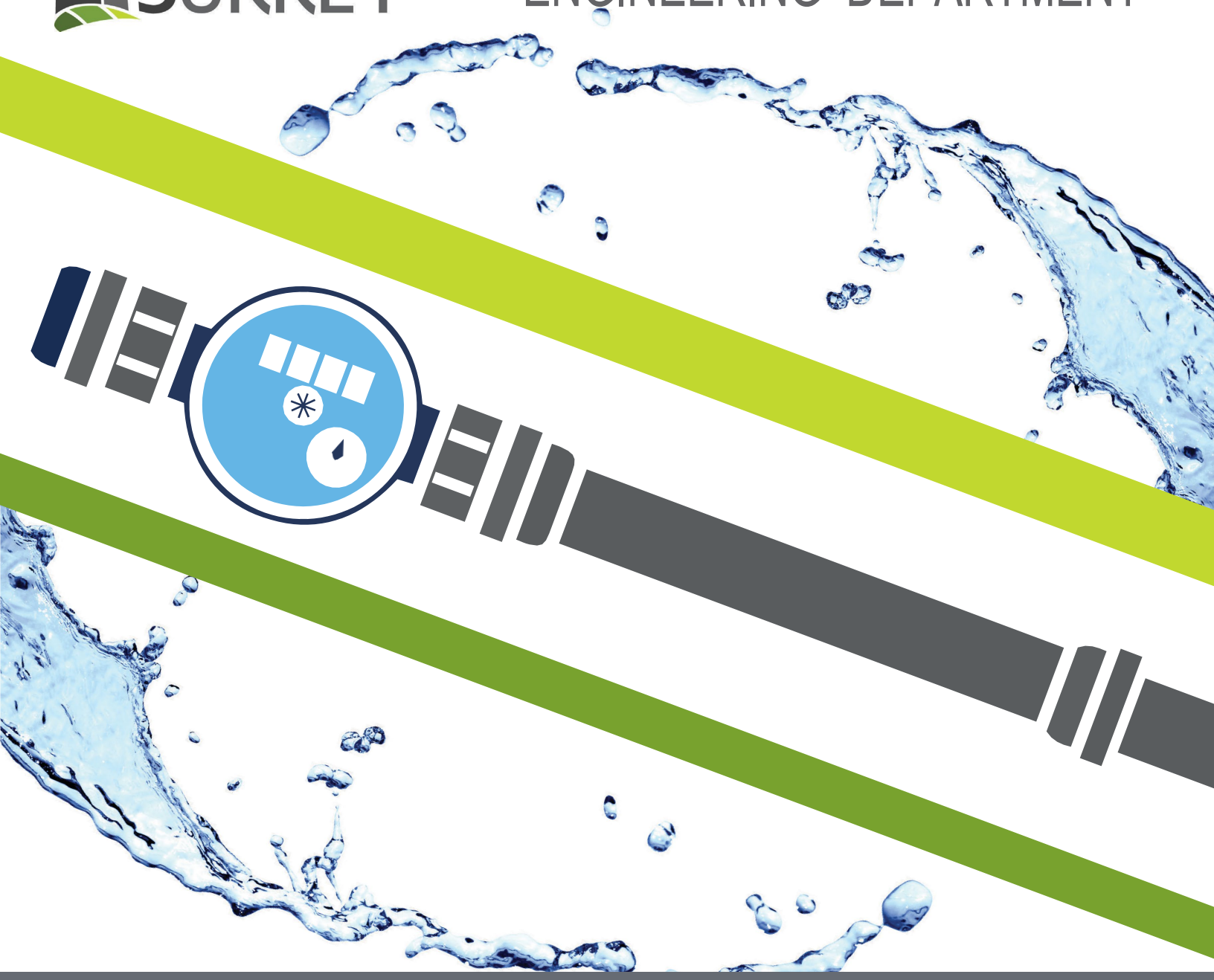
CITY OF SURREY

ENGINEERING DEPARTMENT



WATER METER and SERVICE CONNECTION

Design Criteria Manual & Supplementary Specifications

May 2020

SCHEDULE OF REVISIONS

Description	Page
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Responsibilities – Clarification is provided that the *City* supplies and installs meters up to 25 mm diameter.	i
Timing – The *Applicant's* responsibility to keep the meter area clear and protect the meter installation from damage throughout the duration of the project is reinforced.	ii
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Meter Configuration – Additional commentary is provided regarding placement of ancillary water infrastructure components upstream or downstream of the meter.	3
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Description	Page
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PREAMBLE

Introduction

This document outlines the *City*'s requirements for the installation of cold-water meters and service connections. It is divided into two separate parts, the Design Criteria and the Supplementary Specifications.

Intent

The Design Criteria are intended to provide direction to the *Applicant* and *Consultant* on the elements required to be considered in the design of new service connection and water meter installations. It is intended to be used in conjunction with the City of Surrey Design Criteria Manual.

The Supplementary Specifications are intended to provide direction to the *Applicant* and *Consultant* on the specifications that must be incorporated into building servicing contracts for the installation of new water meters. The Supplementary Specifications are to be used in conjunction with the City of Surrey Supplementary Specifications document and the *City* approved edition of the Master Municipal Construction Document.

Glossary of Terms

"*Applicant*"	Refers to a property *Owner*, *Developer*, or authorized agent who makes an application for connection to a water service.
"*Consultant*"	As defined in the latest *City* Design Criteria Manual.
"*ASTM*"	Refers to the American Society for Testing and Materials.
"*AWWA*"	Refers to the American Water Works Association.
"*City*"	Means the City of Surrey.
"*CSA*"	Means the Canadian Standards Association.
"*Developer*"	Means person(s) or organization(s) developing property as per *City* guidelines.
"*General Manager Engineering"*	Means the General Manager or their appointed designate of the Engineering Department of the *City.*
"NFPA"	Refers to the National Fire Protection Association.
"*Owner*"	Means the property *Owner* as defined by the latest Surrey Waterworks Regulation and Charges By-law.

Responsibilities

The Surrey Waterworks Regulation and Charges Bylaw, 2007, No. 16337 (as amended) outlines metering requirements for specific scenarios.

For all new and replacement service connections, the *Developer* shall supply and install all piping, valves, and fittings required at the *Developer's* cost.

For all new connections, the *Applicant* must supply and install all piping, fittings, meter box(es) / chamber(s) / vault(s), and equipment.

The *City* supplies and installs 19 mm and 25 mm meters for single-family and duplex residential construction at the *Applicant's* cost. All other meters, including permanent, temporary, and construction service meters, are supplied and installed by the *Applicant.*

Backflow prevention devices, although not covered within this document, are to be installed in accordance with Surrey Waterworks Cross Connection Control Bylaw, 2013, No. 17988 (as amended).

