

<a href="#">Section 02200</a>	Demolition
<a href="#">Section 02610</a>	Underground Utilities Services
<a href="#">Section 02660</a>	Water Systems
<a href="#">Section 02685</a>	Natural Gas Distribution
<a href="#">Section 02695</a>	Steam and Condensate Distribution
<a href="#">Section 02720</a>	Storm Drainage
<a href="#">Section 02730</a>	Sanitary Sewer
<a href="#">Section 02800</a>	Power and Communication Utilities
<a href="#">Section 02900</a>	Landscape Systems

## **1.0 GENERAL**

### **1.1 Related UBC Guidelines**

- .1 UBC Technical Guidelines

### **1.2 Description**

- .1 Demolition of Buildings and Site Works.

### **1.3 Definitions**

- .1 "Remove" - Remove and legally dispose of items and materials off-site except those indicated to be reinstalled, salvaged, or to remain the owner's property.
- .2 "Remove and Salvage" - Items and materials indicated to be removed and salvaged remain the Owner's property. Remove, clean, and pack or crate items to protect against damage. Identify contents of containers and deliver to Owner.
- .3 "Remove and Re-Install" - Remove items and materials indicated; clean, service, and otherwise prepare them for reuse; store and protect against damage. Re-install items in locations indicated.
- .4 "Existing to Remain" - Protect construction indicated to remain against damage and soiling during demolition. When authorized in writing by the Owner at the contractor's request, items and materials may be removed to a suitable and bonded storage location as determined by the Owner and at the contractor's cost and then cleaned and reinstalled in their original locations.

## **2.0 MATERIAL AND DESIGN REQUIREMENTS**

### **2.1 Submittals**

- .1 Fire Safety Plan conforming to the BC Fire Code Section 2.14 as required by Part 8 of the BC Building Code, Clause 8.2.2.2 demolition sites, for review and approval by the UBC Fire Department prior to commencement of building demolition.
- .2 Submit to the Project Manager
  - .1 Proposed dust-control measures.
  - .2 Noise-Control Measures.
  - .3 Demolition Activities indicating the following:
    - .1 Detailed sequence of demolition and removal work, with starting and ending dates for each activity.
    - .2 Dates for shutoff, capping, and continuation of utility services.
    - .3 Phasing and dates for sectional shutoff of sprinkler system serving existing buildings which are to remain.
    - .4 Inventory of items to be removed and salvaged.
    - .5 Inventory of items to be removed by owner.
    - .6 Photos or videotape, sufficiently detailed, of existing conditions of adjoining construction and site improvements that might be misconstrued as damage caused by demolition operations.

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- .7 Record drawings at Project closeout, which also identify and accurately locate capped utilities and other subsurface structural, electrical, or mechanical conditions.
- .8 Landfill records indicating receipt and acceptance of hazardous wastes by a landfill or other facility authorized to accept hazardous wastes.

## 2.2 Quality Control

- .1 The contractor to engage or have on staff a professional engineer registered in BC to review and give written instructions on the layout and proposed methods of temporary supports, demolition and remedial work at all structural components so as to maintain structural integrity. The engineer shall submit reports and Letters of Assurances in the form established by Municipal Regulation.
- .2 Prior to the start on site the Project Manager is responsible for contacting the University Architect, the Superintendent Architectural Trades, the Superintendent Municipal Services and the Associate Director Engineering Services, regarding: work that is about to start, regarding any demolition materials that need to be saved (especially locks for security), plus any details regarding the necessary removal of obstructing street furniture, signs in the landscape, lamp post sign blades, bollards etc, including access to the site and site-related signage etc.  
Contact 604-877-3442 for the University Architect.  
Contact 604-822-5644 for the Superintendent Architectural Trades.  
Contact 604-822-0077 for the Superintendent Municipal Services.  
Contact 604-822-0852 for the Associate Director Engineering Services.

## 2.3 General

- .1 Before removal from site, the contractor shall ascertain from the Project Manager what is to be salvaged. The owner reserves the right to require the contractor to salvage any removed materials, fixtures, fittings or components. Items selected by the Project Manager shall be transported and handed over to the Project Manager as determined during the course of construction, or at the end of the project.
- .2 Except for items or materials indicated to be reused, salvaged, or otherwise indicated to remain the owner's property, demolished materials shall become the contractor's property and shall be removed from the site with further disposition at the Contractor's option.  

Historical items, relics, and similar objects include, but are not limited to, cornerstones and their contents, commemorative plaques and tablets, antiques, and other items of interest or value to the owner or authorities having jurisdiction, which may be encountered during the work of this section, remain the owner's property. Carefully remove and salvage each item or object in a manner to prevent damage and deliver promptly to the Project Manager or as directed.
- .3 Storage or sale of removed items or materials on or adjacent to the site shall not be permitted.
- .4 Materials
  - .1 Products - (UBC Mandatory, approved, or not approved for UBC projects - typ.).

## **2.4 Use of Explosives**

- .1 Use of explosives shall not be permitted.

## **2.5 Hazardous Materials**

- .1 Stop work around an area where existing previously unidentified hazardous material is discovered (refer to Section 01357), including materials suspected of containing asbestos, and immediately contact the Project Manager for direction before continuing with the work affected.

## **2.6 Construction Site Waste Storage and Disposal**

- .1 Refer to Section 01352 - Environmental Procedures.

## 1.0 **GENERAL**

### 1.1 **UBC Utilities Jurisdiction**

- .1 UBC Utilities is part of Land & Building Services at the University. It is responsible for design, operation, maintenance, and overall stewardship for each of the following underground utility services:
  - .1 Section 02660 - Water Distribution.
  - .2 Section 02685 - Natural Gas Distribution.
  - .3 Section 02695 - Steam and Condensate Distribution.
  - .4 Section 02720 - Storm Drainage.
  - .5 Section 02730 - Sanitary Sewers.
  - .6 Section 02800 - Power and Communication Utilities.
- .2 The demarcation point of service defining UBC Utilities' responsibility is included in the respective sections as listed above.

### 1.2 **UBC Utilities Contact Information**

- .1 Administration Office:

UBC Utilities  
2040 West Mall,  
Vancouver, BC V6T 1Z2  
Phone: (604) 822-9445  
Fax: (604) 822-8833
- .2 Key Positions in Utilities include:
  - .1 Director.
  - .2 Manager, Steam Plant (Chief Engineer).
  - .3 Manager, Electrical Utilities (Senior Electrical Engineer).
  - .4 Manager, Mechanical Utilities (Senior Mechanical Engineer).
  - .5 Mechanical Utilities Engineer.
  - .6 Senior Accounting Clerk.
  - .7 Lead Trades: Head Electrician, Head Plumber, Head Steamfitter, Head Utilities Maintenance Engineer.

### 1.3 **Designer Responsibility**

- .1 UBC Technical Guidelines establishes the minimum acceptable standards for the supply and installation of the underground utility services to the buildings on the campus. This is not a design manual. The designer is responsible to ensure that the standards stipulated herein are consistent with the project requirements and are adequate for the project design criteria. The designer shall define the project requirements in the project specification as part of the project tender document.
- .2 Where comments in UBC Technical Guidelines is interpreted to conflict with the industry Standards, Acts and Codes, the compliance with the Standards, Acts and Codes shall prevail and the designer shall bring these conflicts in writing to the attention of the responsible manager at UBC Utilities.
- .3 The consultant and/or contractor shall provide drawings in accordance with the Technical Guidelines. Upon completion of installation of any new or modified underground utility

services, As-built record drawings of underground utility services shall be provided to Campus Planning & Development Records Department. As-built drawings shall show inverts at points of tie-in, changes in direction, entrance and exit to the manholes, etc. Service profiles shall be provided in congested areas indicating location of all services.

## 2.0 UBC UTILITIES DEVELOPMENT SUPPORT SERVICES

### 2.1 General

- .1 Table 2.1.1 outlines UBC Utilities' development support services and requirements for underground utility services. Support services and development requirements are defined in terms of UBC Board of Governors approval status.

**Table 2.1.1**  
**UBC Utilities Service Standard for Campus Development**

UBC Board of Governors Approval Status	Development Information Provided to UBC Utilities	UBC Utilities Support Services	Response Time	UBC Board of Governors Approval Status
Pre-Board Preparations	Type of development sought (e.g. housing, research, industrial); Number of buildings and units; define short list of proposed locations.	General advise on development process, where to obtain records, services available.	3 weeks	None
Board 1 Approval: Project in principle, location, donor agreement	Confirm number of buildings, number of units, identify utility services needed. Provide a preliminary site plan drawings.	Range of expected cost of servicing; consultation on site services available; viability to relocate services if needed	3 weeks	None
Board 2 Approval:	Preliminary capital & operating budgets, schedule, select consultant, proceed with schematic design. Provide a site plan drawing based on field survey. Final list of services desired, including energy source for heat. Re-confirm number of buildings, units, and usage. Provide building and unit occupancy estimates.	Revised cost estimate for servicing.	3 weeks	None
		Conduct field inspections to locate underground services, verify records.	3 weeks	\$300 fixed fee per utility service per site.
Board 3 Approval: Schematic design, proceed with drawings & tender.	Provide pre-tender site plan. Provide estimated average and peak loads, and service connection sizes (e.g. pipe and cable sizes) for all desired utility services.	Run system engineering models to assess impact on existing infrastructure. Re-evaluate water fire flow requirements if significant re-development of fire flow zone.	4 weeks	None
Board 4 Approval: Final capital & operating budgets, award construction contract.	Provide construction tender documents and addendums.	Specify and procure meters.	Size and order within 2 weeks. Delivery lead time by supplier.	At cost.
		Service shutdowns (Application Required)	2 weeks	\$200 fixed fee per shutdown if M-F 7:30-3:30; or \$350 after hours or weekends.
Board 5: Project completion report.	Provide copies as-built service drawings (originals to CP&D). Provide actual construction costs.	Review development process, costs, actual energy consumption, etc. as agreed.	4 weeks	None

## 2.2 Underground Utility Record Drawings

- .1 Record drawings for all underground utility services must be obtained from Campus Planning & Development Records Department (Telephone: 604-822-9570).

