WATER METER

DESIGN GUIDELINES
AND
SUPPLEMENTARY SPECIFICATIONS

29 September 2020

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1. GENERAL INFORMATION

1.1 Introduction

This document outlines the *City's* requirements for the installation of water meters on municipal water services, pursuant to Waterworks Bylaw No. 3325.

1.2 Content and Intent

This document is divided into four separate parts:

Introduction – which outlines the purpose of this document, defines key terms, and outlines the responsibilities of each party.

Design Guidelines – which are intended to provide direction to the *Applicant* and *Applicant's Engineer* on the elements that need to be considered in the design of new water meter installations.

Supplementary Specifications – which are intended to provide direction to the *Applicant* and *Applicant's Engineer* regarding approved products, materials, and other specifications that must be incorporated into the design of the new water service and water meter.

Appendices – which provide reference material including a water meter sizing calculation sheet and standard water meter installation drawings.

1.3 Definitions

Applicant	Refers to a property *Owner* or their authorized agent who makes an application for a water service connection.
Applicant's Engineer	Refers to a professional engineer engaged by the *Applicant* to design the water service connection and water meter assembly.
ASTM	Stands for the American Society for Testing and Materials.
AWWA	Stands for the American Water Works Association.

City	Refers to the *City* of Burnaby.
CSA	Stands for the Canadian Standards Association.
FM	Stands for Factory Mutual.
NFPA	Stands for National Fire Protection Association.
Owner	Means the property *Owner* as defined in the *City* of Burnaby Waterworks Bylaw No. 3325.
ULC	Stands for Underwriters Laboratory of Canada.

1.4 Responsibilities

The *City* of Burnaby Bylaw No. 3325 outlines billing meter requirements for specific property types and land uses.

The *Applicant* or *Applicant's Engineer* is responsible for determination of the appropriate size and type of water billing meter as well as the design of the complete meter assembly, in accordance with City requirements. The water meter design must be approved by the *City* prior to initiation of any on-site works associated with the water meter or water service installation.

Water services may be installed by the *City*, at the *Applicant's* expense, to within one metre of the property line, or otherwise at the City's discretion. The *Applicant* is responsible to connect to the *City* installed water service including the supply and installation of the complete meter assembly, with the exception of the meter. Water meters are supplied and installed by the *City*, at the *Applicant's* expense.

The *Applicant* may apply for a permanent water service for water use for construction purposes. Construction services may be billed "falt-rate" or, equipped with an approved water meter and double check valve backflow prevention device, at the discretion of the City. Water for construction use shall not be obtained from a *City* fire hydrant.

Backflow prevention devices are to be installed in accordance with City of Burnaby Bylaw No. 6335.

1.5 Timing

Water services and meters are installed in order of priority, based on the date of application. Upon receipt of the application, the *City* will advise the *Applicant* of a tentative date for the water service and meter installation and the *Applicant* should allow at least four months lead time to account for delivery from meter equipment manufacturers.

The water service shall not be activated until the private plumbing system has been approved by the City Plumbing Inspector.

1.6 Disclaimer (Water Supply)

The City does not guarantee a stable pressure nor continuous supply of water. It does not accept responsibility for increases or decreases in pressure. The *City* reserves the right at any and all times, without notice, to change operating water service for the purpose of making repairs, extensions, alterations, or improvements, or for any other reason, and to increase or reduce pressure to an area for design or operational reasons. Customers who depend upon a continuous, uninterrupted supply of water or having processes or equipment that require specific water quality shall provide such emergency storage, piping, pumps, tanks, filters, pressure regulators, additional service pipes or other means of their own for a continuous and adequate supply of water suitable for their specific requirements. Should a long term change of pressure occur within an area for design or operational reasons, the customer shall be responsible for and bear all costs of making any changes necessary to regulate supply pressure for their use.

The *Applicant* agrees to save harmless the City of Burnaby from any legal actions or claims of any kind and description whatever brought against it for or on account of any damage or injury to persons or property because of water service or water meter installations.