Timing

The installation of any new or replacement service connections is triggered by the *Applicant* request as either part of a Land Development or Building Permit process. As part of the process, except for a single-family and duplex residential development types, the *Applicant* shall submit a calculation to estimate the service connection size, and the *City* shall confirm the appropriate service connection size and location.

For new connections, the installation of a water meter is triggered by an application for a Building Permit or Plumbing Permit. Following the issuance of the Building Permit, the *Applicant* and *City* shall confirm the meter size and location within the property and relative to any structures.

For new single-family residential dwellings, water meter boxes, setters, and lids are to be installed by the *Applicant* and approved by the *City* Plumbing Inspector prior to *City* installation of the water meter.

The meter area must be kept free and accessible at all times in order to facilitate the installation of the meter. The *Applicant* is responsible for protection of the meter installation from damage throughout the duration of the project (until the *City* Plumbing Inspector has approved the installation) and must repair any damage that occurs to the box, setter, meter, or lid. The *Applicant* shall ensure that the meter box and lid are adjusted to final grade and remain unobstructed to facilitate maintenance, reading, and testing.

For proposed installations of 50 mm or larger meters (where a drawing submission is required as per Design Criteria Manual Section F) installation of the water service, chamber, or meter within private property shall not begin prior to *City* approval of the meter design drawings.

DESIGN CRITERIA MANUAL

A. Meter Sizing Methodology

For all single-family residential homes without fire sprinklers, the water meter size shall be 19 mm, except in the case where the *Consultant* can demonstrate the need for a larger water meter. All other meters should be sized in accordance with *AWWA M22 Sizing Water Service Lines and Meters* and the *City of Surrey Water Meter Sizing Calculation Sheet* contained in Appendix A. It should be noted that this methodology is based on the *AWWA* fixture value method and not the fixture unit method employed in the BC Building Code for piping within buildings.

For developments that are proposed to be phased, the meter chamber and piping must be sized for 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 for the first phase.

The *Applicant* or *Consultant* must ensure that the meter selection and installation requirements are appropriate for the designed application without unnecessarily oversizing the meter or restricting water pressure.

B. Service Connection Sizing Methodology

Only one service connection is allowed for each legal lot, unless under specific circumstances where prior approval from the *City* must be obtained.

For lots with onsite fire sprinkler or fire hydrant requirements, domestic and fire service lines are to be separated, either at the property line or at the main, as determined by the *City*. A domestic water meter is to be installed at the domestic line and a detector meter backflow preventer is to be installed at the fire line, as outlined in the Surrey Waterworks Cross Connection Control Bylaw, 2013, No. 17988 (as amended). The exception to this is for single-family residential homes that employ fire sprinklers. In this case, a combined domestic and fire service line is acceptable.

For all single-family residential homes (regardless of the lot's zoning) without fire sprinklers, the service connection size shall be 19 mm or 25 mm, except in the case where the *Consultant* can demonstrate the need for a larger service connection. For all duplex, triplex, and four-plex homes, a separate 19 mm service connection is allowed for each unit.

The domestic service connection for other types of development, i.e., multi-family, industrial, commercial, and institutional lots, is to be sized in accordance with the *City of Surrey Water Service Connection Sizing Calculation Sheet* contained in Appendix B of this document. This calculation sheet is modified based on *AWWA M22 Sizing Water Service Lines and Meters*. This calculation method does not include any fire service connection, if required by the development.

It should be noted that this methodology is based on the AWWA fixture value method and not the fixture unit method employed in the BC Building Code for piping within buildings.

For developments that are proposed to be phased, the service connection must be sized for the ultimate build-out of the development.

C. Meter Selection

Meters approved for use in the *City* are listed in Section 1.1 of the Supplementary Specifications.

Only one domestic meter is to be supplied per property unless otherwise approved by the *City*. The only exception is duplex, triplex, or four-plex units where separate domestic meters are to be provided for each unit.

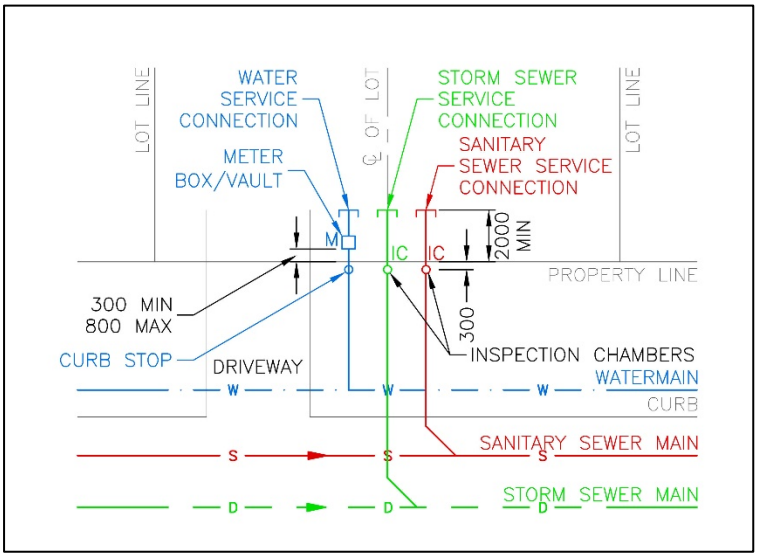
When a combined domestic/fire service connection is installed for a single-family home with sprinklers, the meter must be approved for fire protection applications as indicated in Section 1.1 of the Supplementary Specifications.

D. Meter Location

All meters 50 mm and smaller must be located at the property line in a chamber unless otherwise approved by the *City.*

For developments with no or limited setback from property line, such as City Centre, the meter shall be installed inside within 1.0 metre of the exterior wall and within 0.5 metres of the ceiling. Pipe supports, hangers, straps, or similar shall be provided to appropriately support the meter. The meter location must be accessible for *City* staff with the register face oriented such that it is clearly visible.

For property line installations, the meter box or vault must be located on private property, within 300 mm to 800 mm from the property line as indicated on Supplementary Detail Drawing SSD-WM1 and depicted in the illustration below.



Water meters shall not be installed within any utility right-of-way unless such right-of-way is designated for a water meter installation. Grading of the area around the chamber must ensure positive drainage away from the chamber.

An area of at least 1.0 metre horizontal and 2.0 metre vertical around the meter box or vault shall be free of major landscaping or objects, including shrubs, fences, gate tracks, retaining walls, etc., to facilitate future maintenance of the meter assembly.