## 2.3 Field Inspections

- .1 To verify or complement record drawing information, UBC Utilities will provide trades staff support to perform field inspections to assist in verifying locations, condition, and features of existing underground utility services. Trades staff will be supported by UBC Utilities engineering and technical professionals.
- .2 Written requests (facsimile or email) shall be submitted as follows:
  - .1 For electrical service contact Manager, Electrical Utilities.
  - .2 For gas, steam, water, sanitary, or storm contact Manager, Mechanical Utilities.
- .3 UBC Utilities charges a \$300 fixed fee per utility service per site. For example, field inspections for water, electrical, sanitary sewer, and storm sewer underground utility services for a new development would cost \$1,200.

## 2.4 Shutdowns

- .1 UBC Utilities has sole authority and responsibility to perform shutdowns (or cross connections) of the systems within its jurisdiction. There is a \$200 fixed fee per shutdown if work can be performed Monday through Friday, between the hours of 7:30 a.m. - 15:30 p.m. If shutdowns must be performed after hours or weekends, the fixed fee is \$350.

## 2.5 Utility Service Connection Permits

- .1 A service connection permit is required for any connection to a utility service as defined in the following Sections in Division 2:
  - .1 Section 02660 - Water Distribution.
  - .2 Section 02685 - Natural Gas Distribution.
  - .3 Section 02695 - Steam and Condensate Distribution.
  - .4 Section 02720 - Storm Drainage.
  - .5 Section 02730 - Sanitary Sewers.
  - .6 Section 02800 - Power and Communication Utilities.
- .2 The Service Connection Application must be completed and submitted to UBC Utilities per the instructions on the form. Refer to Standard Documents - ServConnApp.doc
- .3 *Additional permits from the provincial Electric Safety Branch, Gas Safety Branch, Boiler Safety Branch, Plumbing permits (UBC C&CP) and the Construction Permit from Vancouver Coastal Health, are the responsibility of the project team.*

## 2.6 .Development Permit Approval by UBC Utilities

- .1 The Director of UBC Utilities has sole authority to authorize underground utility service aspects of any development. Sign off of development permits by UBC Utilities is coordinated by the Manager of Development in Campus and Community Planning.

## 1.0 **GENERAL**

### 1.1 **Related UBC Guidelines**

- .1 UBC Technical Guidelines

### 1.2 **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 the Greater Vancouver Regional District (GVRD). UEL and UBC are fed from GVRD's Sasamat Reservoir located south of 16<sup>th</sup>. Avenue in Pacific Spirit Park. Ultimately two pipes feed UBC:
  - .1 24" (600 mm) water main on University Boulevard, which is the suction line supplying three central booster pumps located in the Powerhouse. The discharge pressure from the Powerhouse booster pumps is set at 100 psig (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 eight pressure reducing valve (PRV) stations.

## 2.0 **MATERIALS AND DESIGN REQUIREMENTS**

### 2.1 **Responsibilities**

- .1 UBC Utilities is primarily responsible for operation, maintenance, and overall stewardship of the water distribution system. On the browser find the Guidelines' website's Technical Requirements link and then find the Divisional Guidelines link, please refer to [http://www.technicalguidelines.ubc.ca/technical/divisional\\_specs.html#2](http://www.technicalguidelines.ubc.ca/technical/divisional_specs.html#2) for the demarcation of UBC Utilities 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 Utilities point of service for water supply to irrigation systems, (standard dwg 1140-UT-05-WaterIrrigDemarc.dwg).
- .2 Key positions in UBC Utilities are described in Division 2, Section 02610 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 larger than 3" in diameter.* For details go to [http://www.vch.ca/media/water\\_system\\_construction\\_permit\\_2011.pdf](http://www.vch.ca/media/water_system_construction_permit_2011.pdf).
- .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 Sustainability Development Policy # 5 (<http://universitycounsel.ubc.ca/policies/index/>).
  - .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 2, Section 02660 and the referenced standards, UBC Technical Guidelines shall apply.

## 2.3 Water Service Connections

- .1 The first step to install any new or substantially modified connections to the water distribution system at UBC is to complete a Service Connection Application. Refer to Standard Documents - ServConnApp.doc.
- .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 Utilities 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 Utilities will evaluate the added load using UBC's water distribution (Cybernet) model at no cost to the project. The residual pressure under fire flow conditions as per the system model will be provided in writing.
- .5 The Designer shall obtain the Water service records by contacting the Records Clerk at Campus & Community Planning (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 Utilities. For large academic buildings, this is normally required by UBC Utilities.

## 2.4 Metering

- .1 Water meters are required for all buildings as per the design requirements shown in the drawing 1140-UT-06-WaterMeterStdComp. *Remote reader shall be installed outside the building in an accessible location.* For core campus buildings the design requirements are shown in drawing 1140-UT-07-WaterMeterStdMag that can be found by on the following web page: [http://www.technicalguidelines.ubc.ca/technical/divisional\\_specs.html#1](http://www.technicalguidelines.ubc.ca/technical/divisional_specs.html#1)
- .2 As indicated on the drawing standard, the meter and strainer are to be purchased and supplied by UBC Utilities. The project will be invoiced for the purchase price of the hardware with no additional markup or procurement fees.

## 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 604-822-8228). Instructions for applying are included in the Fire Hydrant Permit Application. Refer to

[http://www.planning.ubc.ca/vancouver\\_home/plans\\_and\\_policies/forms\\_and\\_documents/forms.php](http://www.planning.ubc.ca/vancouver_home/plans_and_policies/forms_and_documents/forms.php)

- .2 A temporary connection to a hydrant is only permitted for a maximum of 30 days and is only allowed for demolition/asbestos abatement purposes. For all other temporary water connections, a Temporary Water Connection Permit for Construction must be obtained from UBC Utilities (telephone 604-822-3274).

## 2.6 Service Connections and Water Mains

- .1 Water service connections shall be designed per UBC Utilities standard as shown in the attached Water Entry standard. Refer to Standard Documents – 1140-UT-03WaterEntry drawing that can be found on the following web page:  
[http://www.technicalguidelines.ubc.ca/technical/divisional\\_specs.html#1](http://www.technicalguidelines.ubc.ca/technical/divisional_specs.html#1)
- .2 For Slab on Grade see 1140-UT-08WaterEntrySOG drawing that can be found on the following web page:  
[http://www.technicalguidelines.ubc.ca/technical/divisional\\_specs.html#1](http://www.technicalguidelines.ubc.ca/technical/divisional_specs.html#1)  
*Design consultants shall provide new irrigation service connection tie-in details including location, pipe size, material, isolation valve (minimum 2" diameter off main), meter, strainer, backflow preventer and chamber drain connection to the storm system.*
- .3 Pipe shall be Class 50 ductile iron pipe manufactured to AWWA C151; cement mortar lined to AWWA C104 and coated 1 mil. thick asphalt.
- .4 Copper, up to 75 mm diameter, type K, joints brazed only.
- .5 Joints shall be single rubber gasket for push-on bell and spigot type joints to AWWA C111, Tyton or approved equal.
- .6 Flanged joints shall be AWWA C110; flat faced conforming to ANSI B16.1, Class 125.
- .7 Fittings shall be ductile to AWWA C110 suitable for pressure rating of 2415 kPa. Cement mortar lined to AWWA C104. Minimum design pressure for piping 1,210 kPa.
- .8 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.
- .9 Nuts shall be heavy steel hex carbon steel to ASTM A563 Grade C hot-dip galvanized to ASTM A153.
- .10 Tie rods shall be continuously threaded, quenched and tempered alloyed steel to ASTM A354, Grade BC, hot-dip galvanized to ASTM A153.
- .11 Joint Restraint Devices  
.1 Each joint shall be restrained with the socket pipe clamp or equal, with prior approval.

## 2.7 Valves and Valve Boxes

- .1 Gate Valves shall be manufactured to AWWA C509, ductile iron body, resilient seated, non-rising stem, 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 Building Operations.

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

## 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 distance 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. that can be found by copying the following address into the web browser page, [http://www.technicalguidelines.ubc.ca/technical/divisional\\_specs.html#1](http://www.technicalguidelines.ubc.ca/technical/divisional_specs.html#1)

## 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 As per MMCD Section 02666.

### 3.2 Trenching

- .1 As per MMCD Section 02666.
- .2 Trench alignment and depth as shown on Contract Drawings or as approved otherwise by Utilities Mechanical Engineer (Telephone: 604-822-3274, Fax: 604-822-8833).

### 3.3 Granular Bedding

- .1 As per MMCD Section 02666.
- .2 Minimum soil cover to be 1.0 m.
- .3 For pipe bedding use clean granular pipe bedding, graded gravel, 19 mm (-), MMS type 1. 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.
- .4 Place granular bedding (sand) material across full width of trench bottom in uniform layers to 100 mm depth.
- .5 Use imported bedding when proposed work is installed under through paved areas, when Utilities Mechanical Engineer deems native material unsuitable for backfill, or when trench has been excavated in rock. Otherwise for trench backfill, native backfill may be used if free of rock greater than 25 mm.

