

2024

DRINKING WATER
INFRASTRUCTURE
DESIGN STANDARD

W500A



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Overtime it will be necessary to update these documents as the regulations, design practices and technologies continue to evolve and change. It is the user's responsibility to check the City of Barrie's website for the current revision. Standard holders are cautioned about immediately discarding superseded and cancelled standards.

Last Revision Date: April 2024

Revision No.	Date	Comment
1	February 2015	Guideline, BSD 500-533, Approved Manufacturers' List
2	May 2015	Guideline, BSD-500, BSD-502, BSD-506, Approved Manufacturers' List
3	October 2017	Revisions to BSD-506, BSD-515, BSD-524, BSD-525, BSD-532 and BSD-533, Addition of BSD-534 and BSD-535
4	December 2017	Frame and Cover/Grate Update
5	October 2020	Revision to Introduction, Legislation – Acts and Regulations, Updated Fire Flow Requirements and Hydrant Spacing within ROW, Update to Water Turnover Requirements, Update to Tracer Wire Installation Procedure, Addition of BSD-536, Changes to BSD-526 remove Cad Weld and replace with Thermite Weld
6	January 2021	Revisions to Maximum Velocity, Residential Service Installation and Specifications for General Services
7	August 2021	No Pre-Filling of Watermains, Disinfection Procedure update, Fire Flow Testing Requirements
8	February 2022	Fire Flow Calculation Equation, Addition of Fire Flow Spreadsheet to website
9	June 2022	Section 4.1.1 Remove an outdated Appendix reference and update with a link to Water Infrastructure Map, Remove direct tapping reference and associated table
10	April 2023	Added new document names and numbers throughout
11	July 2023	Update the reference to the Fire Underwriters Survey
12	September 2023	Update Water Meter Information
13	January 2024	Added details on corrosion protection measures – section 4.5.5 and 4.5.6. General formatting changed throughout document. Approved product list updated to separate corrosion protection categories into two distinct categories.
14	April 2024	Updated Approved Product List to Verified Technologies List throughout

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1 Introduction

The purpose of this document is to provide guidance for the design and installation of water infrastructure systems that connect to the City of Barrie Water Distribution and Transmission System. This information is made available to Consulting Engineers, Subdividers, Contractors or any individual wanting to make any connection to the City of Barrie Water System. This Standard shall not relieve the proponent from the primary responsibility for the design to meet all Federal, Provincial and Municipal regulations, including the MECP Safe Drinking Water Act, 2002.

This specification is applicable to installation of watermains and services up to and including 600mm in diameter. Installations of watermains larger than 600mm in diameter, or for any special installation shall be reviewed and approved on an individual project basis by the City of Barrie Corporate Asset Management Branch Water Operations Branch of the Infrastructure and Growth Management Division.

The information found in this specification shall be used in conjunction with the terms of pertinent the Subdividers Agreements and/or Site Plan Agreements issued by the City of Barrie. Also, this information will be a supplement to any additional or updated specification, approved by the City of Barrie.

1.1 Definitions

In this specification the following definitions shall apply:

AWWA shall mean the American Water Works Association.

City shall mean the City of Barrie.

Contractor shall mean the firm of Contractors, the company or individual acting as the Contractor and having entered into a contract with the Developer/Owner to install the watermains, services and/or appurtenances.

Developer(s)/Owner(s) shall mean the registered developer for the lands for which a subdivision agreement has been entered into.

City Representative shall mean any person assigned to a project by the City to carry out work on their behalf. This person could be a member of our water operations branch, a technical advisor, a field coordinator, a project manager or an infrastructure inspector. The name of the Representative shall be specified prior to the start of construction on any project.

Consultant shall mean professional engineers authorized to practice in Ontario and they shall be responsible for the preparation of drawings and specifications for the proposed extension to the water distribution system to the satisfaction of the City's Engineering Department. The Consultant shall act on behalf of the Developer/Owner.

Service shall mean every water pipe installed from the watermain to serve one lot.

MECP shall mean the Ministry of the Environment, Conservation and Parks.

OPSD shall mean the Ontario Provincial Standard Drawings.

ODWS shall mean the Ontario Drinking Water Standards.

General Service(s) refers to Industrial, Commercial, Institutional, and Multi-Residential lots.

PEO shall mean the Professional Engineers Ontario, who is the licensing and regulating body for professional engineering in the province of Ontario.

P.P.U. shall mean persons per unit.

2 Legislation - Acts and Regulations

This document does not supersede, nor replace any legislation governing the design of potable water systems. Designers, Consultants and Contractors must be fully familiar with legislation such as the Ontario Water Resources Act, Safe Water Drinking Act, Environmental Assessment Act, Environmental Protection Act, Ontario Building Codes when carrying out the design and construction of water infrastructure projects within the City of Barrie.

Although this document is often referred to as policies, the design portion should be considered as minimum guidelines. This document provides the City's design preferences under normal circumstances. The Engineer, however, should use their best judgment to find innovative solutions when abnormal design conditions are encountered. Deviation from these design guidelines requires written approval of Director of Infrastructure or designate.

All watermain, appurtenances, and components shall comply with all applicable current industry standards and specifications for quality management and quality control, such as:

- The Canadian Standards Association (CSA);
- American Water Works Association (AWWA);
- American Standard and Testing Materials (ASTM);
- Underwriters Laboratory (UL);
- Verified Technologies for Drinking Water Systems List;
- Water Supply for Public Fire Protection (as amended);
- NSF International (NSF); and,
- Water Operations Quality Management System (QMS)

3 Liability

The Developer/Owner shall save harmless, the City, its agents and employees from and against all claims, demands, losses, costs, damages, actions, suits and proceedings arising out of or attributable to any act or omission in connection with the development of water infrastructure connected to the City's water transmission and distribution system.

4 Drinking Water Infrastructure Design Standard

4.1 Servicing Responsibilities

Private land developers developing within the City are required to:

1. Provide a water distribution system which will carry all water demands within or being directed through the site as approved by the City.
2. Provide a water distribution system that is sufficient enough to accommodate all domestic and fire flows that are generated within the development, plus all flows that can be expected to be generated external to the development.
3. Ensure there are an adequate amount of temporary auto flushing devices installed in new subdivisions that are added to the water distribution system for fire flow protection.

These requirements are all the responsibility of, and at the expense of the developer.

4.1.1 Professional Design

The Developer/Owner shall employ a qualified licenced Professional Engineer (includes PEO Limited License and LET Designation), authorized to practice in Ontario, to design the watermain system in conjunction with all other infrastructure including: sewers, road and other services, in order that all services will be properly engineered and co-ordinated. The Developer/Owner shall submit detailed stamped engineering drawings for the water distribution design.

The Developer/Owner shall carry out a hydraulic network model simulation to determine if the demand flow exceeds the capacity of the supply and to demonstrate that the proposed system will not adversely affect the surrounding system in terms of pressure and supply. A reservoir should be assumed with the appropriate HGL for water supply to the area being designed. The [Water Infrastructure Map](#) illustrates the pressure zone boundaries, HGLs and watermains greater than 300mm.

4.1.2 Submission Requirements

The Proponent shall provide a water analysis report addressing service supply and demand associated with the proposed development, ensuring adequate domestic and fire flow pressure and water quality. It should be demonstrated in the report that the proposed system will not adversely affect the surrounding system in terms of pressure and supply.

The water system analysis report shall be signed off/endorsed by a Professional Engineer or PEO Limited Licensee, and shall include:

- Demand calculations including Average Day, Maximum Day, Peak Hour and Fire Flow

- Hydraulic analysis for existing and future scenarios under Average Day, Maximum Day, Peak Hour and Maximum Day plus Fire Flow conditions. Hydraulic modelling submission should include, but not limited to the following,
 - Network schematic/map for each scenario which identifies junction ID, and pipe sizes;
 - Junction input data tables for all scenarios listing ID numbers, elevations, demands, pressures;
 - Pipe input tables for all scenarios listing pipe numbers (with up and downstream nodes indicated), diameters, lengths, roughness;
 - Junction output data showing normal operating pressures, water age information, design fire flow at 140 kPa (20 psi) residual pressure;
 - Pipe output data showing velocities, flows, headlosses, headloss gradient, and age of water information; and,
 - Input and output data for any other elements including valves, pumps, reservoirs and tanks where applicable.
- Electronic copy of the hydraulic model (InfoWater or EPANET format)
- Digital files (in original format) of all calculations
- For multi-phase developments, the report should address the water supply under both temporary condition(s) and ultimate built-out condition.

Subject to a Digital Use Agreement being executed and payment of associated fees per the current [Fees By-Law, Schedule E, 8.0 Engineering Modelling Fees](#) being made, the City's water model in InfoWater or EPANET format could be made available to the consultant for analysis related to developments within the Salem and Hewitt's Secondary Plan Areas. For small size development projects, a reservoir can be assumed with the appropriate Hydraulic Grade Line (HGL) for water supply to the area being designed for. Refer to the current [Water Distribution and Storage Master Plan](#) for pressure zone boundaries, hydraulic grade lines (HGL) and watermain information from the City of Barrie's website.

4.2 General Design Considerations

4.2.1 Design Period

All watermains shall be designed to adequately accommodate flows from the ultimate development expected within the zone boundary. At the discretion of the City, watermains for the ultimate development shall be designed in accordance with the current City of Barrie Water Storage and Distribution Master Plan.

Should the MECP conclude the City of Barrie does not have sufficient water reserve capacity to adequately service the site; the City of Barrie draft plan comments shall become null and void until the capacity issue can be resolved to the satisfaction of MECP.

4.2.2 Private Wells

Private wells will not be permitted unless approval is granted from the City. The review and approval of new wells may be considered by the City only in cases where replacement or upgrading of existing systems is warranted. The proposed development must be serviced from the municipal water distribution system, ensuring any connections to the previous private well supply have a complete physical disconnection from any piping or plumbing that is to be connected to the municipal water supply.

4.2.3 Infrastructure Standard Drawings

In addition to these written guidelines, reference should also be made to the City's Infrastructure Standard Drawings.

4.2.4 Verified Technologies for Drinking Water Systems

In addition to these written guidelines, reference should also be made to the Verified Technologies for drinking water systems list.

4.3 Watermain Design Criteria

4.3.1 Flow Calculations

The Developer/Owner and his Consultant shall propose the size of the watermain to accommodate the development.

The watermain shall be sized to meet the greater of either:

- Maximum day demand plus fire flow or
- Peak hour demand.

DENSITIES – the following densities shall be used for population:

Residential P.P.U.

Low Density (single detached, duplexes or semi-detached dwellings)	3.25 ppu
Medium Density (triplexes and fourplexes, cluster and/or block townhouses, street townhouses, walk-up apartments)	2.57 ppu
High Density (apartment dwellings)	1.67 ppu

Adopted from "Development Charges Background Study City of Barrie", Watson & Associates, April 2019

AVERAGE DAY DEMANDS – the following minimum average consumption rates shall be used in average demand calculation:

Average Water Consumption Rate

Residential	225 Litres/Capita/Day
Commercial/Institutional	28 m ³ /ha/Day

Industrial	35 m ³ /ha/Day
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Note: Industrial consumption rate is for light industrial use. Heavy industrial use could have significantly higher water consumptions.

PEAKING FACTORS – peaking factors shall be based on MECP Design Guidelines for Drinking – Water Systems, 2008 (Table 3-1 and Table 3-3).

