

Table of Contents

1.0	DEFINITIONS	3
2.0	DESIGN SUBMISSION REQUIREMENTS.....	4
3.0	DESIGN FLOWS	4
	Watermain Capacities	4
	Residential and Domestic Water Demands.....	4
	Commercial, Institutional and Industrial Water Demands	5
	Fire Flow Testing.....	5
	Fire Flow Test Reporting	5
4.0	WATER SUPPLY SYSTEM PRESSURES.....	7
5.0	FRICITION FACTORS.....	8
6.0	WATERMAINS	8
Blocks	8	
	Minimum Sizes of Pipe	9
	Minimum Depth of Pipe	9
	Dead Ends and Cul-De-Sacs	9
7.0	MATERIALS	9
8.0	VALVES	10
	Mainline Valves	10
	Valve Sizes.....	11
	Number, Location and Spacing	11
	Air Valves	11
	Drain Valves.....	11
	Valve Boxes	11
	Chambers.....	11
9.0	HYDRANTS	12
	Numbers, Spacing and Type	12
	Anti-tampering Devices	12
	1. Fire Hydrant Spacing and Colour.....	12
	2. Maintenance Hydrant (For Swabbing & Flushing)	13
	3. Blow-Off (For Flushing).....	13
	4. Yard Hydrant (For Sampling)	13
	5. Branch Valves and Boxes	13

10.0	RESTRAINED JOINTS.....	13
11.0	CATHODIC PROTECTION	14
	Tracer Wire	14
	Copper Service Connections	14
	Valves, Hydrants and Fittings on Non-Ferrous Watermains	15
	Valves, Hydrants and Fittings on Existing Ferrous Watermains.....	15
	Connecting Non-Ferrous Watermains to Ferrous Watermains	15
	Exposed Ferrous Watermain	15
	Thermite Weld Coating	15
	Replacement and Testing of Anodes	15
12.0	WATERMAIN INSULATION.....	15
14.0	CONNECTIONS TO EXISTING WATER SYSTEM.....	16
15.0	WATER SERVICES.....	17
	Minimum Sizes of Pipe	18
	Location 18	
	Minimum Depth of Pipe	18
	Mainstops	18
	Valves, Curb Stops & Boxes	18
16.0	MARKING AND RECORDING HOUSE SERVICE CONNECTIONS	18
17.0	WATERMAIN BREAKS	19
18.0	WATER SERVICE DECOMMISSIONING	19
19.0	WATER SERVICE METERS AND BACKFLOW PREVENTION	19

City of Kawartha Lakes Standard Details - Watermains

CKL-100	Cul-De-Sac Water Looping Detail
CKL-101	Gate Valve and Valve Box on PVC Watermains
CKL-102	Hydrant Installation
CKL-103	50 mm Self Draining Blow-Off
CKL-104	Minimum Restraining Length (L) for PVC Watermains
CKL-105	Support for Mechanical Joints for PVC Watermains- Valves and Dead Ends
CKL-106	Support for Mechanical Joints for PVC Watermains- Plugged Cross
CKL-107	Joint Restraining Length (In Combination with Granular Thrust Block) for PVC Pipe
CKL-108	Cathodic Protection / Bonding Cable / Tracer Wire for PVC and CPP Watermain Systems
CKL 109	19 mm Yard Hydrant
CKL 110a	Thrust Blocking for PVC Watermain Dead Ends
CKL 110b	Thrust Blocking for PVC Watermain Plugged Tee
CKL 110c	Thrust Blocking for PVC Waterman Plugged Cross
CKL 111	Restrained Joint Detail for PVC Pipe
CKL 112	Service Connection Location Single Detached Residential Lots (30') to 11.9 Metres (39') (New Connections)
CKL 112B	Service Connection Location Single Detached Residential Lots 12 Metres (40') and Greater (New Connections)

Supporting Documentation

- **City of Kawartha Lakes Approved Manufacturers' List**
- **Watermain Commissioning Standard Operating Procedure**
- **Watermain Commissioning Checklist**
- **Watermain Commissioning Work Plan**
- **City of Kawartha Lakes As Built Lateral Location Sheet**
- **Fire Flow Testing Calculator**

This document does not supersede, nor replace any legislation governing the design of Potable water systems. Designers, Consultants, Engineers 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 Code when carrying out the design and construction of water infrastructure projects within the City of Kawartha Lakes.