2. DESIGN GUIDELINES

2.1 Meter Sizing

Meters for domestic water use shall be sized in accordance with *AWWA Manual of Water Supply Practices M22 Sizing Water Service Lines and Meters* taking into account specific requirements outlined in the meter sizing calculation sheet included in **Appendix A**. Note that this sizing methodology is based on the *AWWA* fixture value method, and not the fixture unit method employed by the BC Building Code.

The meter size selection should not compromise the operating range or the long term life of the meter and must ensure that pressures supplied to the property are appropriate for the intended use. In this same regard, the analysis should be sufficiently thorough to avoid unnecessarily over-sizing the meter. In some instances, this may result in a smaller meter than the existing water service size. *NOTE; newer meter technologies no longer derate max continuous flow to 50% but still incur headloss.*

For developments that are proposed to be phased, the meter assembly must be sized to accommodate the meter required for the ultimate build-out of the development. However, the initial meter installed must be sized to accurately capture the range of flows anticipated for the current phase of development.

Fire service meters shall be sized based on Fire Underwriters Survey requirements for on-site fire hydrants and NFPA standards for sprinkler systems.

2.2 Meter Selection

2.2.1. Industrial / Commercial / Institutional Services

Water meters that are approved by the *City* are listed in Section 3.1.1 of the Supplementary Specifications.

Unless otherwise approved by the *City*, a single meter for domestic water use is to be installed per property. No water can be sold or conveyed beyond the property served either below or above grade. If the *Owner* intends to subdivide the property in the future, the private water system should be designed such that the internal plumbing between the subdivisions can be isolated and supplied by separate water service connections.

2.2.2. Dedicated Fire Services

All dedicated fire services must be equipped with a FM approved / ULC listed double check detector valve assembly to detect unauthorized water use. The remote receptacle for the “tattle tale” meter must be mounted such that it is accessible for the meter reader and *City* staff. All double check detector valve assemblies shall be factory supplied and installed as a complete unit.

2.2.3. Combined Fire & Domestic Services

Where the *Applicant* proposes a combined fire and domestic service, a FM approved / ULC listed water meter and backflow prevention device assembly shall be installed. Fire service meters that are approved by the City are listed Section 3.1.1 of the Supplementary Specifications.

2.2.4. Private Fire Hydrants

A service to supply a fire hydrant located on private property must be equipped with a FM approved / ULC listed double check detector valve assembly in the case of a dedicated fire service, or a FM approved / ULC listed water meter and backflow prevention device assembly in the case of a combined fire / domestic service.

2.2.5 Mixed Use Developments

Comprehensive developments, including mixed use commercial and residential, shall have meter boxes, chambers or mechanical rooms sized to accommodate proposed and *future* residential metering. The *Applicant* shall prepare a ‘metering strategy’, for the City’s approval that identifies how ‘future’ metering requirements for all parcels will be accommodated, located and access provided for servicing.

2.3 Meter Locations

Locations for all (*proposed and future*) water meters are subject to approval of the City. Ideally, all meters, 150mm or larger, shall be located just inside the property line. Meters could be located inside a building mechanical room, or other areas, as approved by the City, in advance. Meter boxes or chambers shall be easily and completely accessable by City personel at all times.

2.3.1. Inside Meters

The distance from the floor level to pipe centre of the water meter setting shall not exceed 0.75 metres.

The meter shall be located close to the wall through which the water service enters with no more then 2 metres of pipe between the entry point and the meter.

A minimum working area of 1 metre x 1 metre horizontal immediately adjacent to the meter, as well as a 2 metre vertical clearance, shall remain free of obstruction to allow for convenient servicing or testing of the meter at all times.

The meter should be located within a reasonable distance of a floor drain. The floor drain should be adequately sized to accept the flows associated with meter testing and servicing.

No electronic, electrical, mechanical, or other water-sensitive equipment should be placed or installed under the meter assembly, or in an area where splash or flow from the meter assembly could occur during servicing or testing of the meter.

2.3.2. Outside Meters

Meter boxes or chambers shall be located 300mm inside the property line.

An area of at least 1 metre horizontal and 2 metres vertical around the meter box or chamber should be free of major landscaping or obstructions to provide adequate access for meter maintenance or testing. Grading of the area around the meter box or chamber should ensure positive drainage away from the box or chamber.