HAZEN-WILLIAMS “C” FACTORS – the following “C-Factors”, as recommended by MECP, shall be used, based on inside diameter of the pipe/ regardless of material:

Watermain Pipe C-Factors

Pipe Diameter (mm)	“C” Factor
150	100
200-250	110
300-600	120
Over 600	130

According to MECP Design Guidelines for Drinking – Water Systems (2008), a minimum operating pressure of 275 kPa (40 psi) and a maximum operating pressure of 700 kPa (100 psi) shall be maintained through the system. Preferred operating pressure shall generally be in the range of 350 to 485 kPa (50 to 70 psi) under maximum daily flow. Pressures outside of this range can be accepted; however, where the maximum pressures exceed 550 kPa (80 psi), PRVs are required inside the building after the meter that is supplied and installed by the contractor/homeowner. Pressure during maximum day demand plus fire flow shall not fall below 140 kPa (20 psi).

The developer’s consulting engineer shall contact the Corporate Asset Management Branch of the Infrastructure and Growth Management Division to determine if the development site is in an area experiencing problematic static and residual pressures along with any deficiencies in meeting fire flow requirements.

Fire flows shall meet the following criteria:

FIRE FLOW DEMAND – the following minimum fire flow demands shall be used in hydraulic network analysis unless FUS calculations require a higher fire flow:

Fire Flow Requirements

Description	Minimum Required Fire Flow (L/s) ¹
Large Residential Lots ²	70
Residential	100
Townhouse	155
Apartment	200
High Rise Residential / Downtown / Mixed Use	- ³
Institutional	200
Commercial	283
Industrial	333

Note 1: Subject to requirements of the Ontario Building Code

Note 2: Refers to Buildings having a minimum of 3.0 meters of separation between buildings

3: Applicant will need to provide their own calculations

Specific fire flow demand shall be calculated according to the latest published requirements of the Water Supply for Public Fire Protection; Fire Underwriters Survey (as amended). Proposed Fire Flows less than minimums indicated would be subject to recommendation by a qualified Professional Engineer and approval by the City on a case by case basis.

Under special circumstances, the City will require built form modifications for fire flow reductions for residential development when the anticipated fire flow requirements exceed more than 15% of the fire flow requirements identified in Table 4-4, prior to approval of increasing watermain size.

4.3.2 Fire Flow Testing

Fire flow testing shall be arranged through a customer service representative at Water Operations (705-739-4220 x4805) and will be done in accordance with [Section 'N'](#) of the City's Fees By-Law. This testing is required for all development applications to establish and confirm boundary conditions for the development and will provide the basis for the water analysis. Fire flow testing shall be conducted in accordance with the guidelines set out in the current edition of National Fire Prevention Association (NFPA) 291: *Recommended practice for Fire Flow Testing and Marking of Hydrant*, this will include achieving adequate pressure drop at the residual hydrant or flowing the total demand necessary for fire-fighting purposes.

Contractors performing the test should consider the following practice:

- It is best to conduct the flow test during peak hours in the morning to reflect the worst-case scenario.
- While some flow test can involve many hydrants flowing at the same time to achieve the minimum pressure drop or the desired flow, for a typical single fire flow test, the closest hydrant downstream of the building supply line should be the Test Hydrant or Residual Hydrant where system pressures are taken, and the subsequent downstream hydrant will be the flowing hydrant to obtain pitot pressure reading.
- Ensure that the test is not performed below 0°C unless the contractor assumes all responsibility for road conditions and any potential winter control measures that are required.
- Use the Fire Flow Testing Calculator spreadsheet worksheet that is posted on the City of Barrie website under Water Transmission and Distribution. This spreadsheet shall be submitted in PDF and Excel file format with the fire flow test report

4.3.3 Fire Flow Test Reporting

Upon completion of the Fire Flow Test Report is to be submitted to the City's Water Operations Branch, Water Customer Services Section. At minimum, this report shall include the following information:

- Test date and time including both start time when the valve of the flow hydrant was open and end time when the last flow hydrant valve was closed;
- Location Description including a Key Map that shows adjacent streets and hydrant info (ID, residual, flow hydrant);
- Name of the City of Barrie Water Operations staff that was present;
- Name of Company that conducted the test;

- A statement from a qualified professional confirming the test has been conducted in accordance with the NFPA guidelines;
- Table showing the following information:
 - Static Pressure, Watermain Size, Test No. NO. Of Outlets, Outlet Inside Diameter (IN), Discharge Coefficient, Residual Pressure (PSI), Pitot Pressure (PSI) Flow (U.S. GPM). A minimum of two (2) sets of flow data are to be obtained during the test.
- Confirmation on whether or not the Test was able to achieve a 25% pressure drop from observed static level or if the test achieved the desired flow (i.e. max. day plus fire flow); and,
- Test readings should be plotted on a Pressure vs Flow Graph.
- Test Results sent to water.operations@barrie.ca
- Test report cannot be completed more than 2 years prior to submission.
- Include with the test report the W501 Fire Flow Calculator spreadsheet that is posted on the [City of Barrie website](#) under the Water category.

4.3.4 Estimated Available Fire Flows from Fire Flow Test Results

Residual Pressure shall be calculated in accordance with NFPA 291.

The following formula shall be used to calculate the discharge during the fire flow test:

$$Q_F = 29.84 * c * d^2 p^{0.5}$$

where:

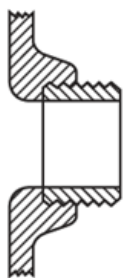
Q_F = flow (US gpm)

c = coefficient of discharge

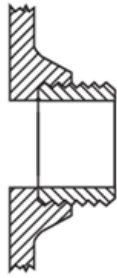
d = diameter of the outlet (inches)

p = pitot pressure (psi)

Use the diagrams below from NFPA 291 to determine what coefficient of discharge to use:



Outlet smooth
and rounded
(coef. 0.90)



Outlet square
and sharp
(coef. 0.80)



Outlet square and
projecting into barrel
(coef. 0.70)

The following formula shall be used to calculate available fire flow at a specific residual pressure (typically 20 psi):

$$Q_R = Q_F \times \frac{h_r^{0.54}}{h_f^{0.54}}$$

where:

Q_R = flow predicted at desired residual pressure

Q_F = total flow measured during test

h_r = static pressure – desired residual pressure (20 psi)

h_f = static pressure – residual pressure during fire flow test

It should be noted that the estimated fire flows using the calculations only represent the maximum possible flows that can be drawn from the system at the time of flow testing, and that they may not represent the worst-case scenario. The flows also do not take into consideration the maximum velocity requirements during fire flow conditions (Section 4.3.6 Maximum Velocity)

4.3.5 Minimum Watermain Sizing

For distribution systems designed to provide fire protection, the minimum diameter of watermains shall be 150 mm, except beyond the last hydrant on cul-de-sacs where the minimum diameter of watermains may be 50 mm. Under special circumstances the City may limit the maximum watermain sizing to address anticipated water quality concerns, which may result in required revisions to the system from a fire flow perspective.

For distribution systems that are not designed to provide fire protection, the minimum diameter of watermains shall be 100mm.

4.3.6 Maximum Velocity

The maximum velocity for all watermains; under normal operating conditions (average and maximum day demands) will not exceed 1.5 m/s, while during fire flow conditions, the maximum velocity will not exceed 5.0 m/s. In all cases, watermain diameters shall be such that a flushing velocity of 0.8 m/s can be achieved for cleaning and flushing procedures.

4.3.7 Head Loss Gradient

Maximum head loss gradient allowed under normal operating pressures (average and maximum day demands) is 2.5 m/km excluding fire flow situations.

4.3.8 Minimum Slope

The minimum slope for a transmission watermain installation is 0.5% unless otherwise approved by the City. This is to prevent the accumulation of trapped air and to avoid localized high points.

4.3.9 Transient analysis

Transient analysis is required for designing of transmission watermain and joints, in accordance with the most current version of the MECP Design Guidelines for Drinking Water System.

4.3.10 Backflow Prevention

Where there is a risk of contamination at a property, such as non-potable water, wastewater or any other form of liquid, chemical or substance entering the waterworks that may affect the quality of the water supply, backflow prevention devices may be required as per the City of Barrie's Backflow Prevention and Cross-Connection Control By-Law. The backflow prevention devices will be selected, supplied, installed, and tested at the Owner's expense.

4.4 Watermain Layout and Installation

4.4.1 Location within Right-of Ways

Watermains shall be located in the boulevard on the opposite side of the road from the proposed hydro distribution and opposite side of the right-of-way to the sidewalk. If sidewalks are installed on each side of the roadway, then the watermain shall be located on the north and west side of the street opposite the storm sewer and hydro distribution. As indicated in the City's typical road cross-section detailed drawings.

All watermains in a cul-de-sac shall conform to [W513](#) showing typical cul-de-sac watermain design, as directed by the City Representative.

In non-standard locations, such as easements, parks, townhouses/condominium developments and reconstruction projects, metallic warning tape shall be installed over all watermain. The metallic warning tape shall be terminated at hydrants. The metallic warning tape shall be laid in the trench 0.3 metres (12") to 0.5 metres (19") directly above the watermain.

4.4.1.1 Separate Domestic Water and Fire Supply Feeds (where necessary)

If a distribution system installed for domestic and fire supply cannot be turned over in 3 days under average daily demand considering minimum hour consumption, then two separate supply feeds (one for domestic use and one for fire flow supply) are required to ensure the adequacy and reliability of water supply while maintaining adequate water turn over.

For condominium projects that require two separate supply feeds for water, the feeds are to be metered at the property line and a check valve is to be placed on the fire main. An above ground heated chamber shall be placed at the property line. This shall be in accordance with Infrastructure Standard [W536](#).

4.4.2 Right-of-Ways

Permanent easements should be avoided. Also, the use of easements to loop watermains is discouraged. If required, easements shall be a minimum of 5 m wide for standard depth of bury between 1.7 m to 3.7 m for watermains less than 600 mm in diameter. For pipe bury greater than 3.7 m the width of easement shall be such that it permits installation be made by conventional excavation methods and that the operation be totally contained within the easement. Should the easement contain other utilities, the width shall be sufficient to accommodate appropriate offsets as well as future excavations. All watermains should be offset at least 2 m from the easement limits.

Excavations shall conform to OPSS 401. Where the easement is adjacent to an existing or future structure a fictitious slope of 1:1 must be considered, calculated from the deepest depth of the foundation of the structure. The pipe/excavation shall not be placed within the zone encumbered by the 1:1 slope. No service connections will be allowed off a main on an easement.

4.4.3 Watermain Depth

Watermains shall be installed with a minimum cover of 1.7 metres over the mains in urbanized areas. On open ditch or unimproved roads, an increased cover of minimum 2.3 metres shall be provided to allow for future road improvements or lowering of the road profile when urbanization occurs.

4.4.4 Watermain Bedding and Cover

Watermain shall be constructed with beddings as per OPSD 802.010 (granular 'A' embedment material) for flexible pipes and OPSD 802.030 or 802.031 class 'B' (granular 'A' bedding material, granular 'A' or select native cover material) for rigid pipe.

Alternative embedment material shall be sand meeting gradation requirements of OPS 1004.05.07 compacted to 95% Standard Proctor Maximum Dry Density. Geotechnical certification of alternative material and compaction must be provided every 150 metres. The compaction testing must include the entire embedment envelope (haunches, bedding and top of pipe).

In cases where native backfill material is deemed unsuitable by the City's Representative, backfill will be imported granular and shall be at the sole discretion of the City's Representative.

In areas where the City's Representative allows a watermain to be installed with less than a minimum cover, the Contractor is to supply and install insulation per section 4.4.7, to protect watermains, hydrant leads and appurtenances.