Where the meter is approved to be installed within a building, the installation should be within 1.0 metre of the exterior wall. The meter should also be within a reasonable distance of a floor drain, which must be suitably sized to accept the flows associated with meter testing. The meter should be installed a minimum of 600 mm above the floor slab. A space of at least 1.0 metre horizontal and 1.0 metre vertical from the meter assembly shall be free of obstruction to allow for convenient servicing and testing of the meter at all times. No electrical, mechanical, or 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 of the meter.

E. Meter Configuration

The general configuration for single-family residential meter installations is illustrated on Supplementary Detail Drawing SSD-WM1. For all meters 50 mm and larger, configuration details shall be determined by the *Consultant* and outlined in the submittal drawings.

For all meters 50 mm and larger, adequate straight length pipe shall be provided upstream and downstream of the meter in order to comply with manufacturer recommendations for maximum accuracy. Bypass tees, isolation gate valves, and concentric reducers may be located within the straight pipe length distance in accordance with manufacturer recommendations. Non-concentric reducers, check valves/backflow preventers, pressure reducing/sustaining or altitude valves, throttling devices or similar shall not be located within four pipe diameters of the meter. A restrained coupling must be provided on the downstream side of the meter to facilitate meter removal for replacement/maintenance.

i. Isolation Valves

Isolation valves are required to be installed upstream and downstream of the meter assembly. Isolation valves shall be the same size as the incoming and outgoing service connection.

Isolation valves may be located in the same chamber as the meter, or outside of the chamber with MR6 valve boxes. In all cases, isolation valves must be accessible to *City* staff and free of obstructions to facilitate operation.

ii. Reducers

Reduction in the size of the incoming or outgoing water service connection must occur between the isolation valves.

Reduction must be achieved using concentric reducers. Use of threaded blind flanges to transition to smaller pipe size is not acceptable.

iii. Bypasses

A bypass is required to be installed on all 50 mm and larger meters.

The bypass size shall be as per the table below:

Table A – Bypass Size

Water Service Connection Size (mm)	Bypass Size (mm)
50 [1]	25
100	50
150	50

[1] Bypass may be part of setter.

The bypass valve must be accessible to *City* staff and free of obstructions to facilitate operation.

After completing the meter installation, the bypass valve must be closed and sealed.

Bypasses must not be located directly above the meter in a chamber setting; however, rotating the bypass 45 degrees is permitted if space governs.

iv. Setters

Setters are only permitted for water meters 50 mm diameter or smaller and must be the same size as the water service connection.

v. Test Ports

Test ports must be provided for all meter assemblies 50 mm diameter or larger. In the absence of a test port on the meter case, a test tee must be installed at a distance of three pipe diameters downstream of the meter.

vi. Remote Receptacles

For exterior meter installations, remote receptacles must be mounted to the chamber lid.

The chamber lid must have a recessed circular opening such that the top of the remote receptacle is flush with the lid.

At least 1.8 metres of 22 gauge, three-colour (red, green, black) wire shall be provided between the remote receptacle and meter. Remote wiring connections shall be factory or field sealed to ensure that the connection is waterproof.

For inside meter installations, where approved by the *City*, wall mounted remote receptacles should be located approximately 1.6 metres above grade and easily accessible for reading. Where possible, remote receptacles should be located adjacent to gas or electric meters. For all inside meters, the remote receptacle shall be equipped with a radio transmitter end-point.

vii. Chambers

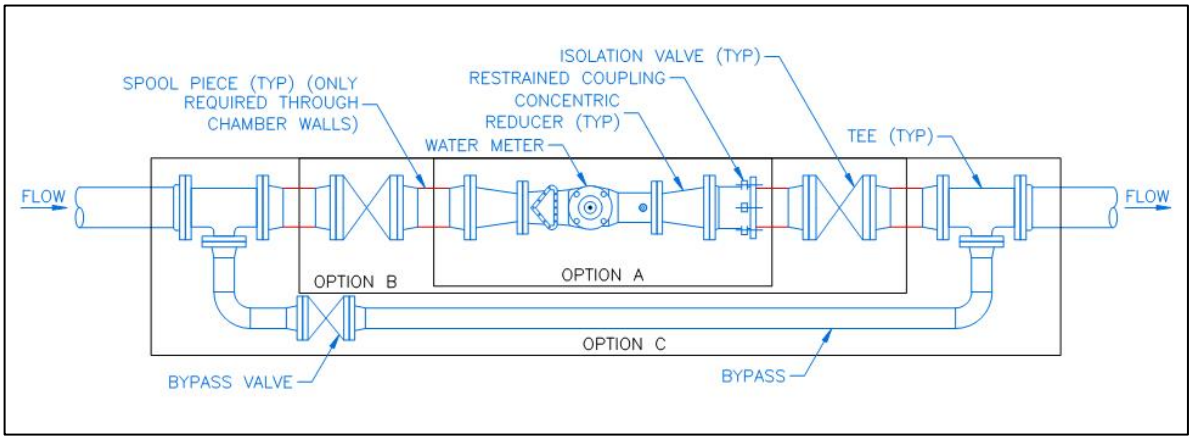
Meter chambers must be selected to provide adequate space for removal and testing of all equipment within the meter assembly, including backflow prevention devices where applicable.

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

Thrust beams must be designed for all chambers housing equipment 75 mm or larger to ensure that the thrust force is transferred to the full width of the chamber. The *Consultant* shall ensure that the chamber manufacturer is in agreement with the thrust bearing area on the chamber.

All chambers for meters 75 mm and larger must be equipped with a sump and drained by either a gravity connection to the storm sewer, or where this is not possible by a sump pump. The *Owner* is responsible for providing power to the sump pump in accordance with the BC Electrical Code.

The illustration below depicts meter configuration options (Option A, B, and C in the figure) that the *Applicant* or *Consultant* may consider.



F. Submissions

For all meters 50 mm and larger, the Plumbing Permit Application submitted by the *Applicant* shall be accompanied by:

- A site plan at 1:500 scale and chamber layout at 1:250 scale;
- Location of meter chamber relative to overall site development plan (dimensioned from property corner);
- Future phasing of the project;
- Meter size, type, and manufacturer;
- Demand flow calculations in accordance with Appendix A;
- Chamber drain type and discharge location;

- Site specifics (i.e., building use);
- On-site fire system (hydrants, fire sprinklers);
- Irrigation systems; and
- Any other relevant information pertaining to the proposed meter installation.

For all meter assemblies 50 mm and larger, the *Consultant* must provide sealed design drawings and shop drawings of the complete meter installation and relevant calculations, to demonstrate the appropriateness of the sizing of the meter, for *City* approval prior to installing the meter. A meter chamber design drawing template is provided in Appendix D (SSD-WM2).