### 3.4 Pipe Installation

- .1 As per MMCD Section 02666.
- .2 A minimum 3 m horizontal clearance is required from either sanitary sewer or storm sewer piping, when they run parallel. If this clearance cannot be met, water piping can be installed closer with prior approval from UBC Utilities, providing water pipe is installed above sanitary or storm sewer piping with minimum vertical clearance 0.5 m. 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.
- .3 Minimum 750 mm clearance is required from all other services.
- .4 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.
- .5 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.
- .6 Requirements for piping into the building's mechanical room as per drawing 1140-UT-01WaterStationSchematic.
- .7 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. To access this drawing click on the link called List of Standard Drawings at <http://www.utilities.ubc.ca/resources.html>
- .8 *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 As per MMCD Section 02666.
- .2 At every valve and fitting install up to 3 m length of tie rods on each side of valve/fitting and each branch, when pipe couplings are used.

### 3.6 Hydrants

- .1 As per MMCD Section 02666.
- .2 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 the Utilities Mechanical Engineer.

### 3.7 Thrust Blocks

- .1 As per MMCD Section 02666.

- .2 Place concrete thrust blocks between valves, tees, wyes, plugs, caps, bends and undisturbed ground as shown on the Contract Drawings or as directed by Utilities Mechanical Engineer.
- .3 Thrust blocks to undisturbed soil shall be provided, complete with bearing area and block volume.

### **3.8 Pipe Surround and Backfill**

- .1 As per MMCD Section 02666.
- .2 Upon completion of pipe laying and before backfilling, Contractor shall notify for inspection Utilities Mechanical Engineer (Fax: 604-822-8833) and UBC Utilities Head Plumber (Fax: 604-822-4416). Notification for inspection shall be provided 24 hours in advance.
- .3 After inspection of work in place, surround and cover pipes.
- .4 For trench backfill native backfill material may be used in boulevard areas if free of rock greater than 25 mm.

### **3.9 Cleaning and Preliminary Flushing**

- .1 As per MMCD Section 02666.
- .2 Water may be supplied from UBC fire hydrants upon application for a Hydrant Permit.
- .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 on or south of Agronomy Road must be de-chlorinated in a manner that it does not pose threat to aquatic life in Booming Ground Creek.

### **3.10 Testing and Flushing Procedures**

- .1 As per MMCD Section 02666.
- .2 Contractor shall notify Utilities Mechanical Engineer (Fax: 604-822-8833), and UBC Utilities Head Plumber 24 hours in advance of testing. (Fax: 604-822-4416). Use the Utility Service Activation Request form.
- .3 Perform all tests to in presence of Utilities Mechanical Engineer.
- .4 Testing Procedure & Report as per MMCD Section 02666
- .5 A concise, written and signed report shall be provided via facsimile to both the Utilities Mechanical Engineer and the Mechanical Utilities Manager (Fax: 604-822-8833).

### **3.11 Disinfection and Flushing**

- .1 As per MMCD Section 02666.
- .2 Perform disinfection procedure and residual chlorine test in presence of Utilities Mechanical Engineer.
- .3 Maintain water chlorinating level (free chlorine concentration mm. 25 mg/L) in new piping for minimum 24 hours.

### 3.12 Shutdowns & Connections

- .1 *Shutdowns must be requested in writing adhering to UBC's campus-wide standard shutdown procedures. Obtain a Service Shutdown Request form and Utility Service Activation Request form from: <http://www.buildingoperations.ubc.ca/resources/policies-procedures-forms/>*
- .2 *Operating valves on the water distribution system shall only be performed by UBC.*
- .3 Connections to existing waterworks system may be made by Contractor with approved design and proper notification.
- .4 Notify Utilities Mechanical Engineer (Fax: 604-822-8833) and UBC Utilities Head Plumber (Fax: 604-822-4416) with a minimum 24 hours in advance of scheduled connection.
- .5 Make connections in presence of Utilities Mechanical Engineer or UBC Utilities Head Plumber. To prevent damage to existing utilities, excavate at least 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 the Manager, Mechanical Utilities, UBC Utilities.

## **1.0 GENERAL**

### **1.1 Related UBC Guidelines**

- .1 UBC Technical Guidelines

### **1.2 System Description**

- .1 The University of British Columbia owns and operates its own natural gas distribution system. All parts of the system are non-interruptible (firm gas) service, except the supply to the steam plant.
- .2 There are three pressure zones within North Campus part of the system (north of 16th Avenue) as follows:
  - .1 1.8 kPa (7" water) low pressure.
  - .2 34 kPa (5 psig) medium pressure.
  - .3 69 kPa (10 psig) high pressure.
- .3 The south campus (south of 16th Avenue) operates at 69 kPa (10 psig).
- .4 Steel gas piping system throughout UBC Campus has a complete cathodic protection system.

## **2.0 MATERIALS AND DESIGN REQUIREMENTS**

### **2.1 Responsibilities**

- .1 UBC Utilities is primarily responsible for operation, maintenance, and overall stewardship of the natural gas distribution system. The demarcation of UBC Utilities point of service is as shown on Gas Meter standard drawing that can be linked from website page ([http://www.technicalguidelines.ubc.ca/technical/divisional\\_specs.html](http://www.technicalguidelines.ubc.ca/technical/divisional_specs.html)).
- .2 Where there is no gas meter for a given building, UBC Utilities demarcation point is the last valve outside the building wall.
- .3 UBC Utilities is not responsible for any part of the gas piping or equipment inside buildings.
- .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 Natural Gas Distribution Standards**

- .1 The latest revisions of the following standards shall apply to natural gas distribution at UBC:
  - .1 UBC Sustainability Development Policy #5 (<http://universitycounsel.ubc.ca/policies/index/>).
  - .2 B.C. Gas Safety Act.
  - .3 Canadian National Gas Code.
  - .4 NACE.
  - .5 CGA Standard (as applicable).
  - .6 CSA Standard (as applicable).

### 2.3 Natural Gas Service Connections

- .1 The first step to install any new or substantially modified connections to the natural gas distribution system at UBC is to complete a Natural Gas Service Connection Application. Refer to Standard Documents - ServConnApp.doc on website page ([http://www.technicalguidelines.ubc.ca/technical/divisional\\_specs.html](http://www.technicalguidelines.ubc.ca/technical/divisional_specs.html)).
- .2 Any new connections to the gas distribution system will be reviewed for consistency with UBC Utilities standards.
- .3 Project design drawings shall provide building load (list of appliances with nameplate capacities in m<sup>3</sup>/hour) and required pressure.
- .4 The Designer shall obtain the gas service records by contacting the Records Clerk at Campus Planning & Development and develop proposed service connection location(s). Service connections may be possible to more than one gas main fronting the site.

### 2.4 Metering

- .1 Natural gas meters are required for all buildings. All meters shall be temperature compensated. Gas meter design requirements are as shown in Standard Documents - GasMeterStd.dwg. on website page [http://www.technicalguidelines.ubc.ca/technical/divisional\\_specs.html](http://www.technicalguidelines.ubc.ca/technical/divisional_specs.html). Revenue gas meters shall have reading in m<sup>3</sup>, shall be provided with PFM regulator, ISO 9001 (smaller meters) or with electronically compensated pressure and temperature (larger meters).
- .2 The mean atmospheric pressure for PFM (Pressure Factor Measurement) is 100.71 kPa for all revenue natural gas meters on UBC Campus.
- .3 As indicated on the drawing standard, the meter assembly is to be purchased and supplied by UBC Utilities. The project will be invoiced for the purchase price of the hardware with no additional markup or procurement fees.

### 2.5 Seismic Protection

- .1 The decision whether to install seismic shutoff valves is the responsibility of the project consultants. Buildings which meet the following criteria may not benefit significantly by installing a seismic shutoff valve:
  - .1 Building is structurally designed for current seismic codes.
  - .2 Restraints installed on all gas equipment (e.g. water heaters, air heating units) and piping.
  - .3 Flexible connections installed on all gas equipment.
- .2 Buildings which use natural gas for emergency power or other emergency needs are recommended not to install seismic valves.
- .3 When installed, the following valves are required: California Seismic™ (formerly Koso™) valves for horizontal orientation: Safe-T-Quake valves for vertical orientation. Seismic gas valve shall be supported with two (2) brackets secured to a building wall or equivalent.
- .4 Regardless UBC Utilities requires that seismic restraints be used on all gas equipment (i.e. water heaters) and main gas piping in the building.

- .5 UBC Utilities requires that flexible gas connections be used on all gas equipment in the building.

## 2.6 Design and Materials

- .1 Design piping pressure: 415 kPa (60 psig).
- .2 Connections shall be to the highest available pressure.
- .3 New underground piping shall be SDR11 Series 125 Polyethylene, manufactured to CAN 3-B137.4M86. New underground valves shall be PSV polyethylene shut off valves with butt fusion outlet ends, to accommodate SDR 11 pipe, conforming to ASTM D-2513. Pipe fittings shall be butt heat fusion polyethylene manufactured to ASTM D-3261-85.
- .4 New aboveground piping up to shall be minimum Schedule 40, ASTM A53 steel piping. Up to, but not including the gas meter assembly, all piping shall be painted yellow. All piping up to 2" size shall be socket welded, manufactured to ASTM A182. New piping over 2" may be butt welded. All aboveground valves shall be bronze plug-type shutoff valves with threaded outlet ends to accommodate A53 steel pipe, and conforming to ASTM B62.

## 2.7 Permits

- .1 Permits by B.C. Gas Safety Branch and inspections/witness by B.C. Gas Safety Inspector of pressure testing and purging are the sole responsibility of the project.