4.4.5 Fill-Areas

Watermain shall not be laid in fill until the density reports have been submitted to and approved by the City's Representative confirming that the fill has been engineered. All fill areas shall be compacted to 95% Standard Proctor Maximum Dry Density and the City's representative must receive copies of all geotechnical compaction reports.

4.4.6 Pipe Crossing and Clearance

The minimum horizontal separation between the watermain and the sanitary/storm sewer is to be 2.5 metres (from pipe OD to pipe OD). A minimum of 0.5 metre vertical clearance is required between the watermain and all infrastructure, while still maintaining a minimum depth of cover at all times to allow for proper bedding and structural support of the watermain and sewers.

Where it is not possible for watermain to cross above the sewer, the watermain passing under a sewer will be protected by providing:

- A vertical separation of at least 0.5 m between the invert of the sewer and crown of the watermain.
- Adequate structural support for the sewers to prevent excessive deflection of joints and settling.
- That the length of water pipe be centred at the point of crossing so that the joints will be equidistant and as far as possible from the sewer.
- Refer to [W518](#) and [W519](#).

4.4.7 Watermain Insulation

Watermains that are expected to be potentially impacted by the normal depth of frost penetration, shall be thermally protected in accordance with MECP document “Guidelines for Servicing in Areas Subject to Adverse Conditions”, and with the approval of the City of Barrie Water Operations. For installations below grade, rigid foam extruded polystyrene slab insulation shall be placed above or below the watermain. All joints to be taped. Refer to Verified Technologies for Drinking Water Systems listing for materials allowed.

In general, the thickness of the insulation should be a minimum of 50 mm for every 300 mm reduction in the depth of cover. See detail [W514](#).

4.4.8 Liners and Encasements

Steel liners shall be used for directional drilling or jack and bore installations, for example; rivers and railway crossings and for other structural integrity requirements. Refer to [W521](#) and [W522](#) for crossing details.

The watermain must be installed as per the specifications of the manufacturer and designer, and the watermain shall be restrained along the entire length of the liner.

Grouting is required on transmission mains 400 mm and greater, with the exception of railway crossings. Grouting shall be a 3 to 1 (3:1) sand to cement mix ratio unless otherwise stated. The liner ends shall be sealed wrapped around both the liner ends and the pipe and secured with Type 304 stainless steel bands to prevent entry of water or excess moisture unless otherwise noted. Stamped engineered shop drawings shall be provided to the City of Barrie for review and approval prior to construction.

Casing spacers are to be as per the Verified Technologies for Drinking Water Systems list. Watermain pipes to be centred in the casing.

4.4.9 Watermain Installation Offset and Deflection

The standard offset of all watermains must be maintained on any curved alignment installation. Pipe deflection should be used wherever possible to minimize the use of manufactured bends. Wherever it is necessary to deflect from a straight alignment, either in the vertical or horizontal plane, the amount of deflection shall not exceed the pipe and/or joint manufacturers maximum deflection. If the

deflection is greater than the manufacturers specified maximum deflection, the pipe shall be removed and reinstalled with the use of bends and proper thrust restraint, in order to provide for an acceptable deflection.

4.4.9.1 Pipe Deflection

On radius installations of pipe, lengths should be assembled in a straight alignment and then curved in the trench. All pipe curvatures shall result from the bending of the pipe lengths. Note that deflection of the joint is very slight, up to one degree. The Contractor shall always follow the manufacturers' specifications for pipe deflection.

Offset per 20 ft (6.1 metres) - PVC

Pipe Diameter	Max. Offset
4" (100 mm)	24" (610 mm)
6" (150 mm)	17" (430 mm)
8" (200 mm)	12" (305 mm)
10" (250 mm)	11" (280 mm)
12" (305 mm)	9" (230 mm)
16" (400 mm)	6" (150 mm)

Ductile Iron - Pipeline Curve Geometry

O = deflection angle

S = joint deflection offset

L = laying of length

R = radius of curve

$$R = \frac{L}{2 \tan O/2}$$

See AWWA C600 Installation of Ductile-Iron Mains & Their Appurtenances, Table 2 for Maximum Joint Deflection – Full-Length Pipe – Push-On Type Joint Pipe and Table 3 for Maximum Joint Deflection Full-Length Pipe – Mechanical-Joint Pipe.

4.4.10 Termination of Watermains

The design proposal of the watermain shall ensure that adequate water quality requirements are met. Water distribution systems shall be designed to exclude any dead-ended pipe. Dead end watermain design proposals which are part of an interim phase of a subdivision build-out shall meet water quality requirements by:

- i) Demonstrating adequate turnover by use; or

- ii) Strategic valve location; and
- iii) Installation of a hydrant and/or auto flushing device(s).

4.4.11 Looping of Watermains

All watermains shall be looped. Temporary watermains may be terminated per section 4.4.10 to the satisfaction of the City Representative.

4.4.12 Protection of Existing Infrastructure

It shall be the Contractor's responsibility to protect and support existing underground/overhead infrastructure, which may be encountered during the progress of the work. Any existing infrastructure, that has to be relocated, shall be at the Contractor's expense with no cost to the City. Utility poles, which require support, shall be held with the appropriate equipment as supplied by the Contractor, at the Contractor's expense. The attachment of this equipment shall be made by the Utility Company. The Contractor must always have a qualified person on-site to operate any vehicle used to support utility poles.

The Contractor must arrange for locates of all infrastructure by contacting the appropriate Operating Authority prior to any excavation on road allowance.

4.4.13 Removal and Abandoning

Where possible and/or as directed by the City, the contractor shall completely remove abandoned pipes. If mains are to be abandoned in place, follow OPSS 510 – Construction Specification for Removals.

4.4.14 Additional Watermain Design and Installation Parameters

Concrete thrust blocking shall be installed at all tees, vertical and horizontal bends, hydrants, ends of watermains and connections 100 mm and larger, as per OPSD 1103.010 and OPSD 1103.020.

PVC 'tee' pressure fittings shall be mechanically restrained at each joint. Refer to [W512](#).

All watermain tees, horizontal bends and branch valves in fill areas shall be restrained with tie rods, 19 mm stainless steel, in addition to concrete thrust blocking.

Bonding wedges, as supplied by the manufacturer are NOT to be installed on ductile iron pipe.

All couplings must be installed with the approved restraining glands.

4.4.15 No Pre-Loading of Watermain

Watermains shall not be pre-loaded with water (by way of a water truck or a back flow preventer) until all servicing of all servicing of all sizes (including saddles, main stop, curb stop and service line to property line), main line valves, hydrants, risers, and temporary hydrants are installed. Commissioning will proceed when all appurtenances have been installed according to the approved drawings on a dry watermain.

The City of Barrie assumes no liability for service leaks during the pressure testing of the system due to dry tapping of the watermains.

4.5 Watermain Infrastructure Material

All waterworks materials used shall be new and shall conform to those listed in the City of Barrie Verified Technologies for Drinking Water Systems list, and the latest revision of the Standards of the American Waterworks Association (AWWA). All materials in contact with potable water shall conform to National Safety Foundation (NSF) 61. Compliant and manufactures shall provide confirmation of certification if requested.

The City reserves the right to select any materials or product it deems appropriate for the application. The City also reserves the right to remove from the Verified Technologies list any product previously approved but found inappropriate for the application. This includes but is not limited to pipe material, valves, or fittings. The designer shall clearly indicate on the drawings and contract documents the materials which are acceptable for use in a particular application where the use of one or more of the approved list is not acceptable.

The Contractor shall supply all materials for the watermain and appurtenances necessary for the complete watermain assembly.

A complete list of materials and manufacturers, which will be used to install the water distribution system, shall be sent to the City Representative for approval before construction commences.

The Contractor shall inspect all materials before installation and reject any pieces showing breaks, cracks or other defects. Before the watermain is lowered into the ground it shall be brushed out to ensure that there is no dirt or foreign material in the watermain or appurtenances.

All pipe up to and including 600 mm shall be delivered to the site with end covers and a tamper evident seals in accordance with OPSS 441.07.07.

4.5.1 Material Transitions

Transitions from one pipe material to another must be made at a valve or coupling.

Where PVC pipe is used, a tracer wire must be provided along the entire pipe as per standard drawing detail.

4.5.2 Distribution Watermain Material

The City will permit the use, as per the Verified Technologies for Drinking Water Systems List, of Polyvinyl Chloride PVC (Class 150) or Poly-Encased Ductile Iron (Class 52) watermains up to and including 400 mm diameter pipe size. Molecularly Orientated Polyvinyl Chloride (PVCo) watermains are permitted for use up to 300mm diameter pipe size.

PVC watermain must be used when a soils report indicates aggressive soils, but not in contaminated soils. The City Representative reserves the right to impose the type of watermain material.

All PVC and PVCo watermain shall be colour coded blue.

4.5.3 Transmission Watermain

4.5.3.1 Concrete Pressure Pipe

Concrete watermain shall be concrete cylinder pipe in accordance with AWWA C301 or C303 for 500 mm diameter pipe, and C301 for 600 mm diameter pipe and greater. Refer to the Verified Technologies for Drinking Water Systems list. Design deflection to be limited to less than 2% of the internal diameter to avoid damage to the cement lining. All joints shall be protected on the exterior using mortar diaphragms and grout. Thrust restraint will be provided through the use of restraining joints per manufacturer's recommendation. The requirements for corrosion protection shall be confirmed after completion of the necessary soils testing, which shall consider sulphate and chloride concentrations.

Stamped design shop drawings are required for concrete pipe. Direction of installation shall be shown on the shop drawings. Welded joints will not be permitted. The connection of any proposed watermain to an existing watermain shall only be made using a manufactured "Tee".

4.5.3.2 Ductile Iron Pipe (400mm and Larger)

Pipe shall be Class 53, ductile iron cement lined, with Tyton and/or restrained Joints as per OPSS 441.05.02, with cement lined fittings. All pipe and mechanical joints of pipe shall be protected Polyethylene Encasement in accordance with this specification and the manufacturers recommendation. Field cut pipe shall be kept to a minimum. Pipe rounding is mandatory per manufacturer's approved method. The connection of any proposed watermain or water service with a diameter equal to that of the existing watermain shall only be made using a manufactured "Tee".

4.5.4 Tracer Wire

Tracer wire shall be installed on all watermains, hydrant laterals, and water services except where such water service pipe is of copper material. The wire shall be installed in accordance with the [Tracer Wire Installation Design Standard](#).

4.5.5 Corrosion Protection - Petrolatum Tape Systems

4.5.5.1 All direct buried metallic fittings, valves, and joint restraints shall be wrapped end to end in a petrolatum tape system.

4.5.5.2 Petrolatum tape systems shall be comprised of petrolatum primer (paste), petrolatum molding mastic, and cold wrapped petrolatum tape meeting AWWA 217, NACE RP0375

4.5.5.3 Petrolatum tape systems verified to meet City Standards are described in [W500D](#)

4.5.6 Corrosion Protection - Cathodic Systems

4.5.6.1 Sacrificial anodes shall not be used as a substitution of any requirement described in section 4.5.5.

4.5.6.2 The installation and placement of sacrificial anodes shall be in accordance with OPSD 1109.011.

4.5.6.3 Zinc anodes shall conform to ASTM B-418 - Type II.

4.5.6.4 Magnesium anodes shall conform to ASTM B-107 - Type M1.

4.5.6.5 All anodes shall be connected to the targeted metallic surface by a thermite weld.

4.5.6.6 A single 5.4kg zinc anode shall be connected to every copper water service no more than 1.0m upstream of the curb stop.