SUPPLEMENTARY SPECIFICATIONS

1.0 PRODUCTS

1.1 Water Meters

.1 Unless a variation is justified, the *City* will only accept approved makes and models of water meters. The following meters are approved by the *City*:

Table 1 – Approved Meters

Manufacturer	Model	Sizes
Sensus	iPERL	25 mm and smaller
	iPERL Fire Service [1]	25 mm only
	OMNI C [2]	50 mm and larger
Badger	Recordall PD	50 mm and smaller
	E-Series	19 mm and larger
	E-Series Fire Service [1]	25 mm to 50 mm
Neptune	T-10	50 mm and smaller
	MACH 10 [1]	50 mm and smaller

[1] Approved for use on water service connections supplying residential homes with fire sprinklers.
[2] Alternate meters may be accepted, but must be approved by the *General Manager, Engineering*.

.2 All meters must be new. Used or reconditioned meters are not acceptable.

1.2 Registers

.1 Meters must have encoder-type remote-registration conforming to the latest version of *AWWA C707*.

.2 The register must be factory programmed to record water use to 0.001 of a cubic metre (1 litre).

.3 All registers must be provided with factory podded moisture protection for internal components suitable for operation in flooded or humid pit/chamber conditions.

.4 All registers must be new. Used or reconditioned registers are not acceptable.

1.3 Remote Receptacles

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

.2 The remote receptacle shall be mounted such that it is easily accessible by the meter reader or *City* staff. Excess wire must be looped and mounted on the wall adjacent to the meter.

1.4 Pipe and Fittings

.1 Connections 75 mm in diameter and greater must be restrained to the *City* water main.

.2 All pipe material within chambers shall be ductile iron, Schedule 80 PVC, C900 PVC, polyethylene, or Type K copper. All products must be approved for potable water application. All joints within the chamber must be restrained (i.e., flanged, glued, welded, threaded).

1.5 Valves

.1 Valves up to 50 mm in diameter must meet *AWWA C800*, and must have bronze case with National Pipe Threaded, soldered, compression type or flange connections. Valves must be full port ball valves using rubber o-ring seals. Actuation is to be by a curb-stop style operating nut.

Valves over 50 mm in diameter on domestic services must be ductile iron, resilient seat, with non-rising stem, gate valves with flanged ends, and must meet *AWWA C509*. Stem seal to be o-ring type. Actuation is to be by a standard 50 mm square-operating nut.

.2 All valves on fire service lines must comply with NFPA and Fire Code requirements.

1.6 Reducers

.1 Only concentric reducers shall be used within the limits of the meter installation.

1.7 Setters

.1 For 19 mm and 25 mm services, setters shall be equipped with a full port inlet ball valve and dual check valve on the outlet.

For 38 mm and 50 mm services, the setter shall be equipped with a full port inlet ball valve and full port outlet ball valve to facilitate in-situ testing of the meter.

.2 All setters must meet NSF 61 Annex F/G requirements.

1.8 Flange Adapters

.1 Flange adapters for 50 mm to 200 mm sizes must conform to *AWWA C219*.

1.9 Bolts and Nuts

.1 Bolts and nuts must be stainless steel. Bolts shall conform to *ASTM F-599* or *F-731*. Heavy hex nuts shall conform to *ASTM F-574* or *F-836*. Threads, fit, and dimension must conform to *AWWA C111*.

1.10 Chambers

.1 Boxes/pits for meters up to 50 mm shall be pre-cast concrete or light-weight composite (irrigation pits are not acceptable).

Chambers/vaults for meters 75 mm and larger shall be pre-cast concrete.

.2 Lids (and boxes / chambers) must be capable of withstanding H-20 static loading, except where lids are located in travelling surfaces, including driveways, where H-20 dynamic loading applies.

.3 Lids for meter boxes up to and including 560 mm x 860 mm (internal dimensions) shall be cast iron. Concrete lids are not acceptable.

Lids for meter chambers larger than 560 mm x 860 mm (internal dimensions) must be aluminum spring assisted, trough type, and divided into multiple sections where the dimensions exceed 900 mm in any direction.

Manhole access is not acceptable unless approved by the *City*.

.4 Lids must have one 45 mm circular hole for mounting the remote receptacle, which must be sealed until the installation of the remote receptacle. The hole shall be recessed such that the remote receptable is flush with the lid.

.5 Exterior surfaces of all chambers must be damp proofed by applying an asphalt emulsion coating to all exterior surfaces. Construction joints must be made water tight with an appropriate sealant. All pipe penetrations through chamber walls must be sealed and waterproof.

2.0 EXECUTION

2.1 Meter Installation

.1 **Meters must be installed with the register casing oriented such that it is easily visible to *City* staff.**

For single-family residential dwellings, the meter must be centred in the box.

.2 Meters, valves, and bypasses should be supported with appropriate steel pipe stands. Meter installations must be checked for leakage at completion of the installation. The assembly should be flushed and air must be eliminated from the system. By running water through the meter and performing a visual check of the low-flow indicator, the proper operation of the meter should be established.

.3 Insulation blankets must be installed for all single-family meter installations.

2.2 Receptacle Installation

.1 For meters installed at property line, remote receptacles must be mounted to the meter box or chamber lid according to the manufacturer instructions.

The remote receptacle should be installed within the recessed opening of the box / chamber lid, such that it is flush with the lid.

A minimum length of 1.8 metres of 22-gauge three-colour (red, green, black) wire shall be provided, connected and sealed at the receptacle without terminal exposure. Remote wiring connections must either be factory or field sealed to ensure waterproof connections.

.2 Wall mounted remote receptacles must be located where possible near the gas or electric meter approximately 1.6 metres above grade (ground) and easily accessible for reading. The communication cable (wire) from the meter to the receptacle must be installed in accordance with the manufacturer instructions and must not exceed recommended length. The cable must be run neatly in horizontal or vertical directions only, in an approved casing or duct. Buried casing/duct should be at least 600 mm deep. Wall penetrations associated with remote receptacle wiring shall be sealed to prevent moisture intrusion.

3.0 SUPPLEMENTARY DETAIL DRAWINGS

3.1 Supplementary Detail Drawings

.1 The following Supplementary Detail Drawings are provided in Appendix D:

- SSD-WM1 – Installation Detail for Meters 25 mm Diameter and Smaller
- SSD-WM2 – Meter Design Drawing Template

Appendix A – Water Meter Sizing Calculation Sheet

CITY OF SURREY

Water Meter Sizing Calculation Sheet

For Non-Fire Service Meters

Methodology: AWWA M22

General Information

Customer Name: _____ PID Number: _____

Address: _____ Project Number: _____

_____ Building Permit Number: _____

Type of Occupancy: Multi-Family ☐ Institutional ☐ Industrial ☐ Number of Units: _____

Commercial ☐ Other ☐ _____

Is this a phased development? Yes ☐ No ☐

Calculations presented below are for: Buildout ☐ Phase ☐ Phase Number: _____

Separate calculations must be provided for both current phase and buildout.