## 2.8 Notification

- .1 The Mechanical Utilities Engineer (Telephone: 604-822-3274, Fax: 604-822-8833) and Utilities Head Plumber (Telephone: 604-822-5986, Fax: 604-822-4416) shall be notified in writing 24 hours in advance of any planned pressure testing of a new gas service pipe. Failure to provide notice may result in installed services to be re-excavated for inspection.

## 3.0 EXECUTION REQUIREMENTS

- .1 Minimum soil cover shall be 600 mm.
- .2 Warning tape at 300 mm below grade level shall be provided.
- .3 Minimum 750 mm horizontal clearance is required from all other services.
- .4 When crossing electric ductbank, run pipe above electrical ductbank with minimum vertical clearance 150 mm from the top of electric ductbank. Crossing angle shall be 90° degree. If crossing of electric ductbank cannot be done in this manner, then encase natural gas pipe in one larger plastic pipe projecting minimum 500 mm from either side of the electric ductbank.
- .5 A top tracer wire attached to the underground polyethylene pipe shall be provided.
- .6 Continuity of the existing cathodic protection system shall be maintained when any additions or replacements are undertaken.
- .7 Hot tapping may be done only with written permission from the Mechanical Utilities Engineer, UBC Utilities. Phone: 604-822-3274.

- .8 Purge pipe with nitrogen after new service pipe is installed.
- .9 For pipe bedding use clean granular pipe bedding, graded gravel, 10 mm (minus), MMCD type:
  - .1 Bottom bedding shall be a quarter of pipe diameter or 100 mm thick, whichever is larger. Top bedding shall be minimum 300 mm thick. Side bedding shall be a minimum 225 mm to maximum 300 mm thick
- .10 For trench backfill, native backfill may be used if free of rock greater than 25 mm.
- .11 No trees shall be planted within 1,200 mm of underground gas piping.
- .12 Shutdowns must be requested in writing adhering to UBC's campus- wide standard procedures. Refer to Standard Documents- UBC ShutForm.doc
- .13 Connections to existing gas distribution system may be made by Contractor with UBC approved design.
- .14 Gas distribution valves may only be operated by UBC.

## **1.0 GENERAL**

### **1.1 Related UBC Guidelines**

- .1 UBC Technical Guidelines

### **1.2 System Description**

- .1 The majority of the buildings in the Main Campus area (north of 16th Avenue) are serviced by steam from the Powerhouse. 99% dry steam is generated at 1,137 kPa (165 psig) and reduced to approximately 482 kPa (70 psig) in the Powerhouse for distribution to the following major systems: North, South, and West. There is also a Low Pressure system in the vicinity of Powerhouse with steam pressure in the range of 34 - 69 kPa (5-10 psig).
- .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.

## **2.0 MATERIALS AND DESIGN REQUIREMENTS**

### **2.1 Responsibilities**

- .1 UBC Utilities is primarily responsible for operation, maintenance, and overall stewardship of the steam distribution system. The demarcation of UBC Utilities point of service is normally up to and including the PRV at each consumer. Utilities also maintain the condensate tank and pumps, whereas the steam distribution with the consumer's premises is outside Utilities jurisdiction. Also refer to Condensate Pump and Tank Standard Drawing located on web page ([http://www.technicalguidelines.ubc.ca/technical/divisional\\_specs.html](http://www.technicalguidelines.ubc.ca/technical/divisional_specs.html)).
- .2 Key positions in UBC Utilities are described in Division 2, Section 02610 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. Boiler Safety Branch.
- .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; B.C. Boiler Safety Branch.
  - .2 UBC Sustainability Development Policy # 5 (<http://universitycounsel.ubc.ca/policies/index/>).
  - .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 Service Connection Application. Refer to Standard Documents - ServConnApp.doc.
- .2 Any new connections to the steam distribution system will be reviewed for consistency with UBC Utilities standards as defined in the UBC Technical Guidelines. If necessary the steam distribution engineering/flow model will be updated and run by UBC Utilities at no cost to the project.
- .3 The Designer shall obtain the Steam service records by contacting the Records Clerk at Building Operations – Technical Services (Telephone: 604:822-4294) 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, ([http://www.technicalguidelines.ubc.ca/technical/divisional\\_specs.html](http://www.technicalguidelines.ubc.ca/technical/divisional_specs.html)). As indicated on the drawing standard, the meter, computer, and transmitter are to be purchased and supplied by UBC Utilities. The project will be invoiced for the purchase price of the hardware with 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 Refer to website ([http://www.technicalguidelines.ubc.ca/technical/divisional\\_specs.html](http://www.technicalguidelines.ubc.ca/technical/divisional_specs.html)).
- .7 A copy of design approval by B.C. Boiler Safety Branch shall be provided to UBC Utilities Mechanical Utilities Manager (Senior Mechanical Engineer) and Steam Plant Manager (Chief Engineer).
- .8 A copy of hydrostatic tests required by B.C. Boiler Safety Branch shall be provided to UBC Utilities Mechanical Utilities Manager and Steam Plant Manager (Chief Engineer).
- .9 Manholes shall be constructed with one or two side openable tops.
- .10 Insulation of piping, valves and expansion joints inside steam distribution manholes shall conform to UBC Utilities requirements (available upon request submitted to UBC Utilities).
- .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 Utilities 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 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.
- .5 Shutdowns must be requested in writing adhering to UBC's campus-wide shutdowns procedures. Refer to Standard Documents – UBC ShutForm.doc on website page. Refer to website page ([http://www.technicalguidelines.ubc.ca/technical/divisional\\_specs.html](http://www.technicalguidelines.ubc.ca/technical/divisional_specs.html)).
- .6 Operating valves on the steam-condensate distribution system shall only be performed by UBC.

## 1.0 **GENERAL**

### 1.1 **Related UBC Guidelines**

- .1 UBC Technical Guidelines

### 1.2 **System Description**

- .1 The campus has a dedicated storm drainage system which discharges to the ocean on the north. The south discharges to Booming Ground Creek and to the Fraser River. The present system is monitored for stormwater flow and quality at all discharges from the campus.

## 2.0 **MATERIALS AND DESIGN REQUIREMENTS**

### 2.1 **Responsibilities**

- .1 UBC Utilities is primarily responsible for operation, maintenance, and overall stewardship of the storm sewers in cooperation with the following departments/organizations:
  - .1 UBC Health, Safety, & Environment.
  - .2 UBC Sustainability.
  - .3 UBC Properties Trust.
  - .4 UBC Campus and Community Planning.
  - .5 UBC Building Operations.
- .2 The demarcation of UBC Utilities point of service is defined in the standard document 1120-UT-01-StormDemarc.dwg found on the following web site page, <http://www.utilities.ubc.ca/resources.html>
- .3 The Project Designer must incorporate all specific requirements for 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 **Stormwater Objectives and Standards**

- .1 The latest revisions of the following standards shall apply to storm sewers at UBC.
  - .1 B.C. Master Municipal Construction Documents (MMCD).
  - .2 GVRD Sewer Use Bylaw No.164.
  - .3 UBC Environmental Protection Policy #6 (<http://universitycounsel.ubc.ca/policies/index/>).
  - .4 UBC Sustainability Development Policy #5 (<http://universitycounsel.ubc.ca/policies/index/>).
  - .5 Fisheries Act.
  - .6 An Integrated Storm-water Management Plan (ISMP) is currently being prepared for the UBCD point Grey Campus (July 2008). The objectives of the ISMP are to guide the overarching design philosophy for any storm-water planning, construction and maintenance at the watershed and subdivision levels.
- .2 The following guidelines should be considered in design and construction of stormwater systems:
  - .1 Best Management Practices (BMP) Guide for Stormwater, Greater Vancouver Sewerage and Drainage District Liquid Waste Management Plan. <http://www.metrovancouver.org/about/publications/Publications/BMPVol1a.pdf>

## 2.3 Storm Sewer Connections

- .1 The first step to install any new or substantially modify connections to the storm sewer system at UBC is to complete a Service Connection Application. Refer to Standard Documents - ServConnApp.doc.
- .2 Campus Planning and Development's Regulatory Services also require a Plumbing Permit to meet provisions of the B.C. Building Code Plumbing Provisions.
- .3 Any new connections to the storm sewer system will be reviewed for consistency with the Storm Drainage Master Servicing Plan, and if necessary the stormwater engineering model will be updated and run by UBC Utilities at no cost to the project.
- .4 The Designer shall obtain the Storm service records by contacting the Records Clerk at Campus & Community Planning and develop proposed service connection location(s).
- .5 Service connections may be possible to more than one storm sewer main fronting the site.

## 2.4 Stormwater Control Plan

- .1 As part of the site design submission, a Stormwater Control Plan is required if one of the following conditions is met:
  - .1 The development site is 0.5 hectares (5,000 m<sup>2</sup>) or more.
  - .2 The development involves one or more new buildings.
  - .3 Net increase in stormwater runoff is 50 l/s or more based on 10 year return period and 10 minute duration storm (see standard document 1120-UT-02-IDF.dwg, (IDF Curve), found at [http://www.technicalguidelines.ubc.ca/technical/divisional\\_specs.html#2](http://www.technicalguidelines.ubc.ca/technical/divisional_specs.html#2)).
  - .4 There are features of the development which could lead to stormwater quality problems such as parking facilities.
- .2 If a Stormwater Control Plan is required, the Designer shall provide a written document which clearly summarizes:
  - .1 The storm flow design computations which shall include, but not necessarily be limited to, a figure indicating the catchment area and land use condition, along with a list of all design parameters and resulting design flows for the storm system. The design flows and hydraulic grade line must be indicated for all pipe reaches.
  - .2 Description of potential stormwater contaminants and how stormwater quality will be controlled.
- .3 The Stormwater Control Plan need not be a large document, and the effort should be in proportion to the size and complexity of the development. For example, a single building development may adequately summarize stormwater design in one or two pages.
- .4 A copy of the Stormwater Control Plan shall be provided to the following:
  - .1 Manager, Mechanical Utilities - UBC Utilities (Fax: 604-822-8833).
  - .2 Director, Sustainability - UBC Land & Building Services (Fax: 604-822-6119).
  - .3 Manager - UBC Health, Safety, & Environment (Fax: 604-822-6650).
  - .4 Associate Director of Planning - Campus & Community Planning (Fax: 604-822-6119).
  - .5 Urban Designer/Landscape Architect - Campus & Community Planning (Fax: 604-822-6119).
  - .6 Associate Director of Municipal Services - Building Operations, Technical Services (Fax: 604-822-6969).
  - .7 Landscape Supervisor - Building Operations, Technical Services (Fax: 604-822-6969).

