation

.1 All work to follow MMCD Section *33 11 01*.

3.2 Trenching

.1 Trench alignment and depth as shown on Contract Drawings or as approved otherwise by a UBC EWS Engineer.

3.3 Granular Bedding

.1 Minimum pipe cover to be 1.0 m.

.2 For pipe bedding use clean granular pipe bedding conforming to MMCD Type 1 Granular Pipe Bedding gradation. Bottom thickness shall be a quarter of pipe diameter, or minimum 100 mm thick. Top shall be minimum 300 mm thick. Sides shall be minimum 225 mm to maximum 300 mm thick.

.3 Place granular bedding material across full with of trench bottom in uniform layers to 100 mm depth.

3.4 Pipe Installation

.1 Utility Separation: A minimum 3 m horizontal clearance is required from either sanitary sewer or storm sewer piping, when they run parallel to water main. If this clearance cannot be met, water piping can be installed closer with prior approval from UBC Energy & Water Services. Refer to MMCD Design Guideline Manual Section 1.4, and Vancouver Coastal Health's Water Supply System Construction Permit Guidelines and Application Form (see 2.1.4 this section). Installation may be approved provided water pipe is installed above sanitary or storm sewer piping with minimum vertical clearance 0.5 m and water main joints are wrapped. When crossing sanitary sewers at 90° angle, the water pipe shall be encased with 20 MPa concrete of minimum thickness 150 mm. If concrete is not desirable, joints of the water main can be wrapped with heat shrink plastic or packed with compound and wrapped with petroleum tape in accordance with the latest version of the AWWA Standards C217, and C214 or C209.

.2 Minimum 750 mm clearance is required from all other services. Minimum 3 m. clearance to building footing or per MMCD General Design guidelines clause 1.3.

.3 When crossing electric duct bank (crossing shall be done at 90°), run pipe with minimum vertical clearance 150 mm from the bottom of electric duct bank. If crossing of electrical ductbank cannot be done in this manner, then encase water pipe in one larger plastic pipe projecting minimum 500 mm from either side of electric ductbank.

.4 Test and/or bleed points consisting of Corporation cocks, sized to achieve minimum flushing velocity of 0.8 m/s in accordance with AWW C651, to be provided where shown on Contract Drawings or as required by Utilities Mechanical Engineer for pressure testing and flushing.

.5 Requirements for piping into the building's mechanical room as per drawing 1140-UT-01WaterStationSchematic.

.6 Requirements for replacing cast iron or asbestos cement watermains at utility excavations are to be as shown in drawing 1140-UT-09 Water Mains at Excavations. Where water pipes cross under wall foundations, they must be built of ductile iron for a distance of at least 3 metres on either side of the wall, to avoid settlement cracking.

.7 When excavating over existing A/C or cast iron watermains, only controlled density backfill shall be used. No compaction is permitted.

3.5 Valve Installation

.1 Valves must be adequately restrained to resist pullout force when closed. Valve restraint systems should include calculated restrained joint lengths on each side of the valve or gravity or dead man thrust blocks or other solutions as approved by UBC EWS.

3.6 Hydrants

.1 For Hydrants not in service, place an orange painted sign, 30 cm x 30 cm, lettered "Not in Service" on the main port. Remove when water main is accepted by a UBC EWS Engineer.

3.7 Thrust Blocks

.1 As stated in Section 2.6, thrust blocks are required when joint restraints cannot eliminate thrust impacts to the existing system, or as directed by UBC EWS Engineers.

.2 Thrust block design considerations must be based on fitting type, water pressure and soil conditions.

.3 Place concrete thrust blocks between valves, tees, wyes, plugs, caps, bends and undisturbed ground as shown on the Contract Drawings or as directed by a UBC EWS Engineer.

.4 Thrust blocks to undisturbed soil shall be provided, complete with bearing area and block volume.

3.8 Pipe Surround and Backfill

.1 Upon completion of pipe laying and before backfilling, Contractor shall notify for inspection UBC Energy & Water Services Head Plumber (604-816-9364). Notification for inspection shall be provided minimum 48 hours in advance.