4.5.6.7 Where a fire hydrant is installed on metallic main a single 10.8kg zinc anode shall be connected to the hydrant.

4.5.6.8 Where a fire hydrant is installed on non-metallic main two 10.8 kg zinc anodes shall be connected to the hydrant.

4.5.6.9 Where a metallic pipe transitions to a non-metallic pipe One (1) 14.5 kg magnesium anode shall be connected to the final length of metallic pipe

4.5.7 Polyethylene Encasement

Polyethylene encasement for ductile watermain shall be in accordance with ANSI/AWWA C105/A21.5 and the following:

- Material to be Low Density, polyethylene film having a nominal thickness of 8 mil (.008 inch).

- Junctions between wrapped & existing unwrapped pipe - Polyethylene wrap is to cover the adjacent pipe for a distance of at least 0.9 m. Secure the end with sufficient circumferential turns of tape.
- Attached service lines of dissimilar metals shall be wrapped with polyethylene or suitable dielectric tape for a minimum clear distance of 0.9 m away from the ductile iron pipe.

4.5.8 Restraining

In all areas where the watermain is to be constructed in fill areas or where other infrastructure will be located 5.5 metres or more below the finished grade or where, during installation of other infrastructure, will expose the watermain, the watermain shall be restrained in addition to thrust blocking. Restraint shall be achieved by using tie rods with bell clamps complete with a welded ring on the spigot end of the ductile iron or PVC pipe. All tie-rods shall be stainless steel. Refer to [W512](#).

All watermains and thrust restraints shall be designed to withstand the maximum operating pressure plus the transient pressure to which it will be subjected. The value of the transient pressure will not be less than the pressure surge that would be created by immediate stoppage of a water column moving at 0.6 m/s. The design pressure shall not be less than 1035 kPa (150 psi) in any case.

4.5.9 Fittings

Mechanical joint fittings shall be used on Ductile Iron watermain. PVC push-on fittings or mechanical joint fittings that meet C-907 and CSA B137.2 shall be used on PVC watermain.

4.5.10 Service Saddles

Service saddles must be used on all sizes of PVC watermain, and on ductile iron watermain where tapping size is 25mm, 38 mm or 50 mm.

4.5.11 Tappings

All tappings on watermains require service saddles.

Ductile Iron watermain services saddles shall be located at the 3 o'clock and 9 o'clock position.

On PVC watermain, tappings of 25 mm, for copper services, shall be at the 10 o'clock or 2 o'clock position and for polyethylene services, shall be at the 3 o'clock or 9 o'clock position. The tap must not be closer than 600 mm from the ends of the pipe. Avoid tapping into discoloured areas of the pipe and do not tap a curved pipe.

Tappings of 38 mm to 50 mm shall be at the 3 o'clock or 9 o'clock position. Only approved PVC tapping machines are to be used on PVC watermain by competent personnel and a protective blanket must be used if tapping under pressure. Extra precaution should be taken during installation in cold weather.

Size on size tappings (i.e.: 150 mm tapping off 150 mm watermain) not allowed on PVC watermain.

4.6 Line Valves

All valves are to be resilient seat gate valves, complete with valve box, on watermains up to and including 600 mm. Valves may be mechanical joint or push-on.

Butterfly valves shall be used on all watermains larger than 600 mm in size unless otherwise specified.

Valves in excess of 1.7 metres in depth shall require a valve stem extension.

4.6.1 Number of Valves

Three (3) valves shall be located at tee intersections. If pipe isolation is critical, in certain circumstances the preferred number of valves at cross intersections will be four (4). Where no services connect to the main between valve locations, one (1) valve may be eliminated upon City approval.

4.6.2 Location of Valves

Valves shall be installed with a maximum separation of 305 metres in all areas, or with a maximum of 60 services between valves.

Valves shall be located at intersections so as to be in the boulevard behind the curb radius. Valves should also not be located in the travelled portion of the road, if possible.

Watermains crossing rivers, railways and controlled access highways shall have valves at either side of the crossing.

4.6.3 Air Release Valves

Air release valves on systems up to 300 mm shall be in accordance with [W517](#). Air release valves to be placed at all significant high points on the systems 300 mm or larger. Whenever possible, line valves to be located in the same chamber as air and vacuum release valves. Combination air/vacuum valves to be provided with isolation valve and drain valve assemblies which shall always be left hand opening.

Air vents to be located a minimum of 2.0 metres behind the curb and 1.5 metres above final grade.

4.6.4 Pressure Reducing Valves

Pressure reducing valves (PRV) may be required in certain areas within the City of Barrie limits. Pressure reducing valves are not to be used as standard installations, but as special installations, at the discretion of the City's Representative.

Design should always allow for redundancy so that maintenance can be performed on the PRV without affecting service to customers.

All PRVs require isolation valves upstream and downstream from the PRV. For water quality and maintenance purposes, a hydrant is required downstream from the PRV with an isolation valve further downstream to allow the PRV and hydrant to be isolated from the rest of the system.

The setting of valves shall be determined by the City Representative.

4.7 Chambers

All valves on watermains equal to or larger than 500 mm in diameter will be set in precast waterproof concrete valve chambers. The depth of cover at valves will be reviewed on an individual basis to ensure the operation of the valves are not compromised by excessive depth. Valve chambers will contain a sump directly below the access point.

Within chambers all pipe shall be ductile iron (where possible). All other materials must be reviewed and approved by the City. PVC pipe is not permitted.

The chamber size shall be designed adequately to accommodate access and working height should be a minimum 1.7 m from floor to ceiling of chamber and working distance around outside surface of flanges to the inside wall shall be a minimum 500 mm. Clear access must be provided for entry of workers wearing Self Contained Breathing Apparatus (SCBA) and for removal of the equipment from the chamber.

The top of the roof slab of valve chambers shall be at least 600 mm below the profile of the finished pavement. Chambers shall be watertight and tested to confirm that they are water tight.

A self-levelling frame and cover shall be used for all new maintenance holes that are within an asphalt roadway.

Detailed drawings showing plan, profile and roof section are required for all valve chambers. Refer to [W524](#) and [W525](#).

The sizing of the chamber shall be in consultation with a City Water Operations Representative.

4.7.1 Pressure Reducing Valve Chambers

All pressure reducing valves shall be installed in an approved watertight steel chamber per the Verified Technologies for Drinking Water Systems list and [W523](#).

The sizing of the chamber shall be in consultation with a City Water Operations Representative.

4.8 Hydrants

4.8.1 Hydrant Spacing in Rights-of-Way

The maximum recommended hydrant spacing in ICI (industrial, commercial and institutional) and multi-family residential areas is 90 metres (Water Supply for Public Fire Protection, FUS, as amended), and in single family residential areas is 150 metres. Additional fire hydrants may be required in order to deliver adequate fire flow.

Hydrants shall be installed on all dead end watermains. At the discretion of the City's Representative, a blow-off may be utilized instead of the hydrant. When replacing existing hydrants use the same location, if possible. If a hydrant is to be located to a new location, the affected homeowners shall be notified by the contractor prior to installation.

4.8.2 Hydrant Connection to Main

All hydrants are to be connected to the watermain using a 150 mm ductile iron mechanical joint anchor tee complete with adjustable flange and resilient seat gate valve or PVC push-on tee, complete with restraining rods and clamps, from tee to the Isolation Valve and Box. Hydrant control valves will open in the same direction as the mainline watermain valve and be a minimum of 0.7 metres away from the fire hydrant.

The detail of the hydrant installation shall be according to [W507](#).

Hydrant flange elevations shall be set at a grade that will give a flange elevation of 50 mm to 100 mm above final grade. The flange at final grade shall be a breaking flange and shall be the only breaking flange on the hydrant.

4.8.3 Protection of Hydrants

Hydrants shall maintain an absolute minimum of a 1.5 metre clearance from the edge of curbs, 1.5 metres from driveways, 0.5 meter clearance to sidewalk infrastructure or any other above grade obstacles. If space is not available within the boulevard, a 3 m by 3 m easement behind the sidewalk may be required.

Hydrants located adjacent to parking areas, vehicle traffic areas or in areas without curbing will be protected by bollards as per [W509](#). The bollards must be located so they are not directly in front of a nozzle cap. The posts shall be of 150 mm diameter steel pipe exposed by at least 900 millimetres above grade. The post will be filled with concrete and painted with reflective chrome yellow enamel for ease of visibility.

4.9 Water Services

4.9.1 Residential Water Service Specifications

4.9.1.1 Residential Service Design

Each residential building lot will be permitted one service. The service pipe must be laid at right angles to the watermain and in a straight line from the watermain to the meter. The standard service lateral will be normally located so as to pass through a point near the centre of the building lot frontage.

On crescents or cul-de-sacs the service lateral may be laid at other than right angles to the watermain, but in a straight line from the watermain to the meter.

Service boxes shall be located on the property line in residential areas (Refer to [W537](#) and [W538](#)). A 36" stainless steel service box rod must be installed.

Water services/curb boxes are not to be installed within driveways.

4.9.1.2 Service Connections to Transmission Mains

No service connections will be allowed to connect to a transmission watermain.

4.9.1.3 Residential Service Installation

A City Representative must be present at all tapplings off an existing charged watermain. The Contractor shall provide all materials, excavation, necessary safety devices, backfill and restoration to permit the City's Representative to complete the tapping. The Contractor shall be responsible for all City costs associated with tapping watermains.

All 25 mm copper services shall be tapped at the 10 o'clock or 2 o'clock position. The copper service shall be installed with a vertical goose neck at the watermain. The height of the goose neck should be kept to a minimum. Refer to Drawing [W502](#). Services 38 mm and 50 mm require a saddle and shall be at the 9 o'clock and 3 o'clock position. Refer to [W503](#). All crossed-linked polyethylene services shall be tapped at the 9 o'clock or 3 o'clock position and installed with a horizontal goose neck at the watermain. Refer to [W504](#). All residential services, 25mm through 50mm, shall connect to the watermain using an equally sized service saddle.

The Contractor shall install a marker of 50 mm x 100 mm lumber, 2.5 metres in length, at each curb stop at the time of installation. The marker should project 1.3 metres above ground and be identified by painting the top 300 mm with “blue” paint. These markers must be removed (not broke off at ground level) at the time of acceptance of the watermain.

The City requires three working days’ notice from receipt of payment, made at building permit stage, to complete a tapping.

All residential service fittings shall be compression copper connections. Non-copper service pipe must have stainless steel inserts used at all service fittings. Copper services shall enter through the building wall or under the footings. Non-copper service pipe shall enter under the footings.

On a service of 50 mm and smaller, a main stop shall be installed at the watermain.

Water services terminated in a crawl space, under stair landings, in walls, or any other inaccessible areas will not be accepted. Any services larger than 50 mm shall be installed in accordance with procedures outlined in 4.4.

Curb boxes shall be sized for the service. The service box shall be installed in a perpendicular manner, properly adjusted to final grade. A 36” stainless steel service box rod must be installed. Curb stops shall be placed on the street property line. Curb stops shall be ball style with compression connection. Couplings shall be copper compression.

There shall be no couplings under the foundation or floor of the building or inside the building. Only one (1) coupling is permitted between the curb stop and the angle meter valve for services up to and including 50 mm. No couplings will be permitted between the watermain and the curb stop for services up to and including 50 mm.

An angle meter ball valve, complete with compression connection, is to be installed on all residential water services, at the point the service enters the building and prior to the water meter. Angle meter valves shall be no less than 450 mm and no more than 600 mm above the finished grade. Refer to [W532](#).