- .5 The storm water control plan must be discussed with and approved by UBC Utilities.
- .6 Approval of the Stormwater Control Plan is confirmed with authorization of the Development Permit.

## 2.5 Storm Sewer Design

- .1 Control of stormwater quality shall be addressed in the Stormwater Control Plan. Best Management Practices (BMP's) shall be implemented to protect stormwater runoff quality. A reference document for applicable BMP's is GVRD's Best Management Practices Guide for Stormwater. This document should also be consulted for associated design information.
- .2 The Designer is encouraged to incorporate methods of biofiltration into the site design to assist with water quality treatment. This includes such features as grassed swales, vegetated buffer strips, french drains, engineered wetlands, etc. Engineered BMP's described above may be reduced or eliminated if adequate biofiltration measures are incorporated into the site design. If biofiltration is proposed for a development, it shall be included in the Stormwater Control Plan.
- .3 The Rational Method shall be applied for the design of all drainage systems servicing an area of 10 hectares or less. The hydrograph method shall be used for catchment areas exceeding 10 hectares. Hydrograph modeling shall also be applied where stormwater detention facilities are incorporated into the storm system. All hydrograph modeling shall be completed using either Visual OTTHYMO or a SWMM based program compatible with XP-SWMM2000.
- .4 The storm service system shall be designed within the project site and to the receiving trunk sewer to convey the peak 1:10 year return period storm flows. In most cases, the sewer system shall be sized to ensure that the maximum hydraulic grade line elevation remains within the pipe. Under unique circumstances, surcharging below ground surface may be permitted provided it can be demonstrated that no risk to buildings or property result.
- .5 Rainfall intensity-duration-frequency (IDF) curves and associated rainfall data for all storm flow calculations are provided in the following UBC IDF curve. Refer to Standard Documents - IDF curve.pdf on website page.  
([http://www.technicalguidelines.ubc.ca/technical/divisional\\_specs.html](http://www.technicalguidelines.ubc.ca/technical/divisional_specs.html)).
- .6 The Designer shall select a time of concentration ( $T_c$ ) and run-off coefficient ( $R$ ) which are appropriate for the proposed development. The " $T_c$ " shall be the sum of the inlet time and travel time. In most cases, the inlet time shall be 10 minutes when the impervious surface flow path length to the storm inlets is 100 meters or less.
- .7 Storm water shall flow only by gravity into the UBC storm system. Only under unique circumstances will pumped storm water be considered. Perimeter drains can be pumped into the UBC storm system, but a request for a permission to do so shall be submitted to UBC Utilities with an explanation why the storm water cannot be discharged by gravity, the proposed pump capacity (L/s) at operating head (kPa), a diagram showing pump curve with superimposed piping system curve at operating flow and head and sump dimensions with elevations at which pump starts and stops. Sump volume between pump start and stop elevations shall be sized so that the maximum number of On/Off cycles does not exceed six per hour.
- .8 When extending the existing trunk lines, sufficient size, depth and slope of the sewer shall be maintained to facilitate the future extension of service in accordance with the Storm Drainage Master Servicing Plan.

- .9 All storm sewer piping shall be designed with a minimum velocity of 0.6 m/s when flowing full or half full, based on the Manning's formula. Special provisions must be provided for supercritical flow or where the velocity exceeds 3.0 m/s to ensure structural stability and durability concerns are addressed.
- .10 The minimum slope shall be 1.0% for CB leads, 0.2% for storm mains smaller than 600 mm in diameter, and 0.1% for storm mains 600 mm in diameter and larger.
- .11 All catch basins, lawn drains and inlet shall provide a sump and trash hood in accordance with MMCD standard drawings.
- .12 An American Petroleum Institute (API) Oil Water Separator or equivalent product such as Lafarge's Stormceptor chamber shall be incorporated at the most downstream point of the on-site storm drainage system for all parking facilities providing 20 or more parking stalls. The system shall be appropriately sized and include a bypass to reduce flushing of contaminants during elevated flows.
- .13 *For underground parkades, drains should not be connected to the storm drainage system but rather to a 'Parkade Drainage Treatment System' (PDTs) and then discharge to the building sanitary sewer system. UBC has adopted the standards of the City of Vancouver's Bulletin 2008-007-EV/PL, November 10, 2008.*
- .14 Manholes at maximum 100 m spacing shall be installed at each branch connection and each change of direction. Top of manholes shall be 150 mm above the ground in all landscaped areas, otherwise flush with surface. Pipe shall be straight between manholes.
- .15 A minimum pipe size at 200 mm shall be used for gravity service mains in residential areas and 250mm in research/industrial areas. A minimum pipe size of 150mm shall be used for all service connections.
- .16 MMCD inspection chambers are not allowed on the storm sewer systems under UBC Utilities jurisdiction.
- .17 The downstream sewer pipe shall be equal or larger diameter. However, an exemption may be obtained with UBC Utilities' approval. *For storm drainage hydraulic details, refer to Section 4.0 for the MMCD Design Guideline manual.*
- .18 Where drop manholes are required, drops shall be outside, with clean-outs. For standard details refer to MMCD manhole installation standards.
- .19 Catch basins shall be spaced to service a maximum area of 500 m<sup>2</sup> on grades up to 3%. For grades exceeding 3% the spacing shall be reduced to an area of 350 m<sup>2</sup>. Special consideration shall be given at low spots to ensure that adequate capacity is provided. A minimum pipe size of 150 mm shall be used for CB leads.
- .20 The length of service between the building face to the first storm sewer connecting manhole shall be a maximum 75 m.
- .21 A minimum 750 mm horizontal clearance is required where the storm sewer is installed within a common trench with the sanitary sewer. If the invert of the sanitary sewer varies significantly from the storm sewer, the Designer shall give special consideration to the horizontal spacing.
- .22 When crossing electric duct bank, run pipe below electrical duct bank with minimum 150 mm vertical clearance from the bottom of electric duct bank. Crossing angle shall be between 45° and 90°.

- .23 Provide positive slopes away from entrances and exits (not less than 4%) to adequate storm drains or gratings that will allow a ponding depth of at least 100 mm. (This will, in normal cases, give sufficient lead time for Building Operations to remedy flooding situations before interior floor finishes are damaged). Install continuous gratings in lieu of catch basins and drains where broad sheets of water are anticipated to flow down pathways and roads towards entrances. Where possible provide alternate means for water to escape if a drain is plugged such as overflow scuppers, secondary French drains, etc.

## 2.6 Materials

- .1 Unless otherwise approved by the Manager, Mechanical Utilities, UBC Utilities, only the following pipe material shall be used for the gravity storm sewer system:
  - .1 PVC, class SDR 28 (150 mm diam. and smaller) and SDR 35.
  - .2 Concrete (reinforced C76 required for all pipes 600 mm in diameter and larger).
  - .3 Corrugated HDPE having a minimum pipe stiffness of 320 kPa may be permitted under unique circumstances.
  - .4 PVC piping is preferred for all piping 300 mm in diameter or smaller.

## 3.0 EXECUTION REQUIREMENTS

- .1 Storm sewer works and appurtenances shall be installed in accordance with the current MMCD standards and specification, unless otherwise noted.
- .2 Minimum cover on all storm sewers shall be 1.0 meters in accordance with the MMCD standards. Where no future main line extension or connection of services, lawndrains, or catch basins is required, and where no traffic road exists or in future will exist, minimum cover may be reduced to 600 mm with special approval.
- .3 Site grading and surface inlets shall be located to ensure that stormwater is contained and controlled within the boundaries of the site.
- .4 Washout from concrete trucks and spray washing of exposed aggregate pavement shall conform to GVRD Best Management Practices for Stormwater Guide (Appendix H Construction Site Erosion and Sediment Control Guide) BMP CP10.
- .5 All pipe surround material shall consist of clean granular MMCD Type 1 bedding.
- .6 Native backfill may be used in non-traveled area if free of rock greater than 25 mm.
- .7 For purposes of cleaning and flushing, water may be supplied from UBC fire hydrants upon application for a Hydrant Use Permit. Refer to Standard Documents - HydrantApp.doc.
- .8 Supplemental to MMCD Section 02721, Clause 3.12 - Video Inspection. A concise, written and signed report and video tape or DVD disk shall be provided to Utilities Mechanical Engineer & Mechanical Utilities Manager (Fax: 604-822-8833).
- .9 Prior to covering the pipe, all installed and bedded pipe shall be inspected by UBC Utilities. The Contractor shall provide written notification to both the Utilities Mechanical Engineer (Phone: 604-822-3274; Fax: 604-822-8833) and the UBC Utilities' Head Plumber (Fax: 604-822-4416) with minimum of 24 hours notice.
- .10 Records of pipe sizes and inverts shall be provided to the Record Manager, Campus and Community Planning (Phone: 604-822-7217); and also to the Mechanical Utilities Engineer, (Phone: 604-822-3274), in accordance with the Section 01720 of these guidelines.