Step 1: Calculate Total Fixture Value

Fixture	Fixture Value (GPM @ 60 psi)		No. of Fixtures		Fixture Value (GPM @ 60 psi)
Bathroom Group					
Includes bathtub, shower, toilet, and lavatory sink.	12				
Bathtub	8	x		=	
Bedpan Washers	10	x		=	
Bidet	2	x		=	
Dental Unit	2	x		=	
Dishwasher	1.6	x		=	
Drinking Fountain - Public	2	x		=	
Hose Bibs (c/w 50 ft Wash Down): (one hose bib per unit for Townhouse or one hose bib per lot for other land use types)	5	x		=	
Kitchen Sink	1.8	x		=	
Lavatory	1.5	x		=	
Showerhead (Shower only)	2.5	x		=	
Service Sink	4	x		=	
Toilet:					
- Flush Valve (non-residential only)	24	x		=	
- Tank Type	4	x		=	
Urinal:					
- Pedestal Flush Valve (non-residential only)	10	x		=	
- Wall Flush Valve	10	x		=	
Wash Sink (Each Set of Faucets)	4	x		=	
Washing Machine	4	x		=	
Other:					
_____		x		=	
_____		x		=	
_____		x		=	

Total Fixture Value = _____ GPM (A)

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PID Number: _____

Step 2: Calculate Probable Peak Demand

Refer to Figure 4-2 or 4-3

Probable Peak Demand = _____ GPM (B)

Step 3: Apply Pressure Adjustment Factor

Water System Pressure (Hydraulic Grade Line - Elevation) - max. 80psi = _____ psi

Pressure Factor from Table 4-1 = _____ (C)

Adjusted Peak Demand (B x C) = _____ GPM (D)

Step 4: Identify Irrigation Demand

Total Irrigation Demand = _____ GPM (E)

Larger irrigation areas should be divided into zones, with a maximum irrigation demand of 50 GPM. If the irrigation demand is greater than 50 GPM, the *Consultant* shall provide a detailed irrigation plan with appropriately designed zones.

Step 5: Confirm Design Demand

Design Demand (Greater of D & E) = _____ GPM (F)

Step 6: Size and Select Water Meter

Design Demand *		Meter Size	
(L/s)	(GPM)	(mm)	(inches)
0 - 1.89	0 - 30	19	3/4
1.89 - 3.15	30 - 50	25	1
3.15 - 9.46	50 - 150	50	2
9.46 - 28.39	150 - 450	75	3

** Based on approximately 90% of operating range of City approved meters.*

Water Meter Make / Model: = _____

Water Meter Size = _____ mm

Meter Location (Outside / Inside) = _____

Professional Certification

Seal

Name: _____

Company: _____

Date: _____

Revision: _____

Comments: _____

Appendix B – Service Connection Sizing Calculation Sheet

CITY OF SURREY

Service Connection Sizing Calculation Sheet

For Domestic Service Connections

Methodology: AWWA M22

General Information

Customer Name: _____ PID Number: _____

Address: _____ Project Number: _____

_____ Building Permit Number: _____

Type of Occupancy: Multi-Family ☐ Institutional ☐ Industrial ☐ Number of Units: _____

Commercial ☐ Other ☐ _____

Step 1: Calculate Design Demand

From Step 5 of Water Meter Sizing Calculation (Appendix A)

Design Demand = _____ GPM

_____ L/s

Step 2: Calculate Headloss and Velocity

		Scenario 1		Scenario 2		
Service Connection Size	=		mm		mm	
Headloss - Water Meter	=		m		m	(A)
Headloss - Backflow Preventer	=		m		m	(B)
Service Connection Length	=		m		m	
C Factor	=					
Headloss - Service Connection	=		m		m	(C)
Total Headloss (A + B + C)	=		m		m	
Velocity	=		m/s		m/s	

Step 3: Size Service Connection

Based on acceptable headloss and velocity.

Service Connection Size = _____ mm

Professional Certification

Seal

Name: _____

Company: _____

Date: _____

Revision: _____

Comments: _____

Appendix C –Water Meter and Service Connection Sizing Calculation Example

CITY OF SURREY

Water Meter Sizing Calculation Sheet
For Non-Fire Service Meters
Methodology: AWWA M22

Example

General Information

Customer Name:	Example			PID Number:	Example		
Address:	Example			Project Number:	Example		
	Example			Building Permit Number:	Example		
Type of Occupancy:	Multi-Family	X	Institutional		Industrial		Number of Units: 31
	Commercial		Other				
Is this a phased development?			Yes		No	X	
Calculations presented below are for:			Buildout	X	Phase		Phase Number:

Separate calculations must be provided for both current phase and buildout.

Step 1: Calculate Total Fixture Value

Fixture	Fixture Value (GPM @ 60 psi)		No. of Fixtures		Fixture Value (GPM @ 60 psi)
Bathroom Group					
Includes bathtub, shower, toilet, and lavatory sink.	12		62		744
Bathtub	8	x		=	
Bedpan Washers	10	x		=	
Bidet	2	x		=	
Dental Unit	2	x		=	
Dishwasher	1.6	x	31	=	49.6
Drinking Fountain - Public	2	x		=	
Hose Bibs (c/w 50 ft Wash Down): (one hose bib per unit for Townhouse or one hose bib per lot for other land use types)	5	x	31	=	155
Kitchen Sink	1.8	x	31	=	55.8
Lavatory	1.5	x	31	=	46.5
Showerhead (Shower only)	2.5	x		=	
Service Sink	4	x		=	
Toilet:					
- Flush Valve (non-residential only)	24	x		=	
- Tank Type	4	x	31	=	124
Urinal:					
- Pedestal Flush Valve (non-residential only)	10	x		=	
- Wall Flush Valve	10	x		=	
Wash Sink (Each Set of Faucets)	4	x		=	
Washing Machine	4	x	31	=	124
Other:					
		x		=	
		x		=	
		x		=	
			Total Fixture Value	=	1,299 **GPM (A)**

The following methodology is based on the AWWA M22 Sizing Water Service Lines and Meters. *Consultants* are expected to purchase and use this publication when completing this methodology. A 31 unit townhouse development has been chosen as an example to demonstrate the use of this sizing method.