Trench depth shall be a minimum of 1.7 metres deep from final grade. Where the 25 mm service cannot maintain 1.7 metres due to the elevations of infrastructure, the contractor shall install 100 mm PVC SDR28 liner, a minimum of 0.5 metres below the utility. This will allow for the installation/removal of the water service.

Services 25 mm to 52 mm in diameter shall be embedded in sand, conforming to OPS 1004.05.08, and 100 mm above and below the service pipe.

The Contractor will be responsible for any costs associated with the relocating of service(s) that do not comply with the City's specifications.

4.9.1.4 Service Material

Copper service pipe shall be a continuous run of Type "K" (W.H.) 3rd party soft copper, minimum 25 mm in diameter. Non-copper service pipe shall be a continuous run of cross-linked polyethylene (PEX) tubing minimum 25 mm in diameter complete with tracer wire and stainless-steel inserts at all joints.

4.9.2 Specifications for General Services (ICI and Multi-Residential)

One domestic and one fire service are required. Any services larger than 50 mm shall be installed in accordance with procedures outlined in section 4.4.

Curb boxes shall be sized for the service. The service box shall be installed in a perpendicular manner, properly adjusted to final grade. A 36" stainless steel service box rod must be installed. Curb stops shall be placed on the street property line. Curb stops shall be ball style with compression connection.

Couplings shall be copper compression. There shall be no couplings under the foundation or floor of the building or inside the building. Only one (1) coupling is permitted between the curb stop and the angle meter valve for services up to and including 50 mm. No couplings will be permitted between the watermain and the curb stop for services up to and including 50 mm.

An angle meter ball valve, complete with compression connection, is to be installed on all 25 mm water services, at the point the service enters the building and prior to the water meter. Angle meter valves shall be no less than 450 mm and no more than 600 mm above the finished grade. Refer to [W540](#).

Trench depth shall be a minimum of 1.7 metres deep from final grade. Where the 25 mm service cannot maintain 1.7 metres due to the elevations of infrastructure, the contractor shall install 4.0 metres of 100 mm PVC SDR28 liner, a minimum of 0.5 metres below the utility. This will allow for the installation/removal of the water service.

Services 25 mm to 52 mm in diameter shall be embedded in sand, conforming to OPS 1004.05.07, and 100 mm above and below the service pipe.

The Contractor will be responsible for any costs associated with the relocating of service(s) that do not comply with the City's specifications.

Written material approval list, for the materials required, shall be submitted to the City Representative for approval before commencing with the installation of the water services.

The Developer/Owner shall determine the pipe size for the proposed domestic service. This service shall be continuous from watermain to water meter. The Developer/Owner shall provide the corresponding flow calculations for any domestic service larger than 50 mm.

The Contractor may utilize an existing valve for tie-in purposes if available. It is understood that should this valve fail, for any reason during the testing procedure, it shall be the Developer/Owner's responsibility to replace the valve, including all labour, material, and excavation.

All water services from 100 mm to 300 mm shall be Ductile Iron or PVC. Should a soils report indicate aggressive soils are present on the site, PVC watermain shall be used unless the soils are contaminated. The industrial service pipe material must be Ductile Iron from the restraining flange to a minimum of 3 metres outside the foundation. Refer to [W505](#). The internal piping must also meet the most current Building Code and/or National Fire Protection Act. Adequate cathodic protection shall be required, per section 4.5.5 of this document.

Per current City of Barrie Fees By-Law, there shall be a daily charge for operation of a valve for filling the service.

The service pipe(s) shall be laid at right angles to the watermain and in a straight line from the watermain to the property line on the building lot frontage. A service valve is not required on the property line for services larger than 50 mm, due to the use of "tapping" valves on larger services.

All main stops, curb stops, meter valves, and shutoff valves up to and including 50 mm are to be ball valves. Valves over 50 mm shall be gate valves.

Any water service 50 mm and less shall have a curb stop and box on the property line and curb box shall not be located in driveway. A City Representative shall complete all tappings of any existing charged watermain. The Contractor shall provide all materials, excavation, necessary safety devices, backfill and restoration to permit the City Representative to complete the tapping. The contractor shall be responsible for all City costs associated with tapping watermains. Refer to current Fees By-Law.

All domestic water services 50 mm and less shall be Type K 3rd party soft copper (25-50 mm) or cross-linked polyethylene (PEX) tubing (25-50 mm).

The City shall NOT be responsible, or liable, for adverse water quality resulting from the installation of an improperly sized water service.

No person shall operate valves, hydrants or interfere with a potable water system in any manner. Failure to comply with this regulation will result in a charge, outlined in current Fees By-Law.

The Developer/Owner shall supply all materials, labour and excavation necessary for charging, swabbing, testing, chlorinating and/or flushing the new service.

The water service tapping requirements are as follows:

TAPPING SIZE	DUCTILE IRON WATERMAIN	PVC WATERMAIN
25mm to 50 mm	Service saddle required	Service saddle required
100 mm and larger	Tapping sleeve and valve up to size on size tapping A cutting-in tee and valve for larger than size on size tappings.	Tapping sleeve and valve up to one trade size smaller than existing watermain. A cutting-in tee and valve for size on size tappings or larger.

Should a temporary service be required, a backflow device must be installed.

4.9.3 Fire Services

All fire services shall conform to the Ontario Building Code and Ontario Fire Protection and Prevention Act.

The fire service requirements shall be the responsibility of the Developer/Owner. Information may be obtained from the Insurance Underwriters, the City of Barrie Building Services Department and the City of Barrie Fire Department.

Where fire services are not metered, the Developer/Owner shall pay to the City a fixed annual service charge. Refer to current Water Rates By-Law.

The City may test the fire water service system from time to time to determine the loss of water through system leakage or other causes. If as a result of the testing, the City believes that water has been used from the said system for other than fire protection purposes, the City may require that the fire water service system be metered and the Developer/Owner shall comply forthwith.

For Fire Protection charges refer to current Fees By-law.

The Owner shall paint private hydrants "Fire Hydrant Red". If a fire hydrant is installed on the fire service, a valve and box is required on the service before it enters the building.

A building shall be within 90 metres of a fire hydrant.

All siamese connections shall be within 45 metres of a fire hydrant.

Private fire hydrants or other fire water service outlets shall not be operated except in the case of fire for fire protection purposes unless special permission of the City has been obtained.

All hydrants shall be maintained as per fire code/insurance requirements.

4.10 Irrigation

All waters consumed in city parks, recreational lands, or on any other property, or as otherwise consumed directly from the municipal drinking water system and including waters for irrigation, yard hydrants, shelters or structures, special event usages, temporary, permanent, or permanent-temporary, construction use, or any other water uses shall be metered, backflow prevention, cross connection and unauthorized use protected.

4.10.1 Irrigation Metering

All waters supplied to city parks, recreational lands or any other property that has no means of prevention from freezing temperatures, or no means of protection from physical damages, shall pass through a water meter that is housed in a pit setter or an above ground enclosure. No single water service of this description shall be greater than 2" (50 mm) size.

The installation and use of water meters shall meet all requirements of and are subject to all applicable City of Barrie Water Distribution Specifications and By-laws.

4.10.2 Pit Setters

Pit setters per the Verified Technologies for Drinking Water Systems list shall be used. Alternative pit setters that meet or exceed the same specifications, standards and quality, as the above models, may be substituted with prior written approval from the City of Barrie. Pit setters must be installed in strict accordance with the manufacturer's instructions and recommendations and all applicable City of Barrie By-laws and Water Distribution Specifications. Pit setters shall not be located on easements but shall be located inside the property line and close as practicable to a roadway. Full access must always be available to a pit setter and if a pit setter is located within a fenced area, access through the fence must be provided.

Pit setters must be installed with a means of isolation via a curb stop, which shall be located on the street property line, or other location preapproved by the City of Barrie. There shall be no other connections on the piping between a curb stop and a pit setter. A City Representative shall confirm this installation arrangement before water is supplied to a pit setter.

The Developer/Owner shall supply and install a pit setter and make a capital contribution to the City of Barrie for the applicable service inspections, review and approval costs. Upon final approval by a City Representative of the complete installation and at the time the municipal drinking water is supplied to a pit setter, the pit setter will become the property of the City of Barrie. Refer to [W506](#).

4.10.3 Above Ground Irrigation Enclosures

Pre-manufactured enclosures shall be certified to ASSE 1060 specifications and if an enclosure is custom fabricated, it must conform to ASSE 1060 specifications. The following enclosure manufacturers are preapproved for use in the City of Barrie: Hot Box and Watts Box.

All enclosures shall be equipped with a means to secure their entry utilizing a padlock(s). Enclosures shall be anchored to a concrete pad that is a minimum 4" (100 mm) thick with the top surface a minimum of 1" (25 mm) above the surrounding grade and extending a minimum 3" (75 mm) beyond the outside perimeter of the enclosure. All piping that pierces the concrete pad must be sleeved and a minimum clearance of 1" (25 mm) must be maintained around the piping outside diameter.

Enclosures shall be selected or fabricated to provide an adequate level of tamper and vandal proofing. The City of Barrie shall give prior written approval for the selection of all enclosures before their installation. Enclosures must be selected and installed in strict accordance with the manufacturer's instructions and recommendations and all applicable City of Barrie By-laws and Water Distribution Specifications.

Where an enclosure is installed on the same property as a pit setter, the enclosure shall be located close as practicable to the pit setter. Full access must be available to an enclosure at all times and if an enclosure is located within a fenced area, access through the fence must be provided.

The Developer/Owner shall supply and install enclosures and make a capital contribution to the City of Barrie for the applicable service inspections, review and approval costs. Upon final approval by a City Representative of the complete installation and at the time the municipal drinking water is supplied to an enclosure, the enclosure will become the property of the City of Barrie.

4.10.4 Irrigation Backflow Prevention

Waters supplied to city parks, recreational lands or any other property, or any other waters supplied via a direct connection to the municipal drinking water system shall be protected from backflow, as required by City of Barrie Drinking Water Protection: Backflow Prevention and Cross Connection Control By-law.

Where a backflow prevention device is required outdoors downstream of the pit setter assembly, it shall be located in an above ground enclosure that is specifically designed for the purpose and appropriate for the style and size of device being housed.

Provided all allowable clearances and limitations are met and not exceeded, respectively, a backflow prevention device and water meter may be located within the same enclosure. Where this is the arrangement, full and independent access must be available to each component for their operation, inspection, maintenance, removal or replacement and without interference or removal of any other component, or part thereof. All piping connections must be standard pipefittings listed for potable water use. A meter and a device must be the same trade size and a device must be located downstream of a meter. A meter must be connected to the piping at its inlet utilizing flanges and a ball valve shall be furnished upstream of the inlet flanged connection. A flanged connection shall be utilized between a meter and a device. A device must be connected at its outlet utilizing flanges and

a drain/purge connection shall be furnished downstream of the device outlet flanged connection. Pipe unions will not be accepted as flanged connections. A meter and a device within the same enclosure must be supported separately and independently and independent of the connected piping. Any supports shall not interfere with the inspection, repair, maintenance, operation, removal or replacement of any component.

Where a backflow prevention device is installed within an enclosure, all piping connections must be standard fittings listed for potable water use and shall be connected to the piping utilizing flanged connections to accommodate its removal and replacement. A ball valve shall be furnished upstream of the inlet flanged connection and a drain/purge connection shall be furnished downstream of the outlet flanged connection. Pipe unions will not be accepted as flanged connections. A device must be supported independently of the connected piping and any supports shall not interfere with the inspection, repair, maintenance, operation, removal or replacement of a device.