- .11 Where notification requirements are not met, services may need to be re-excavated for inspection and/or testing upon request of UBC Utilities.
  - .1 Concrete gutter/curb interface should not be grooved out but smoothed out at bottom to allow smooth passage of wheelchairs and bikes. Drain grates should have narrow openings which are aligned at right angles to the direction of traffic flow.

## 1.0 **GENERAL**

### 1.1 **Related UBC Guidelines**

- .1 UBC Technical Guidelines

### 1.2 **System Description**

- .1 The campus has a dedicated sanitary sewer system which discharges to the GVS & DD trunk system; both to the north and to the south. There are currently 5 communal pump stations and 30 individual building pump stations within the campus wide system. Each discharge to the GVRD system is equipped with a flow meter.

## 2.0 **MATERIAL AND DESIGN REQUIREMENTS**

### 2.1 **Responsibilities**

- .1 UBC Utilities is primarily responsible for operation, maintenance, and overall stewardship of the sanitary sewers in cooperation with the following departments/organizations:
  - .1 UBC Health, Safety, & Environment.
  - .2 UBC Sustainability.
  - .3 UBC Properties Trust.
  - .4 UBC Campus Planning & Development.
  - .5 UBC Building Operations.
- .2 The demarcation of UBC Utilities point of service is defined in the standard document 1110-UT-01-SanitaryDemarc.dwg on the following web page, [http://www.technicalguidelines.ubc.ca/technical/divisional\\_specs.html#2](http://www.technicalguidelines.ubc.ca/technical/divisional_specs.html#2).
- .3 The project Designer must incorporate all specific requirements for 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 **Sanitary Sewer Standards**

- .1 The latest revisions of the following standards shall apply to sanitary sewers at UBC:
  - .1 BC Master Municipal Construction Documents (MMCD).
  - .2 GVRD Sewer Use Bylaw No. 164 - including Schedules A, B, C, and D.
  - .3 UBC Environmental Protection Policy # 6 (<http://universitycounsel.ubc.ca/policies/index/>).
  - .4 UBC Sustainability Development Policy #5 (<http://universitycounsel.ubc.ca/policies/index/>).
  - .5 BC Provincial Health Act.

### 2.3 **Sanitary Sewer Connections**

- .1 The first step to install any new or substantially modified connections to the sanitary sewer system at UBC is to complete a Service Connection Application. Refer to Standard Documents - ServConnApp.doc.
- .2 Campus Planning and Development's Regulatory Services also require a Plumbing Permit to meet provisions of the B.C. Building Code Plumbing Provisions.

- .3 Any new connections to the sanitary sewer system will be reviewed for consistency with the Sanitary Sewer Master Servicing Plan.
- .4 The Designer shall obtain the sanitary service records by contacting the Records Clerk at the Records Department (Telephone: 604-822-9570) and develop proposed service connection location(s). Service connections may be possible to more than one sanitary sewer main fronting the site.

## 2.4 Sanitary Sewer Discharge

- .1 As part of the development design submission, the Designer shall provide the following:
  - .1 Estimates on the number and types of plumbing fixtures proposed in the buildings (i.e. low-flow vs. conventional).
  - .2 The waste stream must be fully characterized by type and quantity.
  - .3 The design flows must be identified for all pipe reaches.
  - .4 Any chemical or biological materials must be fully disclosed and addressed in the design.
  - .5 All waste being discharged shall be in compliance with the GVRD Sewer Use Bylaw No.164. A materials handling and disposal management strategy report must also be submitted for all waste which is not in compliance.
  - .6 The sanitary discharge characterization may be included in the drawing notes of the mechanical or civil design drawings for the development.

## 2.5 Sanitary Sewer Design

- .1 Sanitary sewer systems shall be designed using the Peak Wet Weather Flow (PWWF). The PWWF flow shall be the sum of the Peak Dry Weather Flow (PDWF), infiltration flow, and pumped flow.
- .2 The PDWF shall be the product of the Average Daily Flow (ADF) and the peaking factor. The minimum ADF rates shown in Table 2.5.2 shall be used:

**Table 2.5.2  
Summary of Minimum Average Daily Flows (ADF)**

Flow Category	Description	Category Code	Average Daily Flow
Family Residential	Housing for families, post graduate couples, professional, faculty and staff.	RES-F	325 Lpcd
Student Residential	Housing for students – apartments, dormitories, shared units.	RES-S	230 Lpcd
Office	Administrative and academic offices.	OFF	90 Lpcd
Classrooms	Classrooms, lectures, teaching labs, student and community activities.	CL	90 Lpcd
Research Facilities	Research and processing.	RSH	90 Lpcd
Mixed Building Use	Mixed use of classrooms, lecture halls, labs, research, administration and academic.	M-RCO	90 Lpcd
Library	Libraries.	LIBRY	90 Lpcd
Medical/ Clinical	Clinics, medical sciences research and teaching.	MEDIC	4 L/m <sup>2</sup>

Flow Category	Description	Category Code	Average Daily Flow
Animal Sciences	Livestock holding for research purposes.	ANIMAL	7.5 L/m <sup>2</sup>
Assembly	Visitor oriented buildings for conferences, events, and cultural shows.	ASSM	16 L/m <sup>2</sup>
Food Services	Dominant floor area designed for preparing and serving food services.	FOOD	100 L/m <sup>2</sup> dining area
Hospital	Hospital.	HOSP	680 L/bed or 7 L/m <sup>2</sup>
Other Uses	No distinct common use or other than described above.	OTHER	Specifically determined for use.

- .3 The ADF values listed above shall be considered minimum values. The varied building uses and activities at UBC may produce unique sewage flow rates. The Developer is responsible to ensure that flow rates are computed in accordance with the specific size and activities of the proposed facility. All pertinent information shall be provided on the design drawings as described above.
- .4 The PDWF shall be computed using the Harmon Peaking Formula.
- .5 An infiltration rate of 500 litres per pipe diameter (m) per Length (m) per day shall be added to the PDWF to determine the PWWF.
- .6 Sanitary sewer shall flow only by gravity into UBC sanitary system. Only under unique circumstances will pumped sewage be considered, but a request for a permission to do so shall be submitted to UBC Utilities with an explanation why the sanitary sewer can not run by gravity, the proposed pump capacity (L/s) at operating head (kPa), a diagram showing pump curve with the superimposed piping system curve at operating flow and head and sump dimensions with elevations at which pump starts and stops. Sump volume between pump start and stop elevations shall be sized so that the maximum number of On/Off cycles does not exceed six per hour.
- .7 Gravity sewers shall be sized using the Manning's Formula using an "n" value of 0.011 for PVC or 0.013 for concrete. New gravity sewers shall be sized such that the PWWF depth will not exceed 50% of the full depth of the pipe, with a resulting minimum flow velocity of 0.6 m/s.
- .8 Forcemains shall be sized using the Hazen-Williams formula using a "C" value of 100. Forcemains shall have a minimum pipe size of 100 mm and designed for a minimum velocity of 0.9 m/s.
- .9 When extending the existing trunk lines, sufficient size, depth and slope of the sewer shall be maintained to facilitate the future extension of service in accordance with the Sanitary Sewer Master Servicing Plan.
- .10 A minimum pipe size of 200 mm shall be used for gravity service mains in residential areas and 250 mm in research / industrial areas. A minimum pipe size of 150 mm shall be used for service connections.
- .11 Regardless of pipe slope and capacity, the downstream pipe shall be of equal or larger diameter. No downsizing is permitted.

- .12 Manholes at maximum 100 m spacing shall be installed at each branch connection and each change of direction. Top of manholes shall be 150 mm above the ground in all landscaped areas, otherwise flush with surface. Pipe shall be straight between manholes.
- .13 All service connections shall connect to the service main with a manhole.
- .14 The length of service between the building face to the first sanitary sewer connecting manhole shall be a maximum 75 m.
- .15 A minimum 750 mm horizontal clearance is required where the sanitary sewer is installed within a common trench with the storm sewer. If the invert of the sanitary sewer varies significantly from the storm sewer, the Designer shall give special consideration to the horizontal spacing.
- .16 When crossing electric duct bank, run pipe below electrical duct bank with minimum 150 mm vertical clearance from the bottom of electric duct bank. Crossing angle shall be between 45° degree and 90° degree.
- .17 Where drop manholes are required, drops shall be outside, with clean-outs.
- .18 MMCD Inspection Chambers are not allowed on the sanitary sewer system under UBC Utilities jurisdiction.
- .19 All manholes shall be benched and have a minimum drop of 30 mm. The drop shall be increased to 50 mm for deflection angles exceeding 45° degree.

## 2.6 Materials

- .1 Unless otherwise approved in writing by the Manager of Mechanical Utilities, UBC Utilities, only the following pipe material shall be used for the gravity sanitary sewer system:
  - .1 PVC, class SDR 28 (150 mm diameter and smaller) and SDR 35.
  - .2 Concrete (reinforced C76 required for all pipes 600 mm in diameter and larger).
  - .3 PVC piping is preferred for all piping 450 mm in diameter or smaller.
- .2 Unless otherwise approved in writing by the Manager of Mechanical Utilities, UBC Utilities, only the following pipe material shall be used for sanitary sewer forcemains:
  - .1 PVC, class C900 (300 mm diameter and smaller) and C905.
  - .2 Ductile Iron (DI), class C151.
  - .3 PVC piping is preferred; therefore, DI pipe shall only be approved under unique circumstances.