Meter boxes or chambers shall not be installed in any area where there is a possibility of vehicular traffic, either moving or parked, either at the time of installation or in the foreseeable future. Nevertheless, meter chambers shall be designed to accommodate vehicle traffic loading.

2.4 Meter Configuration

Meters shall be installed horizontally with register faces oriented (upwards) vertically.

Straight pipe lengths upstream and downstream of the meter (including the presence of bypass tees, isolation valves, reducers, and any other fittings) shall comply with manufacturer's recommendations for optimal meter accuracy.

Meters, strainers, valves, bypasses and associated piping or fittings shall be supported by appropriate pipe stands or anchors.

The meter assembly and piping shall be adequately restrained to prevent movement from hydraulic thrust, even when the meter has been removed for service.

A restraint coupling must be provided on the downstream side of the meter to provide flexibility if the meter needs to be removed.

2.4.1. Isolation Valves

Isolation valves must be provided upstream and downstream of the meter assembly to facilitate testing or removal of the water meter and strainer. Valves shall comply with the requirements stated in Section 3.7.

The use of butterfly valves on meter installations are prohibited.

For 50mm or smaller meters located outside, isolation valves must be within the same box or chamber as the meter.

2.4.2. Reducers

Any reduction in the size of the incoming or outgoing water service connection must occur between the isolation valves and within the box / chamber or mechanical room. If a reduction in water service size is proposed, the isolation valve spacing must be sufficient to accommodate a meter that is the same size as the service connection.

2.4.3. Bypasses

Bypasses are required for all meters 50 mm and larger.

For domestic services, the bypass shall be no less than half the size of the meter or service connection. For fire services, a full size bypass shall be provided.

All bypass valves must be equipped with a lock wing on both the operating nut and case. After testing the installation, the bypass valve shall be closed and sealed by the installer.

Pressure reducing valves (PRVs) must be located downstream of the meter assembly. PRVs are not to be installed on the bypass piping around the meter assembly.

For meters located inside, the bypass should be located above the meter, in clear sight for inspection. Bypasses offset horizontally from the meter shall be avoided.

For meters located outside, the bypass piping and valve must be within the same box or chamber as the meter.

2.4.4. Test Ports

Test ports must be provided for all meters 50 mm and larger. In the absence of a test port on the meter case, a test tee must be installed with a 50 mm threaded lateral and plug at a distance of three pipe diameters downstream of the meter.

2.4.5. Setters

All 50mm meters or smaller, located in exterior meter boxes, shall be installed on a setter. Re-setters shall only be installed when approved by the City.

All setters shall include a full port inlet ball valve and full port dual check valve outlet.

2.4.6. Strainers

Where required, strainers shall be installed immediately upstream of the meter using flanged connections. For meters not supplied inclusive of a strainer, the strainer shall be installed as per manufacturer's specifications.

Sufficient area must be provided to drain, inspect, and clean the strainer.

2.4.7. Remote Receptacles

Wall mounted remote receptacles must be located between 1.2 metres and 1.8 metres above ground level and easily accessible for reading. The three wires

from the meter to the receptacle must be installed in accordance with the manufacturer's instructions. The cable must run neatly in horizontal or vertical directions only, in an approved casing or duct. Any penetrations through the building wall to facilitate remote receptacle mounting shall be sealed with sealing compound. Where possible, remote receptacles should be located with an unobstructed view of the sky to facilitate radio communications. Lanes and areas adjacent to large high rises will have to have prior approval from the City.

For outside meters installed at property line, remote receptacles must be mounted to the meter box or chamber lid according to the manufacturer's instructions. Receptacles must be provided with at least 1.8 metres of 22 gauge, three-colour (red, green, black) wire connected and sealed at the receptacle without terminal exposure. Remote wiring connections must be either factory or field sealed to ensure that the connection is waterproof.

Compound meters with two registers must have a separate remote receptacle mounted to the box or chamber lid or wall for each register.

2.4.8. Chambers

The *Applicant* is responsible for selecting the appropriate box or chamber for a given application that satisfies the *City's* requirements, including specifications noted in Section 3.9.