The Developer/Owner shall supply and install all backflow prevention devices and make a capital contribution to the City of Barrie for the applicable service inspections, review and approval costs. Upon final approval by a City Representative of the complete installation and at the time municipal drinking water is supplied to a device, the device will become the property of the City of Barrie.

4.10.5 Yard Hydrants

Yard hydrants must be installed with a means of isolation via a curb stop, which shall be located downstream of and close as practicable to a pit setter. There shall be no other connections on the piping between a curb stop and a yard hydrant. A City Representative shall confirm this installation or arrangement before any water is supplied to a yard hydrant.

The City of Barrie shall give prior written approval for the selection of all yard hydrants before their installation.

All yard hydrants shall be equipped with a means to secure their use, utilizing a padlock.

The Developer/Owner shall supply and install a yard hydrant and make a capital contribution to the City of Barrie for the applicable service inspections, review and approval costs. Upon final approval of the complete installation and at the time municipal drinking water is supplied to a yard hydrant, will become the property of the City of Barrie.

4.10.6 Irrigation and Alternative Use

All waters supplied and used in city parks, recreational lands, or on any other property, or as otherwise consumed directly from what is described as the municipal drinking water system and including waters for irrigation, yard hydrants, shelters or structures, special event, temporary, construction use, permanent, or permanent-temporary, or any other water uses shall be authorized and controlled by the City of Barrie. All water usages, as described above, shall be governed under regulations, processes, policies and procedures as developed, implemented and amended from time to time and administered by the Water Operations Branch.

Yard hydrants must always remain locked and their use shall be authorized and controlled through a key sign-out process with a written, binding agreement upon authorized users, as administered by the Water Operations Branch.

The Water Operations Branch shall authorize waters supplied directly from the municipal drinking water system and used for irrigation purposes or used for any other purpose that requires backflow prevention. The Water Operations branch shall assume the control and maintenance of all backflow prevention devices and enclosures and the water supply with regard to the above usages.

The Water Operations Branch shall approve all designs, installations and usages of all parts of the municipal drinking water system that are to be installed in city parks, recreational lands, or other property, or otherwise any other direct usages of the municipal drinking water system.

4.11 Water Meters

4.11.1 General Service Water Meters (ICI and Multi-Residential)

Meter size must be the same as service size entering building.

The City shall supply and install water meters up to and including 50 mm. The Developer/Owner must make a capital contribution for each meter that is required, along with inspection fees and other associated fees (e.g. tappings), prior to the meter being installed. Refer to current [Fee's By-Law](#).

All meters greater than 50 mm shall be supplied and installed by the Developer/Owner and will become the property of the City at the time of occupancy. Measurements must be in cubic metres (m³), refer to [W533](#) and current [Fee's By-Law](#).

The City has the right to re-size the meter if they determine that the domestic metering has been improperly calculated.

The City of Barrie does not allow turbine meters nor should butterfly valves be installed.

All water meter locations are to be:

- 1) Reviewed and approved by the City Representative;
- 2) Accessible at all times, and
- 3) Installed in a horizontal position within the mechanical room. This room is to be sized to allow meter installations as per [W533](#) and [W540](#).

In General Service Properties only one Bulk meter will be used per property, with exception of multi-residential developments where multiple buildings exist on a single property. In these instances, one meter per building is preferred.

Meter by-passes are mandatory on all water meter installations 38 mm and larger. All water services shall have a valve installed on each side of the water meter. For water meters installations 38mm or larger refer to [W533](#) and for water meters installations less than 38mm refer to [W540](#). Operation of the by-pass valve by other than a City Representative will result in the disruption of service and/or charges being levied.

The correct spacing for setting water meters is as follows:

METER SIZE	METER SETTING SIZE
16 mm x 19 mm	250 mm
19 mm	330 mm
25 mm	380 mm

*The above includes allowance for meter couplings or "tail pieces".

38 mm	330 mm
50 mm	432 mm
75 mm	432 mm
100 mm	508 mm
150 mm	610 mm

*The above is flange face to flange face dimension of the meter only. The Contractor is responsible to ensure the above mentioned values are to catalogue specifications.

4.11.2 Residential Water Meters

Meters 16mm to 19mm water meters are purchased from the City's Water Operations Branch as a package and installed by the Developer/Owner. For Water Meters 25mm to 50mm, the Developer/Owner shall provide a capital contribution to the City for the applicable meter, services inspection costs and installation of the water meter.-This meter shall be provided and installed by the City prior to occupancy of the premises. All meters above 50 mm shall be supplied and installed by the Developer/Owner. The meter will be the property of the City at the time of occupancy.

4.11.3 Care of Water Meters

All domestic meters shall be maintained and repaired by the City. Meters, or meter accessories, damaged due to neglect or by freezing, shall be repaired or replaced at the expense of the Developer/Owner.

4.11.4 Location of Water Meters

Water meters located in a crawl space, under stair landing, in walls, or other inaccessible areas will not be accepted.

The Developer/Owner shall keep the water meters accessible, clean, dry, and protected from freezing.

Piping downstream (and upstream if necessary) must be secured prior to meter installation.

4.11.5 Remote Wire Installation/Inspection

The Developer/Owner shall be responsible to install wire for the remote meter. The meter wire shall be installed from the water meter location to within 0.3 metres of the electric meter base outside of the building and between 1.3m to 1.5m above final grade. A 300 mm (12") coil of wire must be left at the angle meter valve and outside of the building at the meter base. The remote meter wire must be installed a minimum of 200 mm (8") from any electrical wiring and inside the building, not underground. The remote wire will be tested for continuity at the time of the service inspection and pressure test. Should the remote meter wire test fail, the water service will not be connected until the remote meter wire is repaired. It will be the responsibility of the Developer/Owner to repair the remote meter wire to the satisfaction of the City's Representative. Four-conductor wire will not be accepted.

4.11.6 Failure to Register Properly

Where the City has established that a water meter has failed to register accurately, the City shall estimate the quantity of water consumed. The recorded consumption prior to such failure will be the basis of estimating quantities consumed during the failure.

4.11.7 Testing

The City reserves the right to test the water meter at any time.

4.11.8 Dispute Test of Water Meters

Upon written request by the Consumer, the City may test any water meter at the expense of the Consumer. If the meter is found to be inaccurate, the City shall adjust the water bills accordingly and absorb the cost of testing.

4.11.9 Discontinue the Supply

The City may interrupt the supply of water to any premises that has overdue and unpaid accounts. The City shall restore the supply of water (within 48 hours) upon payment to the City of such overdue amounts plus any applicable service charge.

4.11.10 Draining the Plumbing

Where the Owner has requested the water supply to be shut off at the curb stop, the City will not be responsible for draining the water meter and plumbing apparatus to prevent freezing or other damage.

4.11.11 Not for Sale

Water supplied by the City shall not be resold nor shall water servicing be extended without the written permission of the City.

5 Acceptance Protocol for Watermains and Services

5.1 General Requirements

The Developer/Owner shall retain the services of a Professional Engineer experienced in the design and installation of water services. The Professional Engineer retained shall be authorized to practice in the Province of Ontario and shall be responsible for the preparation of drawings and specifications for the proposed water services to the satisfaction of the City. The services of the Professional Engineer shall continue until the work provided for on the site is completely developed.

The Developer/Owner is responsible for the City's service connection charges arising out of, or attributable to the development of the site plan including, but not limited to field inspection, testing and connection of the water services. The City reserves the right to order field revisions, as deemed required by the City's Representative, at the expense of the Developer/Owner.

The Developer/Owner shall have survey markers and/or property bars defining the boundary of each lot, easement and road allowance.

The City requires a separate fire and domestic service and permits one domestic and fire service per lot. Backflow prevention at premise isolation is required to be installed on all domestic and fire services in accordance with the Backflow Prevention and Cross Connection Control By-Law. The type of the device to be determined by CSA B64.10 Series Standards.

The Developer/Owner shall relocate, support or modify any existing infrastructure required to develop the site, at his own expense.

When a site is subject to a Development Agreement, connections to the municipal system are not permitted until the agreement has been registered.

The Developer/Owner shall obtain all necessary permits and consents associated with excavation and installation of water services on existing City of Barrie road allowances and to discharge any applicable City of Barrie Act charges or Local Improvement charges.

The Developer/Owner shall make a capital contribution towards the extension of the water services to the site and across its frontage if the present servicing is not adequate to accommodate the development. The amount of the capital contribution will be determined by the City.

Should the Developer/Owner propose to "phase" the servicing of this development, the City reserves the right to comment and/or alter the proposal, in order to service the development in a logical order.

The Developer/Owner shall be responsible to co-ordinate the installation of all infrastructure and driveway entrances so that conflicts do not occur in the field. All driveways indicated on the drawings must be a minimum distance of 1.5 metres from any above ground water facility.

The water services and fire hydrants within the limits of this site plan are privately owned and shall be maintained by the Developer/Owner.

Water meter to be located within the mechanical room on the ground floor and shall always be totally accessible. The mechanical room shall be sized appropriately for the required meter, bypass assembly as per [W533](#) (if applicable), fire service (if applicable), and backflow prevention.

The service size shall be continuous from watermain to water meter.

Any existing service that will be decommissioned shall be done to the City's satisfaction. This would typically involve disconnecting existing service at the watermain, and entirely removing or abandoning with low strength grout the remaining portion of service within the ROW.

5.2 Approvals

The City of Barrie will not release consent for the issue of building permits prior to the watermains and services being installed, approved and connected to the existing municipal water distribution system.

Approval for construction shall be given if:

- 1) The City has approved all drawings and materials;
- 2) The City has received a complete set of mylars;
- 3) The City has received a copy of the Ministry of the Environment and Climate Change Certificate of Approval, and number;
- 4) The Subdividers Agreements have been signed;
- 5) All Letters of Credit have been placed;
- 6) All cash contributions have been made between the City of Barrie and the Developer(s)/Owner(s);
- 7) All drawings pertaining to roads, sanitary, and storm sewer locations have been signed by the City of Barrie;
- 8) All Municipal Consents have been approved by the City of Barrie;
- 9) The City has received 48 hours' notice prior to construction; and
- 10) The required liability insurance has been taken out.

Should the Subdivider's Agreement not be signed, the Developer/Owner will be permitted to start work on their own lands once the following conditions are met:

- 1) MECP Certificate of Approval obtained;
- 2) The Engineering Fee is paid to the City;
- 3) Insurance requirements are in place;
- 4) All drawings pertaining to roads, sanitary, and storm sewer locations have been signed by the City of Barrie;
- 5) All Letters of Credit have been placed, in accordance with the City of Barrie Development Manual; and,

6) The housekeeping deposit is paid.

The Development Agreement must be signed by the Developer/Owner and a Letter of Credit in place prior to the start of construction.

No connection to existing municipal services or work on City property will be permitted until after registration of the Plan of Subdivision. No tie-ins to the existing municipal water distribution system will be allowed until the Subdivider's Agreement has been signed by all parties.

Should demolition permits be required, the Developer/Owner must sign the appropriate forms and forward to all applicable parties.

The City's Representative shall complete site plan water servicing conditions that are to be incorporated into a site specific Development Agreement and forward a copy to the Civil Consultant and the Developer/Owner.

The Developer/Owner shall supply a drawing, indicating water servicing for the project, including a Professional Engineer's stamp and signature. All field or design changes affecting servicing drawings shall be forwarded to the City Representative for comment prior to any further work proceeding. Requirements for water servicing drawings are listed in the City of Barrie Development Manual.

The water servicing drawings will be reviewed by the City and revisions forwarded to the Developers' Consultant. The Consultant shall forward the MECP Approval forms and the MECP fee to the City for review, complete with two sets of water service drawings.