## 3.0 EXECUTION REQUIREMENTS

- .1 Sanitary sewer works and appurtenances shall be installed in accordance with the current MMCD standards and specification, unless otherwise noted.
- .2 Minimum cover on all sanitary sewers shall be 1.0 meters in accordance with the MMCD standards. Where no future main line extension or connection of services is required, and where no traffic road exists or in future will exist, minimum cover may be reduced to 600 mm with special approval.
- .3 All pipe surround material shall consist of clean granular MMCD Type 1 bedding.

- .4 Native backfill may be used in non-traveled area if free of rock greater than 25 mm.
- .5 For purposes of cleaning and flushing, water may be supplied from UBC fire hydrants upon application for a Hydrant Use Permit. Refer to Standard Documents HydrantApp.doc.
- .6 All gravity sanitary sewer systems shall be low pressure air tested in accordance with the MMCD Section 02731, Clause 3.14.
- .7 Supplemental to MMCD Section 02721, Clause 3.12 - Video Inspection. A concise, written and signed report and video tape or DVD disk shall be provided to Utilities Mechanical Engineer & Mechanical Utilities Manager (Fax: 604-822-8833).
- .8 Prior to covering the pipe, all installed and bedded pipe shall be inspected by UBC Utilities. The Contractor shall provide written notification to both the Utilities Mechanical Engineer (Tel: 604-822-3274, Fax: 604-822-8833) and the UBC Utilities' Head Plumber (Fax: 604-822-4416) with minimum of 24 hours notice.
- .9 Records of pipe sizes and inverts shall be provided to the Record Section, Campus & Community Planning; and to the Manager, Mechanical Utilities, UBC Utilities; in accordance with the Section 01720 of these guidelines.
- .10 Where notification requirements are not met, services may need to be re-excavated for inspection and/or testing upon request of UBC Utilities.

## 1.0 **GENERAL**

### 1.1 **Related UBC Guideline**

- .1 UBC Technical Guidelines
- .2 Division 16 and Division 17

### 1.2 **Coordination Requirements**

- .1 UBC Utilities.
- .2 UBC Building Operations – Technical Services.

### 1.3 **Power**

- .1 The University owns and operates the power system consisting of 60 KV underground and overhead distributions, and 12 KV underground distributions.
- .2 The University purchases power in bulk form from BC Hydro. The two 60 KV lines feed two substations, one located on the South Campus and one on the Main Campus.
- .3 The Main Substation supplies in turn a 12 KV indoor switching station.
- .4 The 12 KV systems is distributed underground in a combined duct and manhole system which services throughout the major portion of the North Campus and a portion of the South Campus.
- .5 The 12 KV system is nominally rated at 12,480 volts, 3 phase, 3 wires, Wye System low resistance grounded.
- .6 The design limits shall be basic impulse level 95 KV and design fault 300 MVA symmetrical.
- .7 The power distribution is a Dual Radial System with 500 MCM low resistive grounded single conductor crosslink polyethylene for 12 KV system.
- .8 For a General Distribution Diagram of the 12 KV feeders, refer to Division 16, Standard Drawing E1-1 ([http://www.technicalguidelines.ubc.ca/technical/divisional\\_specs.html#16](http://www.technicalguidelines.ubc.ca/technical/divisional_specs.html#16)). Also, refer to 5.4.3.1 Design Development Brief.

### 1.4 **Communication**

- .1 The Campus communication systems in most areas of the campus is owned and operated by the University. Project requirements shall be coordinated between the User, the Consultant and the Cable Facilities Services by the Project Manager.

### 1.5 **Central Fire Alarm**

- .1 The University is connected to an MSC 500 central fire alarm system which is located in the Public Service Centre Building at 3030 Wesbrook Mall. The system was built and supplied through the B.C. Buildings Corporation.
- .2 The system requires a MSC 300/500 transponder which shall be supplied by UBC at a cost established by the Engineering and Operations Division, Building Operations, UBC.

### **1.6 Central Building Alarm – A Division, Building Operations, UBC**

- .1 The University operates a Building Management System (BMS) to provide control and alarm monitoring for all primary mechanical and electrical systems.
- .2 The panels are usually located in the building mechanical rooms to capture the necessary alarm event. This event is transmitted across the BMS network to the appropriate display terminals.

### **1.7 Central Clock and Program Bells**

- .1 The University operates two independent time systems. One is used for program bells and is transmitted at 24 V DC. This system is transmitted via leased telephone pair.
- .2 The other is a simplex central clock system which is transmitted via a leased telephone pair to new buildings.
- .3 Inside each building the systems are distributed from a local relay cabinet operating synchronous clocks.

### **1.8 UBC Standard Forms**

- .1 The following standard forms apply to all utilities for this project, as applicable:
  - .1 UBC Application for Service Shutdown.
  - .2 UBC Application for Service Connection.
  - .3 I-B-07 - Clearance Permits.
  - .4 I-B-33 - Test and Work Permits.
  - .5 UBC Utilities Manhole Entry Permit 1.

## **1.0 GENERAL**

### **1.1 Related UBC Guidelines**

- .1 UBC Technical Guidelines
- .2 Landscape Plan 2001
- .3 UBC Comprehensive Community Plan (2000 Draft)
- .4 Neighbourhood Plans
- .5 Main Campus Plan (1992)
- .6 University Tree Database
- .7 UBC Lighting Master Plan (1991)
- .8 Land and Building Services Facilities and Infrastructure Management Plan (1998)
- .9 CAN/CSA B651 Barrier Free Design
- .10 Consultant Studies in progress during 2001 related to Storm Water and Irrigation Management
- .11 GVS & DD Best Management Practices Guide for Stormwater, October (1999)

### **1.2 Related BC Guidelines**

- .1 Integrated Pest Management Manual for Landscape Pests in British Columbia.
- .2 Ministry of Environment. Available on web: <http://www.gov.bc.ca/env/>
- .3 CMHC Roof Deck Design Guidelines (in relation to Green Roofs).
- .4 Crime Prevention through Environmental Design, Guidelines for Safe Urban Design, City of New Westminster, 1999.

### **1.3 Coordination Requirements**

- .1 University Architect / Landscape Architect.
- .2 University Urban Designer / Landscape Architect, (Associate Director Municipal Services).
- .3 University Arborist.
- .4 Project Architect and Civil Engineer.
- .5 Landscape Supervision.
- .6 Physical Access Coordinator.
- .7 Project Engineer for exterior paved surfaces.
- .8 Project Architect for external structures (pergolas, arbors, railings etc.).
- .9 Landscape Supervisor (in relation to Irrigation).
- .10 Waste Management Department, UBC Building Operations.
- .11 Project Architect and Structural Engineer (in relation to Green Roofs).
- .12 Building Operations- Technical Services (in relation to Green Roofs).
- .13 Emergency Services Committee (in relation to Crime Prevention).
- .14 Advisory Design Review Panel (in relation to Crime Prevention).

### **1.4 Warranty Requirements**

- .1 A one year warranty period is required.
- .2 The specifics of the approvals processes must be documented.
- .3 A maintenance manual for the landscape, prepared in conjunction with UBC staff, is to be submitted at the end of the warranty period.

## 2.0 PLANTS AND PLANTING

### 2.1 Design Requirements

- .1 All work must conform to the latest edition of the BC Landscape Standards. The BC Landscape Standards is the basis of soft landscape guidelines for UBC for those topics that are covered by these standards:
  - .1 General requirements.
  - .2 Site preparation and protection of existing site elements – (for tree protection see below).
  - .3 Grading & drainage.
  - .4 BC Standard for Landscape Irrigation Systems.
  - .5 Growing medium.
  - .6 Lawns & grasses.
  - .7 BC Standard for Turfgrass Sod.
  - .8 Plants & planting.
  - .9 Mulching.
  - .10 Landscape over structures.
  - .11 Establishment maintenance.
  - .12 Landscape maintenance.
  - .13 Skateboard deterrents.
- .2 The Master Municipal Construction Document (MMCD) is the basis for standards for hard landscape elements and should be used with reference to the UBC specific Technical Guidelines for Civil Works and Site Services.
- .3 In general, the BC Landscape Standards (latest edition) is the document that takes precedent over the MMCD on topics covered in both documents. The following references and amendments for each section of the BC Landscape Standards (latest edition) should apply:
  - .1 Tree Protection:
    - .1 A protection fence, a minimum of 1.2 metres (4 feet) in height, must be installed around the trees to be retained. This must be erected before construction starts and remain until the project's completion.
    - .2 The protection fence must be constructed of orange snow fencing securely fastened to metal stakes, or 5 cm x 10 cm (2" x 4") wood, driven into the ground. Other forms of protection must be discussed with the University Arborist.
    - .3 The size of the protection fence is determined by the diameter of the tree's trunk. For every 8 cm of trunk diameter there is 1 meter of protection fence or 1" (inch) of trunk diameter to 1' (foot) of protection fence. A tree with a 40 cm trunk diameter will require 5 metres of protection fence or a tree with a 16" (inch) trunk diameter will require 16' (feet) of protection fence.
    - .4 The protection fence is not to be lifted or removed at any time for vehicular access. Vehicles and heavy equipment can cause soil compaction in the root zone, depleting the air space that is essential to the tree's health.

- .5 Any pruning of the branches or roots must be done by a professional Arborist. Storage of building materials, soil, or equipment is not permitted inside the protection area.