Customer and development information is to be provided in this initial section.

Note: For phased developments, separate calculation sheets must be prepared for each phase and also for build-out. Meters are to be sized for the respective phase, but the chamber / building space must be sized for the ultimate meter.

The AWWA M22 sizing methodology is based on the Fixture Values (which are actual peak flows that the device produces) and not Fixture Units which are used in the BC Building Code for building piping design.

In this example, the following fixtures are identified for each of the 31 units in the development:

- 2 bathtubs
- 2 standalone showers
- 3 toilets (tank type)
- 3 bathroom sinks (lavatory)
- 1 kitchen sink
- 1 dishwasher
- 1 washing machine
- 1 hose bib (1/2 inch)

The above fixtures yield a Total Fixture Value of 1,299 GPM for the development.

Note: If a fixture is proposed that is not on the list then the peak flow value (fixture value) can be included on one of the blank lines under "Other" based on the manufacturer's information.

Water Meter Sizing Calculation Sheet
For Non-Fire Service Meters
Methodology: AWWA M22

Example

Refer to Figure 4-2 or 4-3

Probable Peak Demand = 60 **GPM (B)**

The Total Fixture Value calculated in Step 1 is 1,299 GPM. In other words, this is the peak flow that would be realized if all fixtures were turned on at the same time. Step 2 correlates the total peak flow to a probable peak flow based on the probability of multiple fixtures being on at the same time. The AWWA M22 Manual includes two graphs (Figures 4-2 and 4-3) which outline the probable flow demand for various development types.

For this example, Figure 4-3 applies since the Total Fixture Value falls into the high range. The "Apartments" curve indicates that a Total Fixture Value of 1,299 GPM corresponds to a Probable Peak Demand of 60 GPM.

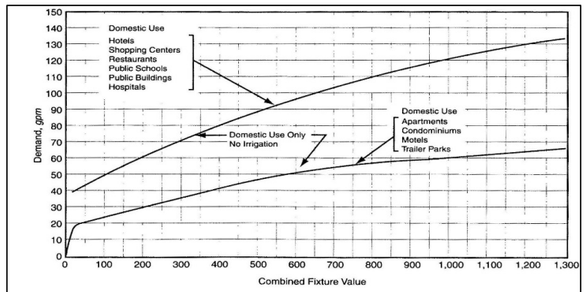


Figure 4-2 Water flow demand per fixture value—low range

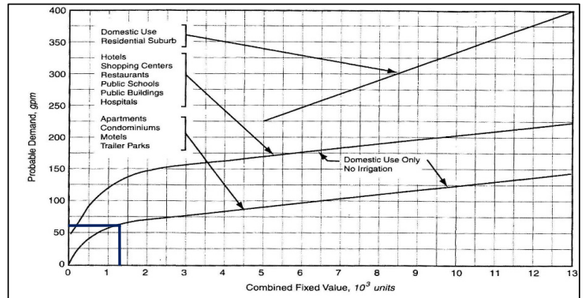


Figure 4-3 Water flow demand per fixture value—high range

Step 3: Apply Pressure Adjustment Factor

Water System Pressure (Hydraulic Grade Line - Elevation) - max. 80psi = 55 psi

Pressure Factor from Table 4-1 = 0.95 (C)

Adjusted Peak Demand (B x C) = 57 **GPM (D)**

The fixture values listed in Step 1 represent peak flows at a pressure of 60 psi.

This step increases or decreases the peak demand based on the pressure at the property line. Table 4-1 in the AWWA M22 Manual provides adjustment factors for various pressures.

For this example, the pressure downstream of the meter is identified as 55 psi. Interpolating from Table 4-1, the pressure adjustment factor is 0.95 and the Adjusted Peak Demand is 57 GPM.

Table 4-1 Pressure adjustment factors*

Working Pressure at Meter Discharge (*psi*)	Average Flow from 50 ft of 5/8-in. Hose and Sprinkler (*gpm*)	Pressure Adjustment Factor
35	6.7	0.74
40	7.2	0.80
50	8.1	0.90
55 → 60	9.0	1.00 ← 0.95
70	9.8	1.09
80	10.5	1.17
90	11.2	1.25
100	12.1	1.34

*derived from Table 4-1 and 4-2 of Manual M22 (1975).

NOTE: To convert psi to kPa: psi × 6.89476; to convert gpm to m^3/hr: gpm × 0.227.

CITY OF SURREY

Water Meter Sizing Calculation Sheet
For Non-Fire Service Meters
Methodology: AWWA M22

Example

Step 4: Identify Irrigation Demand

Total Irrigation Demand = 35 **GPM (E)**

Larger irrigation areas should be divided into zones, with a maximum irrigation demand of 50 GPM. If the irrigation demand is greater than 50 GPM, the Applicant's Engineer shall provide a detailed irrigation plan with appropriately designed zones.

The AWWA M22 Manual provides guidance for calculating irrigation demands.

For this example, an area of 3,000 ft^2 is irrigated by a spray irrigation system. The AWWA M22 Manual indicates that for spray irrigation each "section" represents a flow of 1.16 GPM. A "section" is defined as 100 ft^2. So the calculation yields:

Total Irrigation Demand = 3,000 ft^2 / 100 ft^2 = 30 sections x 1.16 GPM = 34.8 GPM = 35 GPM (rounded)

Step 5: Confirm Design Demand

Design Demand (Greater of D & E) = 57 **GPM (F)**

The Design Demand is based on the greater of the Adjusted Peak Demand and Total Irrigation Demand. This is because the peak domestic demand and peak irrigation demand are not expected to occur at the same time. Sizing based on the greater of the domestic and irrigation flows avoids unnecessarily oversizing the meter.

For this example, the Adjusted Peak Demand of 66.5 GPM governs over the Total Irrigation Demand of 35 GPM.

Step 6: Size and Select Water Meter

Design Demand *		Meter Size	
(L/s)	(GPM)	(mm)	(inches)
0 - 1.89	0 - 30	19	3/4
1.89 - 3.15	30 - 50	25	1
3.15 - 9.46	50 - 150	50	2
9.46 - 28.39	150 - 450	75	3

** Based on approximately 90% of operating range of City approved meters.*

Water Meter Make / Model: = Sensus OMNI C^2

Water Meter Size = 50 mm

Meter Location (Outside / Inside) = Outside

Using the sizing table provided in Step 6, a Design Demand of 57 GPM corresponds to a meter size of 2" (50 mm).