Upon completion of the testing procedure, the Consultant shall deposit with the City, within 30 days, record drawings in accordance with the City of Barrie's Development Manual. Failure to provide record drawings and valve location drawings will result in the City taking the responsibility to produce "as-constructed" drawing. All associated costs shall be at the expense of the Developer/Owner.

Upon approval of the water servicing drawings, the City's Representative shall sign off the site plan and building permits.

A Registered Plan of the project shall be required prior to the start of construction.

5.3 MECP Approvals

The Applications for MECP Drinking Water Works Permit must satisfy the design standards set out in the MECP publication "Watermain Design Standards for Future Alterations Authorized under a Drinking Water Works Permit".

5.4 Installation and Inspection

Prior to the installation of the watermain and appurtenances, the Contractor shall notify the City's Representative 48 hours in advance.

The Consultant/Contractor shall obtain all necessary permits and consents associated with the excavation and installation of water distribution systems on existing City of Barrie road allowances. The Developer/Owner shall have survey markers and/or property bars defining the boundary of each lot, easement and road allowance.

All construction shall conform to the City's Standard Specifications and Drawings. During construction all watermain installations shall be in accordance with Ministry of the Environment, Conservation and Parks (MECP) [2020 Watermain Disinfection Procedure](#).

The City requires an inspection of all distribution systems installed.

The Contractor shall notify the City Water Operations Department 48 hours before commencing any work.

The City does not provide full time inspection but a City Representative will be on site as long as required, to oversee proper installation, materials, and construction is adhered to as outlined in this document.

The City Representative shall be introduced to the Contractor at the pre-construction meeting.

The City Representative shall not be considered as a substitute for supervision by the Owner or his Contractor.

The City Representative is not responsible for ensuring that the trench meets the criteria set out by the Occupational Health and Safety Act. Safety shall be adhered to at all times.

The Developer/Owner shall pay the City for the services of the City Representative at regular rates Monday through Friday, 8:30 a.m. to 4:30 p.m. Overtime rates shall apply for all other times, including statutory holidays and City holidays. When a contractor is going to work outside of normal working hours he/she should notify the City's Water Operations Department a minimum of 48 hours before work is to commence.

The Contractor should follow all instructions given by a City Representative of the City relating to the quality or type of material, installation or construction practices.

The Developer/Owner agrees to have a surveyor verify the final installation grades, elevations and the trench locations for the watermain, main valves, hydrant valves and top flange elevations of the hydrants. The surveyor shall provide the City Representative with a daily written verification.

The City Representative has the right to suspend the work immediately if the work practices being employed, the materials being used or the proposed layout is insufficient. This will be in the form of verbal notification, followed by a written notification. Work shall not recommence until the written notification has been rescinded by the City Representative.

The City Representative, in consultation with the Consulting Engineer and the design staff, reserves the right to order field revisions at the expense of the Developer/Owner.

5.4.1 Residential Service Inspections

The Contractor shall schedule service inspections forty-eight hours in advance.

All applicable inspection fees, meter fees and/or tapping fees must be paid prior to scheduling of inspections. Refer to the current Fee's By-Law.

Should the City's Representative be required to return to the site for an extra inspection (due to curb box damage, curb box not accessible, coupling not exposed, approved angle meter valve not

installed, leakage or the remote wire failure), the Contractor shall reschedule another inspection and shall be invoiced a service charge.

Services must be extended inside the building to the meter location and the angle meter valve must be installed. All services must always be completely accessible.

It is the responsibility of the Contractor to provide the appropriate protection to prevent damages caused by the flushing procedure.

During winter conditions, the same procedures shall apply. The Contractor is responsible for protecting the service from adverse weather conditions, including freezing.

5.4.2 Contractor's Supervision

The Contractor shall have a Supervisor/Foreman in charge at all times. This person shall be responsible for notices, communication or installation instructions and safety precaution.

5.4.3 Under Subdivision Agreement

5.4.3.1 Watermain

Watermain is to be supplied and installed by the Developer/Owner. Upon MECP water sample approval and at the end of the two-year maintenance period, this watermain will become part of the City's Distribution System and will be maintained by the City.

5.4.3.2 Water Services

Individual services are required to each unit, from the watermain to the meter. The curb box shall be on the street line. After the two-year maintenance period, the City will be responsible for the watermain and water services installed in the right-of-way. On private property, the homeowner is responsible for their water service. The City may make the repairs on private property, at the homeowner's request and at the homeowner's expense.

5.4.3.3 Water Meters

Individual water meters are required to each unit. The Developer/Owner is responsible for water meter costs. Refer to current Fee's By-Law.

5.4.4 Under Site Plan Control

5.4.4.1 Watermain

The watermain is supplied and installed by the Developer/Owner who is responsible for all repairs. The City will isolate the system at the Developer/Owner's expense. Valves shall be placed at the adjacent road allowance to the site.

5.4.4.2 Water Services

Individual services only are allowed. The curb box shall be a minimum of 1.5 metres from the face of the building. All repairs shall be completed by the corporation, at their expense.

5.4.4.3 Water Meters

All water meters to be supplied by the City of Barrie.

Individual read meters must be used. Meters must be accessible to the City's Representative.

The Developer/Owner is responsible for all water meter costs.

5.5 Abandoning Watermains and Services

All mains and service shall be removed from the ROW or grouted with low strength grout. Plug ends of all abandoned mains with concrete. Plug all tees and crosses where the abandoned main connects to a main remaining in service.

Remove mechanical joint valves in chambers and salvage. Abandon and bury lead joint type valves. Remove hydrants for salvage for City reuse. Remove top one metre of chamber, salvage frame and cover for future City reuse. If remaining chamber is in the roadway backfill with unshrinkable fill or if in the boulevard area, backfill with granular fill. Bottom of chamber to be broken to allow drainage.

Water services which are being abandoned should be detached at the main. If it is a tee, it is to be removed and a filler piece installed. If it is a tapping valve and valve is in good condition, the valve can be shut off and the main capped.

5.6 Temporary Portable Water Systems

Temporary potable water systems shall conform to OPSS 493

5.6.1 Disinfection of Temporary Potable Service Connections

Temporary service connections shall be chlorinated at the commencement of the contract works. Disconnection and relocation of service connections from one site to another within the contract works will not be subject to re-chlorination, unless otherwise directed by the Site Representative.

Where temporary service connections are disinfected in conjunction with the temporary by-pass watermain no physical connections to hose bibs will be permitted until after successful disinfection.

Where temporary by-pass service connections are disinfected offsite in a controlled environment, one set of samples shall be collected from every 350 m of service hose connected in a series. One set of samples shall also be taken from source and at each end of any hose group connected in series, regardless of the total length. Where temporary by-pass service connections are disinfected in conjunction with the temporary by-pass watermain additional samples must be taken at the end of any two (2) temporary by-pass service connections for every 350 m of temporary by-pass watermain disinfection.

5.7 Temporary Service Connections

The Contractor shall make all shut-offs of consumers services and the final connections from the by-pass pipe to the consumer using flexible hose. Special connections requiring excavation, cutting or tapping shall be made by the Contractor.

The Contractor shall notify the customer concerning this operation in advance. Once the pipeline is returned to service, the Contractor shall restore the consumer to service and disconnect the hose from the consumer connection.

Where admittance to the customer's premises is denied or impossible, by virtue of absence, the connection cannot be cleared, it may be necessary to excavate and clear the service at the main. Where 100 mm diameter temporary connections to the consumers are called for, the length of the 100 mm diameter piping required will be paid at the unit price for 100 mm diameter Temporary By-Pass Piping. Cutting-in or tapping shall be provided by the Contractor and is included in the price bid.

All temporary service Connection materials shall conform to the NSF 61 standard. All hose used for individual property connections shall be minimum 20 mm I.D., designed for a working pressure of 860 kPa and be free from defects in materials and workmanship.

The pipe, hose and all other materials supplied by the Contractor for temporary servicing shall be approved by the contract administrator. Materials shall be fully adequate to withstand the pressures and other conditions of use and shall be of material which does not impart any taste or odour to the water in accordance with NSF 61 Standard. The pipe and fittings shall provide adequate water tightness and care shall be exercised throughout the installation of any temporary pipe and service fittings to avoid the possible pollution of any City main/property services or the contamination of the temporary service pipe. Flushing of the private service connections and chlorination of the by-pass line prior to their use will be required. The temporary service connection shall have a valve near the point of connection to the by-pass and also to the private plumbing system so that, except for the final connection, the by-pass line and private services may be chlorinated.

During freezing, stormy or inclement weather, no work shall be done except that which is directed by the Project Manager. No by-pass service pipe or property service connections shall be installed during freezing or inclement weather and pipes already in use shall be removed or drained and services restored when directed by the contract administrator. Removal and re-installation of such pipes or services shall be done at the Contractor's expense.

Each home shall have its own temporary water service connection to the by-pass pipe and a connection to the private plumbing via a wye at an outside tap. The branching of wyes from a single spigot shall not be permitted; nor will connecting homes in series. An approved hose connection vacuum breaker (HCVB) shall be supplied on the open end of all wyes.

It shall be the responsibility of the Contractor to ensure an adequate water supply at all times. During the construction process, the Contractor is responsible for restoring a customer's water supply within two hours of notification from the Contract Administrator.

5.8 Testing

Testing of the system shall conform to the following sequence: initial tie-in, remove swabs, flush the watermain, pressure test, chlorinate the system, flush the system, take water samples for bacteriological analysis as required, tracer wire continuity and complete final tie-ins. No tie-ins to the existing water distribution system shall be allowed until the Subdivision Agreement has been signed by all parties, all financial obligations have been fulfilled and all testing and sampling has been completed to the satisfaction of the City. When all the above conditions are met, the new system shall be connected to the existing system.

5.8.1 Industrial, Commercial, Institutional and Multi-Residential Testing Procedure

Testing of ICI domestic services and fire services shall conform to the following sequence: initial tie-in, remove the swabs/charge the watermain, pressure test, chlorinate, flush the system and take water samples. The service will not be turned on until samples are approved.

5.9 Initial Tie-In

Upon receipt of Ministry of the Environment and Climate Change approvals by the City and all testing has been completed to the satisfaction of the City's Representative, the remaining tie-in to the Water Distribution System is scheduled.

A City Representative must complete all tapings off any charged watermain. The Contractor shall provide all materials, excavation, necessary safety devices, backfill and restoration to permit the City's Representative to complete the tapping. The Contractor shall be responsible for all City costs associated with tapping watermain.

At the discretion of the City's Representative, a Contractor may be permitted one initial tie-in to the existing watermain by installing a new resilient seat gate valve. The Contractor shall supply all materials, excavation, labour, equipment and restoration. Should there be an existing valve in place for tie-in purposes, the Contractor may utilize this valve with the understanding that should this valve fail, for any reason during the testing procedure, it shall be the Contractor's responsibility to replace the valve, including all labour, material and excavation.

The City's Representative shall be present to inspect the tie-in by the Contractor.

The City's Representative shall determine the location of the initial tie-in, usually at the lowest elevation point. All required tapings, on existing charged watermain must be performed by the City. If a tapping sleeve and valve is required for the initial tie-in, they must be supplied and installed by the Contractor. A City Representative must be present during the installation. There shall be a daily charge for operation of a valve for filling the watermain.

Failure to comply with this regulation will result in a charge outlined in the current fees By-law.

Should the City's Representative deem that circumstances do not allow an initial tie-in; then the Contractor shall use a by-pass complete with a check valve and shut-off. The location of the by-pass shall be at the discretion of the City's Representative.