## 2.2 Design References and Amendments Requirements

- .1 Reference MMCD Section 02104 Shrub and Tree Preservation.
- .2 Reference MMCD Section 02111 Clearing and Grubbing.
- .3 Reference International Society of Arboriculture, Guide for Establishing Values of Trees and Other Plants, 1983.
- .4 Reference MMCD Section 02210 Site Grading.
- .5 Reference MMCD Section 02921 Topsoil and Finish Grading.
- .6 Amend subsection 5.3.8 Pipe - Poly Vinyl Chloride to read:
  - .1 Series 200 pipe is preferred for use in all applications, Series 160 is the minimum permitted.
- .7 BC Landscape Standard takes precedence over MMCD Section 02921 Topsoil and Finish Grading.
- .8 BC Landscape Standard takes precedence over MMCD Sections 02933 Seeding and 02934 Hydraulic Seeding.
- .9 BC Standard takes precedence over MMCD Section 02938 Sodding.
- .10 BC Landscape Standard takes precedence over MMCD Section 02950 Planting of Trees, Shrubs and Ground Covers.
- .11 Reference the Architectural Sections of the Technical Guidelines.
- .12 Amend Section 14.5 Duration and Acceptance to read:
  - .1 Duration of maintenance shall be a minimum of one full year from substantial completion and shall be extended to the satisfaction of the University.

## 2.3 Acceptance

- .1 Acceptance by the University Architect and also the Associate Director Municipal Services, (Landscape Architect), shall be after one full year from substantial completion, or extended at the discretion of the University Architect and/or Associate Director Municipal Services (Landscape Architect) until all works and deficiencies are completed to the terms of the contract.

## 2.4 Notification

- .1 The contractor is responsible for contacting the Project Manager, with a minimum of two weeks prior notification to enable the Project Manager to coordinate any preliminary site reviews with the , before construction commences, and also at the end of the job before substantial completion.

## 3.0 CHILDREN'S PLAY AREAS AND EQUIPMENT

### 3.1 Design Requirements

- .1 Specifications for children's play spaces and equipment will conform to the standards of the Canadian Standards Association (the latest CSA Z614-??).
- .2 Innovation and consideration of the full range of children's play needs is encouraged within the requirements for children's safety and equipment performance.
- .3 Reference to the standards and websites regarding children's play equipment is encouraged; refer to links in Section 1-4-7.

- .4 Play areas shall be universally accessible and safe.
- .5 Consideration shall be given to parents/supervisors and children.

#### **4.0 SITE FURNISHINGS**

##### **4.1 Design Requirements**

- .1 UBC preferences for site furnishings including benches, waste receptacles, and light standards are referenced in the UBC Landscape Plan
- .2 Minimum one year warranty on all site furnishings.
- .3 Minimum five year warranty on garbage receptacles.

##### **4.2 Materials**

- .1 Materials shall be corrosion resistant
- .2 Materials shall be resistant to vandalism and to damage from skateboards
- .3 Use of recycled materials is encouraged
- .4 Selection of materials should be environmentally responsible including consideration of embodied energy of production and avoidance of endangered wood sources
- .5 Local supply of materials is preferred.

#### **5.0 HARD LANDSCAPING**

##### **5.1 Design Requirements**

- .1 The MMCD shall be used for all construction specification guidelines for hard landscape elements addressed by it.
- .2 Landscape structures should reference the appropriate architectural sections of the Technical Guidelines.
- .3 Now that UBC is posted on the internet as a destination for skateboarders, it is imperative that hard landscape steps, furniture, walls and railings are designed to be anti-skateboarding. After-the-fact add-on straps and studs are less desirable than surfaces that have been pre-considered as targets, and aesthetically designed to stop the destructive "grinding" by skateboarders. Preferred deterrents shall be considered at the schematic design stage, may include incorporating air gaps, uneven surfaces, notching, and the creative articulation of surfaces, walls, steps and railings.

#### **6.0 IRRIGATION**

##### **6.1 Design Requirements**

- .1 Irrigation is required in all planting areas.

- .2 Specification of drought tolerant plant species is encouraged.
- .3 Mulching of planting beds is required (see B.C. Landscape Standard), however bark mulch is not acceptable and alternate fertile mulch must be used.
- .4 UBC prefers the use of irrigation only to establish plants in the short-term. Low water-use plantings and mulching of planting areas is encouraged.
- .5 UBC requires the exclusive use of Rainbird irrigation systems.
- .6 Drip irrigation is not to be used except in special circumstances as determined by UBC Landscape Supervisor.
- .7 Polyvinyl pipe sizes in excess of those specified in the BC Landscape Standard are preferred; Series 200 pipe is preferred as a minimum in all applications; Series 160 may be used in special circumstances, with the approval of the Landscape Supervisor.

## **7.0 STORMWATER AND IRRIGATION MANAGEMENT**

### **7.1 Design Requirements**

- .1 Management strategies for storm water management may vary in different parts of the campus due to variable soil and subsoil conditions. Concerns that efforts to direct storm water into the ground may impact geotechnical stability in some areas are the subject of detailed studies which should lead to specific recommendations.
- .2 Where appropriate, integration into the landscape of surface storm water detention and retention features, including naturalized plantings, biofiltration, and bioremediation features, is encouraged. Stewardship and naturalized riparian landscape along stream corridors is encouraged.

## **8.0 WASTE MANAGEMENT**

### **8.1 Design Requirements**

- .1 UBC uses a number of standard Waste Management container and vehicle types and seeks to utilize the same types throughout the campus: These include:
  - .1 3, 4 and 6 cubic yard steel containers for collection of garbage and recyclable cardboard, serviced using an industry standard front-load compactor truck which requires direct drive-in access.
  - .2 35, 65 and 95 gallon wheeled Schaefer carts for collection of recyclable paper and mixed containers, serviced using an industry standard side-load recycling truck which loads from the right side only.
  - .3 30 and 40 cubic yard compactor container for collection of garbage at high waste generation, facilities, serviced, using an industry standard roll-off container truck which requires direct back-in access.
  - .4 10, 20, 30, and 40 yard bins for concrete, gypsum, construction, yard waste, and steel recycling, serviced using an industry standard roll-off container truck which requires direct back-in access.

- .2 Building designs need to allow adequate service area space for removal of garbage and recyclables using the containers and vehicles noted above. Minimum requirements for most buildings include:
- .1 Concrete pad for placement of front-load waste containers to prevent long-term surface damage.
  - .2 3-sided enclosure around concrete pad such that waste bins are visible only from the direction of service vehicle approach. Design to be approved by University Architect.
  - .3 Direct in-line service access to front-load waste containers at least 1.5 times the length of an industry standard front-load compactor truck.
  - .4 Outside service area for recycling cart pickup using an industry standard side-load truck which loads from the right side only.
  - .5 Ramp or ground level access from building to service area to allow recycling carts to be wheeled easily to designated outside pickup area.
  - .6 Service lane widths, turning radii and load bearing capability sufficient to accommodate all waste collection vehicles noted above. Fire truck access standards are typically sufficient.
  - .7 Minimum access width of 12' (feet) to any front-loads waste container enclosures.
  - .8 Minimum vertical clearance above waste containers of 14' (feet).
  - .9 Secure, externally accessible, storage room, located near service entry to building that can accommodate short term storage of waste materials (e.g. garbage, recyclables, and confidential shredding material and special wastes).
- .3 Project specifications are to describe all major components of a project and the level of quality of these components, a list of systems and materials is to be provided by the consultant – this guideline section will guide the consultant in the required items to be described, level of quality, and design approach.
- .4 Standard dimensions of water containers, recycling carts and waste vehicles are as follows:

Type	Description	Size (W x D x H)	Weight (kg)
Waste Containers	3 cubic yard front-load	79 x 42 x 48"	320
	4 cubic yard front-load	79 x 54 x 48"	410
	6 cubic yard front-load	79 x 66 x 58"	550
	30 cubic yard roll-off	96 x 256 x 79"	3,270
	40 cubic yard roll-off	96 x 256 x 90.5"	3,400
Recycling Carts	35 gallon	22.75 x 22.35 x 39.5"	
	65 gallon	28.0 x 26.8 x 42.2"	
	95 gallon	28.0 x 30.5 x 46.5"	

Vehicle Type	Size (W x D x H)	Gross Vehicle Weight (kg)
Front-Load Compactor Truck	8.5 x 32.5 x 13.5'	25,000
Roll-Off Container Truck	9.75 x 33.3 x 9.75'	25,000
Side-Load Recycle Truck	9.5 x 31.5 x 12.5'	17,000
Side-Load Truck Extended	12.5 x 31.5 x 16.0'	-

## **9.0 INTEGRATED PEST MANAGEMENT**

### **9.1 Design Requirements**

- .1 UBC practices Integrated Pest Management. Discuss combination to be applied in specific location with UBC Landscape Supervisor.

## **10.0 GREEN ROOF**

### **10.1 Design Requirements**

- .1 Refer to BC Landscape Standard, 6th Edition, Section 11 - Landscape over Structures and CMHC Roof Deck Design Guidelines.
- .2 Projects with green roof systems and/or landscaping on slab require close and early coordination among the Landscape Architect, Architect, Structural Engineer and UBC Technical Services to ensure that the landscape design objectives are integrated into the structural design.
- .3 Consideration is to be given to the pollen production of plant cover in relation to air intakes.

## **11.0 CRIME PREVENTION**

### **11.1 Design Requirements**

- .1 The principals of CPTED should be consider and reviewed at each stage o the project from pre-design through to occupancy, with reference to the extensive literature on this subject.
- .2 Project design features that address CPTED issues should be flagged for consideration in the plan reviews by the Emergency Services Committee, including representatives of Campus Planning & Development, Heath Safety and Environment, Campus Security, RCMP, fire, ambulance and UEL and by Advisory Design Review Panel with a CPTEC specialist from Richmond Police.
- .3 On complex, large projects, consideration should be given to including a CPTED consultant to the Project Team.