As per Section D of the Design Criteria Manual, the meter location is outside since it is 50 mm or smaller in size. The meter make / model in this example is a Sensus OMNI C^2, which is an approved product listed in Section 1.1 of the Supplementary Specifications. However, it should be noted that a 2" Neptune T-10, Neptune MACH 10, Badger Recordall PD, or Badger E-Series meter would also be acceptable.

Note that the AWWA M22 sizing methodology is based on US customary units. The fixture values, probability curves, and pressure adjustment factors have all been derived using US units. In this final step of the sizing calculation sheet, the units are converted to metric.

Professional Certification

Professional's Seal Here

Seal

Name: Example

Company: Example

Date: Example

Revision: Example

Comments:

This section is for the *Consultant* to certify the water meter sizing calculation.

The comments space is provided to explain any unique aspects of the development that impact the proposed meter sizing.

CITY OF SURREY

Service Connection Sizing Calculation Sheet
For Domestic Service Connections
Methodology: AWWA M22

Example

General Information

Customer Name:	Example		PID Number:	Example	
Address:	Example		Project Number:	Example	
	Example		Building Permit Number:	Example	
Type of Occupancy:	Multi-Family	X	Institutional		Industrial		Number of Units:	31
	Commercial		Other					

Customer and development information is to be provided in this initial section.

This service connection example builds on the previous water meter sizing calculation example (31 unit townhouse development).

Step 1: Calculate Design Demand

From Step 5 of Water Meter Sizing Calculation (Appendix A)

Design Demand = **57** **GPM**
3.6 **L/s**

The Design Demand (from Step 5 of the Water Meter Sizing Calculation Sheet) is 57 GPM (or 3.6 L/s).

Step 2: Calculate Headloss and Velocity

		Scenario 1		Scenario 2		
Service Connection Size	=	50	mm	100	mm	
Headloss - Water Meter	=	0.7	m	0.7	m	(A)
Headloss - Backflow Preventer	=	4.2	m	3.9	m	(B)
Service Connection Length	=	20	m	20	m	
C Factor	=	140		140		
Headloss - Service Connection	=	1.5	m	0.05	m	(C)
Total Headloss (A + B + C)	=	**6.4**	**m**	**4.7**	**m**	
Velocity	=	**1.8**	**m/s**	**0.5**	**m/s**	

Two service connection sizing scenarios are provided, such that the *Consultant* can assess the appropriateness of alternate pipe sizes.

The manufacturer published headloss for a 2" (50 mm) Sensus OMNI C^2 meter (as per Step 6 of the Water Meter Sizing Calculation Sheet) at a flow rate of 57 GPM is 1 psi (0.7 m).

The manufacturer published headlosses for a "typical" 50 mm and 100 mm backflow preventer are 6.0 psi (4.2 m) and 5.5 psi (3.9 m) respectively.

The service connection length (up to property line) is 20 m. Assuming a polyethylene pipe material, a C Factor of 140 is selected.

Using the Hazen-Williams formula, the headloss within the service connection pipe is calculated to be 1.5 m for a 50 mm service size and 0.05 m for a 100 mm service size. The corresponding velocities for 50 mm and 100 mm service connections are 1.8 m/s and 0.5 m/s respectively.

Step 3: Size Service Connection

Based on acceptable headloss and velocity.

Service Connection Size = **50** **mm**

A 50 mm service connection is selected based on the following components of the *City* of Surrey Design Criteria Manual:
- Residual pressure greater than 28 m (38.7 m (55 psi) water system pressure (from Step 3 of the Water Meter Sizing Calculation Sheet) less 6.4 m total headloss = 32.3 m)
- Velocity less than 2 m/s

Professional Certification

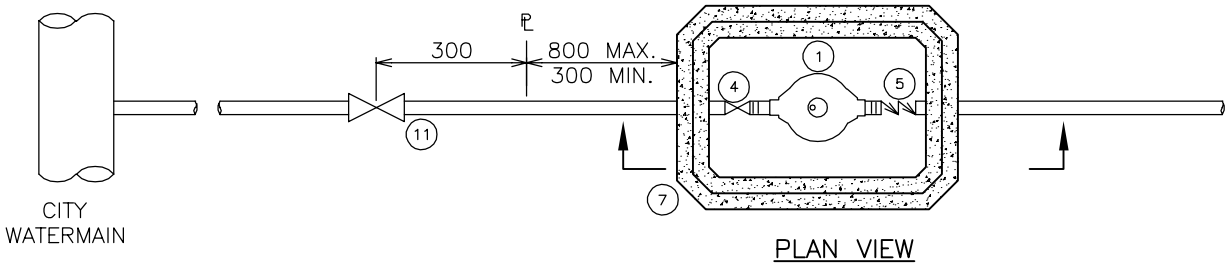
Seal

Name:	Example
Company:	Example
Date:	Example
Revision:	Example
Comments:	

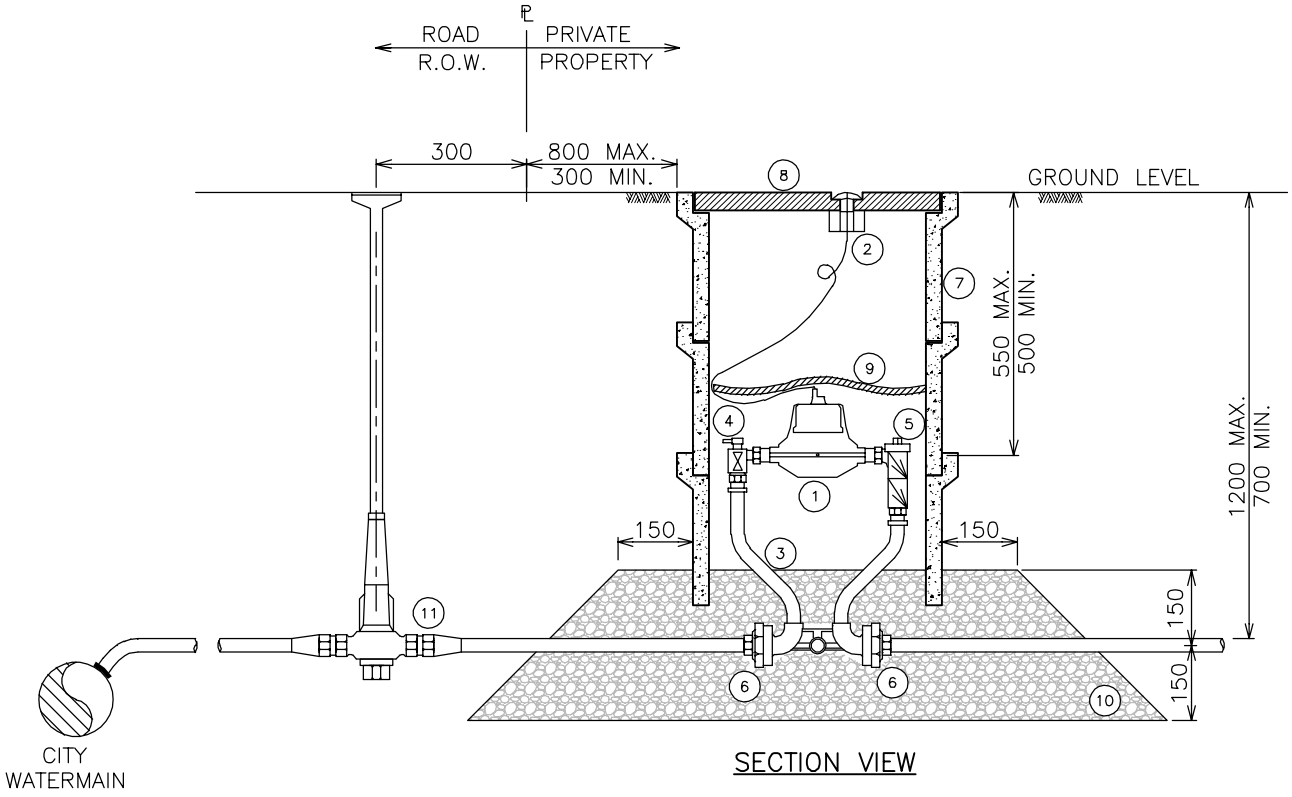
This section is for the *Consultant* to certify the service connection sizing calculation.