Chamber lids / hatches shall be large enough to facilitate service or replacement of the complete meter assembly including the meter, strainer, and isolation valves.

The minimum distance between the inside chamber walls and outside edges of pipe shall be 300 mm to provide sufficient space for maintenance. At least 600 mm separation shall be provided between the water service line and bypass.

All below ground chambers for meters 50 mm and larger shall include a drain connected to the *City's* stormwater collection system. Where a gravity connection is not available, the *City* may accept an electric sump pump.

2.5 Applicant Submissions

An *Applicant's* submission to the *City* for a new water service / meter shall include sufficient detail to support the proposed water meter assembly including:

- Size of the water service connection;
- Meter size supported by water demand calculations as per Appendix A;
- Meter type, manufacturer, and model;
- Meter location relevant to property line and building footprint depicted on a site plan (1:500 scale);
- Meter chamber or mechanical room layout depicted on a detail drawing (1:250 scale);
- Discharge location for chamber drain;
- Land use(s);
- Presence of on-site fire hydrants or fire sprinklers;
- Presence of irrigation systems;
- Future development phases for the property; and
- Any other relevant information regarding the proposed meter installation.

Submissions not in substantial conformity to the *City* of Burnaby Water Meter Design Guidelines and Supplementary Specifications and the BC Plumbing Code will be rejected by the *City*. The *Applicant* shall not proceed with the water meter installation without the prior approval of the *City*.

2.6 Sample Water Meter Installation Drawings

Sample water meter installation drawings are provided in **Appendix B**. These drawings are provided as a guide to the *Applicant* and *Applicant's Engineer* and are intended to illustrate some of the common meter installation details. The *Applicant* and *Applicant's Engineer* are responsible for the complete water meter assembly design and acquiring approvals from the City, for a given application.

3. SUPPLEMENTARY SPECIFICATIONS

3.1 Water Meters

.1 The following meters are approved for use in the *City of Burnaby*:

Table 1 – Approved Water Meters

Manufacturer	Model	Type
Sensus	¾", 1", 1 ½" and 2" Sensus SR II	Magnetic-drive positive displacement meter, complete with radio, enabled for the City's FlexNet communication network.
Neptune	3", 4" and 6" Mach 10	Includes E-Coder, non integrated with Sensus SmartPoint module.
Neptune	Protectus III (Fire Service)	Stainless Steel (S), Fire Service Meter, with Sensus smart point module.

Alternate meters may be accepted, only upon prior approval of the City.
Note; Sensus Omni and iPerl meters are under review at this time.

.2 Water meters shall meet the following *AWWA* standards:

- Positive displacement meters must conform to *AWWA C700*.
- Turbine meters must conform to *AWWA C701*.
- Compound meters must conform to *AWWA C702*.
- Fire service meters must conform to *AWWA C703*.

.3 For all meters with base plates, the base plate shall be cast iron for outside installations and bronze for inside installations. Plastic base plates are not acceptable.

.4 All 38 mm and 50 mm diameter meters shall have oval two-bolt flanges. Slip in gaskets will not be accepted due to a long history of blowout.

.5 All meters must be new. Used or refurbished meters are not acceptable.

3.2 Registers

.1 Registers shall be absolute encoder-type remote-registration conforming to *AWWA C707*. Registers utilizing generator pulses, low voltage conversions, or with internal battery power are subject to approval. Power necessary for data transmission must be supplied by an interrogation device. Registers must be compatible with … ??

.2 The register must provide at least six-digit visual registration at the meter with the capability to simultaneously encode (in digital format) at least six-digits of the meter reading for transmission through the remotely located receptacle. Each reading encoded electronically must include the meter identification number and record the read to the nearest cubic metre (m^3).

.3 Registers must have visual display capabilities for leak detection by means of a full test sweep hand / dial or an electronic flow indicating display.

.4 All registers must be programmed with a multiplier of 1.0 and shall record measurement units in cubic metres (m^3). The unit of measurement, month and year of manufacture, and other identification information must be clearly printed on the face of the register. When multipliers are unavoidable, the information must be clearly marked on both the meter and the remote reading interface for testing and data verification with tax.

