

1.0 **GENERAL**

1.1 **Related UBC Guidelines**

- .1 338201s CCTV Pipeline Inspection (see <https://energy.ubc.ca/community-services/contractors-developers/>)
- .2 330130.41s Cleaning of Sewers (link as above)

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.

2.0 **MATERIALS AND DESIGN REQUIREMENTS**

2.1 **Responsibilities**

- .1 UBC Energy & Water Services (*EWS*) is primarily responsible for operation, maintenance, and overall stewardship of the 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 Facilities*.
- .2 The demarcation of UBC Energy & Water Services point of service is defined in the standard drawing 1120-UT-01-StormDemarc.dwg found under Division 33 section listings here: http://www.technicalguidelines.ubc.ca/technical/divisional_specs.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 *Metro Vancouver's* Sewer Use Bylaw latest edition.
 - .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 *BC Ministry of Health*.
 - .7 *UBC's* Integrated Storm-water Management Plan (ISMP).
- .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. Search the <http://www.metrovancouver.org> website.

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 Utility Service Connection Application. This and other forms can be found at <https://energy.ubc.ca/community-services/contractors-developers/>.
- .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 Energy & Water Services at no cost to the project.
- .4 The Designer shall obtain the Storm service records by contacting the Records Clerk at Infrastructure Development, Records, 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 Management Plan

- .1 As part of the site design submission, a Stormwater *Management* Plan is required if one of the following conditions is met:
 - .1 The development site is 0.5 hectares (5,000 m²) 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 (*use Environment Canada's latest IDF curve for YVR/Vancouver International Airport found at https://climate.weather.gc.ca/prods_servs/engineering_e.html*).
 - .4 There are features of the development which could lead to stormwater quality problems such as parking facilities.
- .2 If a Stormwater Management 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 Management 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 Management Plan shall be provided to the following:
 - .1 *Green Infrastructure Engineer – Campus & Community Planning (Fax: 604-822-6119).*
 - .2 *Manager, Mechanical Utilities - UBC Energy & Water Services (Fax: 604-822-8833).*

- .3 Director, Sustainability - UBC Land & Building Services (Fax: 604-822-6119).
 - .4 Manager - UBC Health, Safety, & Environment (Fax: 604-822-6650).
 - .5 *Landscape Architect Planner* - Campus & Community Planning (Fax: 604-822-6119).
 - .6 *Landscape Architect – UBC Facilities (Phone: 604 822-7913)*.
- .5 The storm water management plan must be discussed with and approved by *the UBC Green Infrastructure Engineer and UBC Energy and Water Services*.
- .6 Approval of the Stormwater Management 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 Management Plan. Best Management Practices (BMP's) shall be implemented to protect stormwater runoff quality. A reference document for applicable BMP's is *Metro Vancouver'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 Management Plan.
- .3 The Rational Method shall be applied for the design of all drainage systems servicing an area of *1 hectare* or less. The hydrograph method shall be used for catchment areas exceeding *1 hectare*. 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. *The storm duration that results in the highest peak flow should be used for design*. 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 *to be based off Environment Canada's latest IDF curve for YVR/Vancouver International Airport (found at https://climate.weather.gc.ca/prods_servs/engineering_e.html)*.
- .6 The Designer shall select a time of concentration (Tc) and run-off coefficient (R) which are appropriate for the proposed development. The "Tc" 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 Energy & Water Services 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 *other* inlet *structures* 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, latest revision.
 - .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 of 200 mm shall be used for gravity service mains in residential areas and 250mm in research/industrial areas. *Service connections with a* minimum pipe size of 150mm *may be used with written approval from UBC EWS.*
 - .16 MMCD inspection chambers are not allowed on the storm sewer systems under UBC Energy & Water Services jurisdiction.
 - .17 The downstream sewer pipe shall be equal or larger diameter. However, an exemption may be obtained with UBC Energy & Water Services' 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 m² on grades up to 3%. For grades exceeding 3% the spacing shall be reduced to an area of 350 m². 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 *maximum* service *length*, between the building face and the first storm sewer connecting manhole, shall be 75 m. *Service connections less than 20m length shall connect to sanitary mains as per MMCD Section 33 03 01 or as approved by UBC EWS.*
- .21 *All services should connect to the mainline distribution system at locations within roadways or utility corridors approved by UBC EWS.*
- .22 A minimum 750 mm, *pipe wall to pipe wall*, 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. *Clearance from building footings shall be approved by EWS and be a minimum of 3 m per MMCD General Design guideline clause 1.3.*
- .23 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°.
- .24 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 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.
- .25 *All regional-level drainage detention facilities shall be designed as per UBC's Integrated Rainwater/Stormwater Management Plan, or as approved by the Director of Sustainability & Engineering and the Director of Energy & Water Services. A detention facility is considered regional-level detention storage if:*
 - .1 *It is located downstream of any storm sewer main as indicated in the UBC Standard Drawings Division 33 Utilities - 1120-UT-01 Storm Demarcation drawing; and*
 - .2 *It is identified as such in the UBC Integrated Rainwater/Stormwater Management Plan.*
- .26 *An oversized pipe may be used for building-level drainage detention, but is not permitted for regional-level detention storage unless approved by the Director of Sustainability & Engineering and the Director of Energy & Water Services. An oversized pipe is considered a detention facility if it includes a device or feature designed to control the discharge from the pipe. Maintenance access for an oversized pipe detention facility is required at the inlet, outlet, and at all pipe connections into the detention pipe.*

2.6 Materials

- .1 Unless otherwise approved by UBC Energy & Water Services only the following pipe material shall be used for the gravity storm sewer system:
 - .1 PVC, class SDR 28 (*required for* 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 Metro Vancouver's 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 *Trench backfill is to be as per MMCD specifications or as approved by UBC EWS.*
- .7 For purposes of cleaning and flushing, water may be supplied from UBC fire hydrants upon application for a Hydrant Use Permit. Refer to <https://planning.ubc.ca/planning-development/permits-and-business-licenses/building-and-trades-permits/trades-permits>.
- .8 As per Energy & Water Services' supplementals (see item 1.1), UBC Technical Guidelines Sections 33 82 01 and 33 01 30.41. A concise, written and signed report and video *inspection* shall be provided to *UBC Energy & Water Services*.
- .9 Prior to covering the pipe, all installed and bedded pipe shall be inspected by UBC Energy & Water Services. The Contractor shall provide written notification to *a UBC EWS Engineer* and the *EWS* Head Plumber with minimum of 24 hours notice.
- .10 Records of pipe sizes and inverts shall be provided to the Records Manager, Infrastructure Development (Phone: 604-822-7217); and also to the *UBC Energy & Water Services*, in accordance with Sections 01 78 39 Project Record Documents and 33 00 10 Underground Utilities Services 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 Energy & Water Services.

END OF SECTION