.2 After inspection of work in place, surround and cover pipes.

.3 Trench backfill is to be as per MMCD specifications or as approved by UBC EWS.

3.9 Cleaning and Preliminary Flushing

.1 Water may be supplied from UBC fire hydrants upon application for a Hydrant Permit.

3.10 Testing and Flushing Procedures

.1 Contractor shall notify a UBC EWS Engineer and UBC Energy & Water Services Head Plumber 24 hours in advance of testing. (Fax: 604-822-4416). Use the Utility Service

Activation Request form.

.2 Perform all tests in presence of a UBC EWS Engineer or the UBC Energy & Water Services Head Plumber.

.3 Testing Procedure & Report as per MMCD Section 33 11 01

.4 A concise, written and signed report shall be provided to UBC Energy & Water Services.

3.11 Disinfection and Flushing

.1 Perform disinfection procedure and residual chlorine test in presence of a UBC EWS Engineer or the UBC Energy & Water Services Head Plumber.

.2 Maintain water chlorinating level (free chlorine concentration mm. 25 mg/L) in new piping for minimum 24 hours.

.3 Before connection to UBC water system, flush piping clean until maximum free chlorine concentration is less than 0.3 mg/L. Any flushed water must be de-chlorinated.

3.12 Testing New Mains

1. After disinfection and flushing, the new main is filled with potable water and sampled for total coliform and E. coli bacteria (bug test) every 350 m.

2. If a sample fails the test, the main shall be flushed and the sampling repeated. If flushing does not result in an acceptable test, the main should be disinfected again.

3.13 Shutdowns & Connections

.1 Shutdowns must be requested in writing adhering to UBC's campus-wide standard shutdown procedures. Obtain a Service Shutdown Request form from: http://buildingoperations.ubc.ca/resources/policies-procedures-forms/ and Utility Service Activation Request form from: https://energy.ubc.ca/community-services/contractors-developers/.

.2 Operating valves on the water distribution system shall only be performed by UBC Energy & Water Services.

.3 Connections to existing waterworks system may be made by Contractor with approved design, proper notification and UBC EWS approval.

.4 Notify a UBC EWS Engineer and UBC Energy & Water Services Head Plumber (604-816-9364) with a minimum 24 hours in advance of scheduled connection.

.5 Make connections in presence of a UBC EWS Engineer or the UBC Energy & Water Services Head Plumber. To prevent damage to existing utilities, excavate the last 300 mm over utility by hand.

.6 Hot tapping is generally not accepted. If there are exceptional circumstances, hot tapping may be requested in writing, and done only with prior written permission from a UBC EWS Engineer.

.7 Records of pipe sizes and inverts shall be provided to UBC Facilities, Records; and to *UBC Energy & Water Services*; in accordance with Sections 01 78 39 Project Record Documents *and 33 00 10 Underground Utilities Services* of these guidelines.

3.14 Building Excavation & Shoring Anchors

1. Excavation and shoring anchors shall be located a minimum 1 m clearance to all existing underground utilities.

2. Anchor systems within 3m of finished grade in areas of interest (such as crossing a near-term future worksite) shall be de-tensioned upon completion of work, or as approved by the Director of Energy & Water Services. These anchors of interest shall be identified through the design phase and building permit process with co-ordination from UBC Energy & Water Services, UBC Properties Trust, UBC Facilities including the UBC Facilities Technical Review Team, and others.

3. De-tensioned or removed anchor systems must be certified in writing following completion of work by a Geotechnical Engineer registered with EGBC.

4. Record Drawings must be submitted to Energy & Water Services for any active anchor systems retained tensioned in-place and any de-tensioned anchor systems abandoned in-place following completion of work.

5. Co-ordinate with UBC Technical Guidelines Division 07 (Thermal and Moisture Protection) for waterproofing requirements around de-tensioned anchor systems.

*****END OF SECTION*****