.5 All registers must be factory sealed to prevent tampering and to provide protection for internal components suitable for operation in humid or submerged conditions. Registers must be removable from the meter without disassembling the meter body, and must permit field installation or removal without taking the meter out of service.

.6 All registers must have data logging capabilities and able to store a minimum of 35 days of hourly data. Battery life must be guaranteed for a minimum of 10 years.

.7 Registers must be new. Used or refurbished registers are un-acceptable.

3.3 Remote Receptacles

.1 Remote receptacles shall be capable of interfacing with the City's radio transmitter system (*Sensus FlexNet*) in the absence of a physical hard wired connection.

.2 Remote receptacles must be either wall mount or pit mount style. Remote receptacles must not include a remote display or data storage.

.3 The materials employed must be resistant to corrosion, ultraviolet degradation, rain, condensation, and suitable for rugged service for the duration of their expected life.

.4 The unit must provide for mechanical and electrical connection between the receptacle and interrogation equipment. Interrogation must be achieved by inductive coupling without physical connection of the reading device.

.5 Colour coded (red, green, black), 22 gauge, three-wire terminals must be provided. Excess wire must be looped and fastened to the building wall or chamber lid.

.6 All wiring shall conform to a Class 2 circuit and be in accordance with the City of Burnaby Electrical Bylaw No. 6494.

.7 For wall mounted receptacles, the receptacle shall be sealed with the terminal screws concealed by the receptacle.

3.4 Pipe and Fittings

.1 All water service connections 75 mm diameter or larger must be restrained to the *City* watermain.

.2 All pipe material shall be ductile iron, Schedule 80 PVC, C900 PVC, polyethylene, or Type K copper. All products must be approved for potable water application.

3.5 Flange Adapters

.1 Flange adapters for sizes 38 mm to 200 mm diameter shall conform to *AWWA C219*.

3.6 Bolts and Nuts

.1 Bolts and nuts shall be stainless steel. Bolts shall conform to *ASTM F599* or *ASTM F731*. Heavy hex nuts shall conform to *ASTM F574* or *ASTM F836*. Threads, fit, and dimension must conform to *AWWA C111*.

3.7 Valves

.1 For interior meters 50 mm or smaller, isolation valves shall be Class 145 lb bronze gate valves complete with hand wheels with wedge disc and female I.P. threads. Quick closing valves are not acceptable.

.2 For exterior meters 50 mm or smaller, isolation valves shall be brass or bronze curb stops. Quarter turn plug valves are acceptable.

.3 For interior meters 75 mm or larger, isolation valves shall be ductile iron, resilient seat, non-rising stem gate valves, with hand wheel activation, and must meet *AWWA* C509. Quick closing valves are not acceptable.

.4 All bypass valves must be equipped with a lock wing on both the operating nut and case.

.5 All valves on fire service lines must comply with NFPA, FM, and ULC requirements.

3.8 Strainers

.1 Strainers must be straight type and of the same size as the meter.

.2 Strainer mesh material shall be corrosion resistant (such as stainless steel).

3.9 Meter Chambers

.1 Below-grade meter boxes and chambers shall be pre-cast concrete, or other approved material.

.2 Lids must be capable of withstanding H-20 dynamic loading in travelled surfaces, where necessary, and H-20 static loading in all other areas. Lids must have two pre-drilled 45 mm diameter holes to facilitate mounting of a remote receptacle. These holes must remain plugged until the receptacle is installed.

.3 Lids shall be cast iron or steel checker plate for meter boxes and aluminum or galvanized steel, spring assisted lockable hatches for meter chambers. Manhole type lids are not acceptable.

.4 Meter plates, frames, valve lids and boxes are a *City* standard. Consult with the Waterworks Operations Office for further details.

.5 Access lids, latches, and ladders must comply with the most current WorkSafeBC requirements.

.6 All chambers must be damp-proofed by applying grout and an asphalt emulsion coating to all exterior surfaces. Construction joints must be made water-tight with an appropriate water-stop sealant. All pipe penetrations through the chamber must be sealed using grommets.

APPENDIX A

Water Meter Sizing Calculation Sheet

APPENDIX B

Sample Meter Installation Drawings

City of Burnaby