The Contractor shall remove all temporary services from the watermain when the services are no longer needed and replace them with brass plugs.

The Contractor shall not operate any existing valves, existing blow-offs, existing hydrants or remove any anti-tampering devices for any reason.

If an existing hydrant is used for by-pass purposes, there shall be a charge for installing and removing a gate valve, as supplied by the City. Only gate valves supplied by the City shall be used. The City shall supply a check valve, it will be the Contractor's responsibility to install it immediately downstream of the City-installed gate valve.

When the Contractor is not granted permission to do the tie-in, the Contractor shall provide all the materials, excavation, labour, equipment, necessary safety devices and restoration for the City Representatives to complete the actual tie-in. The Contractor shall provide assistance as required by the City's Representatives.

5.10 Swabbing/Charging the Watermain General Services

Swabs shall be supplied by the City's Representative on the site. The swabs shall be numbered, and the City's Representative is required to witness the installation of swabs by the Contractor. A swabbing schedule shall be prepared by the Developer's Consultant and approved by the City's Representative. The swabbing schedule shall indicate where the swabs are to be installed and removed.

Swabs up to and including 300 mm may be taken out of hydrants. If hydrants are used to remove swabs, the Contractor shall remove and replace the internal parts of the hydrant. If hydrants are not located in suitable areas then risers shall be installed by the Contractor, at his expense, to facilitate the removal of swabs. All risers shall be properly restrained and installed above ground. All swabs over 300 mm must be taken out of risers. Refer to [W510](#).

The City Representative shall remove the swabs. The Contractor shall supply a means of swabbing the system and provide assistance, at his expense, as determined by the City Representative. It shall be the responsibility of the Contractor to supply a water course for the water to escape, without causing damage/erosion to the existing grade of the property or adjacent properties, during swabbing. Any damage caused by swabbing the watermain shall be restored to its original state or better, by the Developer/Owner. The City shall not be responsible for any damage or repairs during swabbing.

All swabs shall be accounted for and removed from the system prior to pressure testing the system. Any swabs that are not accounted for may require excavation to locate and remove them. All additional work required to locate and remove misplaced swabs shall be at the Developer/Owner's expense.

Swabbing by hand may be utilized by the Contractor if deemed acceptable by the City Representative.

5.10.1 Industrial, Commercial, Institutional and Multi-Residential Services

All domestic and fire services larger than 50 mm shall be swabbed. Swabs shall be supplied by the City Representative on the site. The swabs shall be numbered, and the City Representative is required to witness the installation of swabs by the Contractor. If a multiple system is installed, a swabbing schedule shall be prepared by the City Representative and shall be supplied to the Developer/Owner. The swabbing schedule shall indicate where the swabs are to be installed and removed. All swabs are to be removed by Water Operations Staff.

All risers in a multiple ICI service site must be removed by the Contractor prior to the commencement of pressure testing unless the riser is the only means of flushing the watermain.

5.11 Pressure Testing General Services

The Contractor shall strive to install a system that has zero leakage and zero pressure drop when tested. Pressure testing of all new water systems will be completed by the City's Representative.

The pressure test will be for a two-hour period at 1035 kPa (150 psi) zero leakage and zero pressure drop. If the pressure test meets this criterion, the system as a whole, shall be accepted.

If the above criterion is not met, the system will be divided into sections no greater than 305 m in length. Each section will be tested individually and will be required to meet the allowable leakage and test pressure criteria, as outlined in the AWWA Specification C-600 for Ductile Iron; Section 4 "Hydrostatic Testing" and Section 4.1 "Pressure and Leakage Test" and C-605 for PVC.

The initial tie-in valve shall not be operated by the Contractor under any circumstances.

All **Developer/Owner** installed main and hydrant valves are to be opened by the Contractor and checked by the City's Representative, to ensure that all valves are open prior to any pressure test. The Contractor shall supply all materials, excavations, labour and equipment necessary for the pressure test, at no expense to the City.

The Contractor is responsible for the supply of a suitable pressure test location to allow City personnel to complete a pressure test. This test point will be a 25 mm service, complete with a main stop and curb stop and box. The service tail shall be above grade for easy access.

The Contractor shall supply all materials, excavations, labour and equipment necessary for the pressure test, at no expense to the City.

From November 1st to April 1st, the contractor shall supply a heated enclosure, at their expense, to protect the pressure pump and to facilitate the test.

Failure of the initial pressure test by the City's Representative shall result in all further pressure tests being charged to the Contractor.

5.11.1 Procedure for Pressure Testing Residential Water Services

When a City Representative arrives to install a water meter, a static pressure test of the water service will be performed at this time.

The water service will be thoroughly flushed and then a pressure gauge will be installed by the representative at the angle meter valve location. The curb stop is then operated by the City Representative to pressurize the service and then the stop is turned off.

The pressure gauge will register system pressure and must be left in position a minimum of three minutes after the gauge needle has stabilized. No drop in the registered pressure on the gauge will be considered an acceptable test.

Tests that have not passed will be flushed by the representative and re-tested. If the second test does not pass, the builder will be notified to have the water service excavated and repaired. The City Representative will retest at the builder's expense following required repairs.

The City Representative shall record service sketch measurements for locating the curb stop/box with respect to the watermain, property line and the building.

Should the Contractor use the water service prior to meter installation, a dual check back flow device shall be installed.

5.11.2 Industrial, Commercial, Institutional and Multi-Residential Pressure Testing

The initial tie-in valve shall **NOT** be operated by the Contractor under any circumstances. All Developer/Owner-installed main and hydrant valves are to be opened by the Contractor and checked by the City's Representative, to ensure that all valves are open prior to any pressure test. The Contractor shall supply all materials, excavations, labour and equipment necessary for the pressure test, at no expense to the City.

All domestic and fire services 25 mm and larger, shall be pressure tested by the Contractor and witnessed by the City Representative. The pressure test shall be for a two-hour period at 1035 Kpa (150 psi.), zero leakage and zero pressure drop. If the pressure test meets the above criterion, the system as a whole, shall be accepted. The internal fire service shall be pressure tested to National Fire Code Standards.

If the above criterion is not met, the system may be divided into smaller sections. In this case, each section shall be tested individually and shall be required to meet the allowable leakage and test pressure criteria, as outlined in the AWWA Specification C-600 for Ductile Iron; Section 4 "Hydrostatic Testing" and Section 4.1 "Pressure and Leakage Test" and C-605-13 (as amended) for PVC.

5.12 Chlorinating

Upon approval of the pressure test, the City's Representative shall proceed to chlorinate the new system, using a Contractor-supplied 25 mm temporary service. The service shall have a tail brought above grade a minimum of 1 metre to allow access for the chlorine pump. This service should be at the tie-in point on the newly installed watermain. The point of chlorination must be located in such a way that the new system is chlorinated using a flow of water from the existing system to distribute the chlorine.

The Contractor shall "NOT" operate any main valves, hydrant blow-offs, by-passes or any other appurtenances within the new system during the period of chlorination. Failure to comply will result in charges as per By-Law.

The system shall be chlorinated with an initial concentration of 50 mg/L available chlorine and allowed to remain in the new system for a minimum of 24 hours. The City's Representative shall flush the system after the chlorine has been in the system for a minimum of 24 hours.

1.1.1. Chlorinating Services

The domestic and fire service installations shall be in accordance with the Ministry of the Environment, Conservation and Parks (MECP) [2020 Watermain Disinfection Procedure](#). The domestic service shall have a 25 mm tail located near the tie-in point of the newly installed water service and brought above grade a minimum of 1 metre, to allow access for the chlorine pump. The point of chlorination must provide a sufficient flow of water to evenly distribute the chlorine throughout the entire service.

The City Representative will determine if the tail location and distribution of chlorine are acceptable.

The service shall be chlorinated with an initial concentration of 50 mg/L available chlorine and allowed to remain in the new service for a minimum of 24 hours. Chlorination shall be performed by the City Representative.

The City Representative shall flush the service after the chlorine has been in place for a minimum of 24 hours.

The chlorination tail must be removed, main stop closed, and a brass plug installed upon successful test results.

The Contractor shall NOT operate any main valves, hydrant blow-offs, by-passes or any other appurtenances within the new system during the period of chlorination. Failure to comply will result in charges as per current Fees By-Law.

5.13 Flushing Services

The Contractor shall supply a means of flushing the service that is acceptable to the City Representative. Only the City Representative shall operate valves for flushing the service.

It is the responsibility of the Contractor while charging, swabbing, testing, chlorinating and/or flushing the new service to supply a means for the water to escape without causing damage/erosion to the existing property or to any adjacent property. The service shall not be flushed until the City Representative determines that the proper precautions have been taken by the Contractor. The Contractor shall restore any property damage caused by charging, swabbing, testing, chlorinating and/or flushing the new service to its original state or better at his own expense. The City shall not be responsible for any damage or repair caused by charging, swabbing, testing, chlorinating and/or flushing the new service.

Special attention, by the Contractor, should be given to any areas that are close to streams, ponds or ditches that may be contaminated by runoff water from flushing chlorine from the water service. It

shall be the responsibility of the Contractor to provide a means of safely removing the chlorinated water in these areas.

The Contractor shall supply all materials, labour, and excavation necessary for flushing the new system.

5.14 Sampling Services

The City Representative shall take water samples for analysis, when required or requested, from all newly installed domestic water service after the service has been flushed.

The new service shall be deemed potable upon confirmation from the City Representative's approved water analysis.

If the sample does not pass, additional swabbing, chlorinating and flushing will be required until a successful potability result has been obtained. All costs shall be at the Contractor's expense.

Additional swabbing, chlorinating and flushing, at the Developer/Owner's expense, shall be required until a successful potability result has been obtained.

5.15 Continuity Testing (Tracer Wire)

To ensure there is no damage to the tracer wire during or after construction, the City's representative(s) shall complete a continuity test on the watermain or tracer wire during the commissioning process and again during the assumption process.

Should the City's representative(s) find any problems with continuity or installation of the tracer wire, the Contractor/Developer shall be responsible for all repairs and site remediation as required, at no cost to the City.

All Continuity Testing will be completed as per the requirements in the [Tracer Wire Installation Design Standard](#).

5.16 Electrical Grounding

Non-copper water services require a grounding electrode as per the Ontario Electrical Safety Code.

5.17 Water Service Repair Procedure

When a water service is identified as leaking, the City's Representative will attempt, if possible, to establish an approximate location of the leak. The location of the leak will determine who is responsible for the remedial action.

- a) Residential property owners are responsible for repairs to all leaks located on private property. In ICI/Multi-residential applications the property owner is responsible for all repairs from watermain to meter, in coordination with the Water Operations Branch. If the leak, in the City's Representative's opinion, requires immediate attention, the City will undertake the necessary repairs or replacements. The property owner will be invoiced for the costs involved. The property owner may be able to recover the repair costs from the builder.

b) ASSUMED SUBDIVISION

The City will repair all leaks located on assumed road allowances using procedures deemed appropriate by the City's Representative, at the City's expense.

c) UNASSUMED SUBDIVISION

The City's Representative will contact the Developer to explain the situation, provide direction, and confirm a repair date.

If the scheduled date is unacceptable in the City's Representative's opinion OR if the Developer refuses to acknowledge responsibility OR if in the City's Representative's opinion, the leak requires immediate attention, the City will undertake the necessary repairs or replacements. The Developer will be invoiced for the costs involved. Should the invoice not be paid, the City will proceed to recover the costs by drawing on the Letter of Credit for this development.