The comments space is provided to explain any unique aspects of the development that impact the proposed service connection sizing.

Appendix D – Supplementary Detail Drawings



PLAN VIEW



SECTION VIEW

NOTES:

1. THIS DRAWING SHOULD BE REVIEWED IN CONJUNCTION WITH THE CITY OF SURREY WATER METER DESIGN CRITERIA MANUAL & SUPPLEMENTARY SPECIFICATIONS.

2. MINIMUM 1.0m HORIZONTAL AND 2.0m VERTICAL CLEARANCE AROUND METER BOX TO REMAIN FREE OF LANDSCAPING OR OTHER OBSTRUCTIONS.

ITEM	DESCRIPTION	ITEM	DESCRIPTION
(1)	WATER METER (AS PER APPROVED METER PRODUCTS LIST)	(7)	#37 METER BOX (PRE-CAST CONCRETE OR LIGHT-WEIGHT COMPOSITE)
(2)	REMOTE RECEPTACLE	(8)	CAST IRON LID (C/W RECESSED HOLE FOR REMOTE RECEPTACLE)
(3)	METER SETTER (CAMBRIDGE BRASS SERIES 6020 OR APPROVED EQUAL)	(9)	FOIL BUBBLE WRAP INSULATION BLANKET (CUT TO FIT METER BOX OPENING)
(4)	INLET BALL VALVE – FULL PORT (PART OF SETTER)	(10)	19mm CLEAR CRUSHED DRAIN ROCK (PLACED INSIDE BOX TO STABILIZE SETTER)
(5)	DUAL CHECK VALVE (PART OF SETTER)	(11)	CURB STOP C/W RISER
(6)	COMPRESSION FITTINGS (PART OF SETTER)		

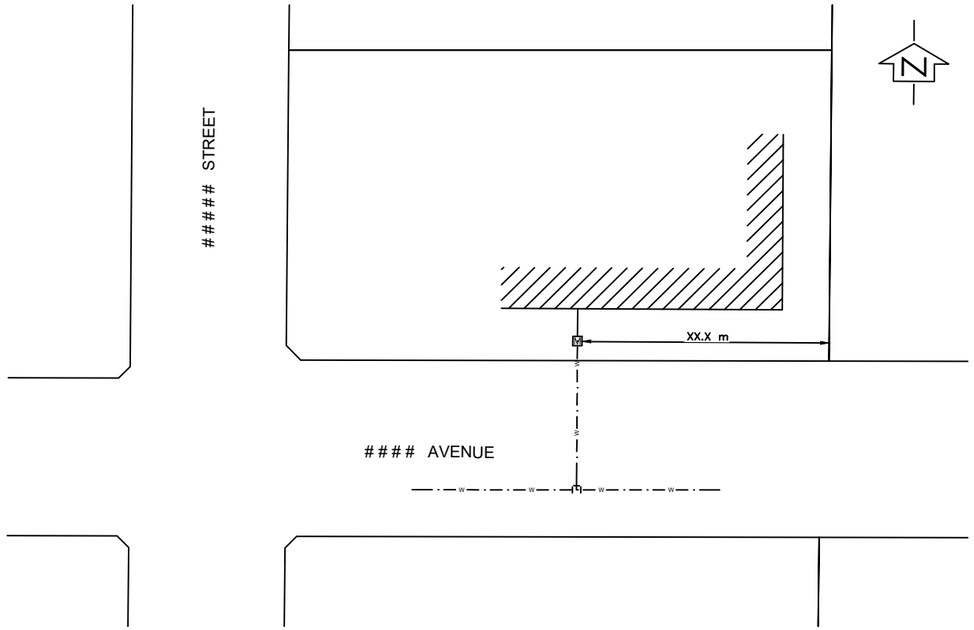
3		All Dimensions Shown In millimetres, Unless Otherwise Noted
2	DECEMBER 2019	
1	JUNE 2016	Title: INSTALLATION DETAIL FOR METERS 25mm DIAMETER AND SMALLER
	Revision Date Approved	

CITY OF SURREY
the future lives here.

WATER METER SUPPLEMENTARY DETAIL DRAWINGS

Approved	
Date	DECEMBER 2019
Drawn By	Urban Systems Ltd.

DRAWING NUMBER
SSD-WM1



SITE PLAN
SCALE 1:500

PLAN VIEW – CHAMBER DETAIL
OR
UTILITY ROOM LAYOUT
SCALE 1:250

WATER METER SIZING CALCULATION
(APPENDIX A – PAGE 1)

WATER METER SIZING CALCULATION
(APPENDIX A – PAGE 2)

NOTES:

ELEVATION VIEW – CHAMBER DETAIL
OR
UTILITY ROOM DETAIL
SCALE 1:250

3		
2	DECEMBER 2019	
1	JUNE 2016	
	Revision Date Approved	

CITY OF SURREY the future lives here.
WATER METER SUPPLEMENTARY DETAIL DRAWINGS

Title: METER DESIGN DRAWING TEMPLATE

Approved
Date: DECEMBER 2019
Drawn By: Urban Systems Ltd.

DRAWING NUMBER
SSD-WM2