The design portion of this document should be considered as minimum guidelines. This document provides the City's design preferences under normal circumstances for municipal water infrastructure. The Engineers however, should use their best judgment to find innovative solutions, when abnormal design conditions are encountered. Deviation from these municipal design guidelines requires written approval of the City's Director of Engineering or designate. All municipal watermain infrastructure, appurtenances and components shall comply with all applicable current Ministry of the Environment, Conservation and Parks (MECP) and industry standards and specifications for design, installation, modification, quality management and quality control, such as:

- Ministry of the Environment (MOE): *Design Guidelines for Drinking Water Systems, 2008 (MOE Guidelines)* *Ministry of the Environment Design Guidelines for Drinking Water Systems, 2008 (MOE Guidelines)*
- Ministry of the Environment and Climate Change (MOECC): *Water Drinking Quality Management Standard (DWQMS)* *Ministry of the Environment and Climate Change (MOECC): Water Drinking Quality Management Standard (DWQMS)*
- Ministry of the Environment, Conservation and Parks F-6-1 Procedures to Govern Separation of Sewers and Watermains
- Fire Underwriters Survey of the Insurance Bureau of Canada Water Supply for Fire Protection: *A Guide to Recommended Practice* (Fire Underwriters, the American Waterworks Association (AWWA))
- Water Supply for Public Fire Protection: *A Guide to Recommended Practice in Canada (Fire Underwriters Survey)*
- *Ontario Provincial Standards (OPS)*, their most recent editions or revisions thereof.
- City of Kawartha Lakes *By-Law 2021-162 to Regulate Water and Wastewater Services*, or as amended shall be adhered to
- City of Kawartha Lakes *By-Law 2016-006 to Establish the Management and Use of the Sewer Works* or as amended shall be adhered to
- City of Kawartha Lakes Drinking Water Works Permit License
- The Canadian Standards Association (CSA)
- American Standard and Testing Materials (ASTM)
- Approved Manufacturer's Product List for Water Systems
- NSF International (NSF)

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.

1.0 DEFINITIONS

- a) **“Backflow Prevention”** means the prevention of a reversal of normal flow that could introduce Contamination to the potable water supply; accomplished by an Air gap or a CSA approved backflow preventer selected, installed and tested in accordance with CSA Standard B64.10:” Selection and Installation of Backflow Preventers”.
- b) **“CKL”, “City”, “City of Kawartha Lakes” or “Kawartha Lakes”** means The Corporation of the City of Kawartha Lakes, including its entire geographic area, and includes its Officers, Directors, employees and agents.
- c) **“Cross Connection”** means any actual or potential connection between the waterworks and any source of pollution, contamination, or other material or substance that could change the quality of the water in the waterworks. This includes any bypass, jumper connection, removable section of pipe, swivel or changeover device, and any other temporary or permanent connecting arrangement through which backflow can occur. Individual protection would be installed on fixtures or appliances that have the potential of contributing to a cross connection.
- d) **“ Dwelling Unit”** means a unit that consists of a self-contained room or set of rooms located in a building or structure, is used or intended for use only as a residential premises, contains kitchen and bathroom facilities that are intended for the use only of the unit, is used as a single housekeeping unit in which no occupier has exclusive possession of any part of the unit, and has a means of egress to the outside of the building or structure in which it is located, which means of egress may be through another residential unit or common area.
- e) **“Guidelines”** means and is not limited to the Guidelines for the City of Kawartha Lakes, and/or Design Guidelines for Drinking-Water Systems 2008 by the Ministry of the Environment, and/or Design Guidelines for Sewage Work 2008 by the Ministry of the Environment, as applicable and as amended.
- f) **“Private Hydrants”** are situated within the limits of the property owned or occupied by the owner or occupier of the water, and/or installed at such locations to serve as exclusive fire protection for said buildings at such a site complex, i.e., institutions, condominiums, community centres, schools, etc.
- g) **“CKL WWW Staff”** means The City of Kawartha Lakes Water/Wastewater Distribution Chief Operator or designate, holding current MECP Certification as per Ontario Regulation 128/04, as amended.

- h) **“Distribution System”** means a watermain system carrying potable water. The primary functions of the distribution main are to distribute water to customers through service connections, and to provide fire protection through hydrants with the adequate quality, quantity and pressure for the consumer.
- i) **“Feedermain”** is any watermain where the primary function of such main is for the transmission of potable water from a water supply plant to a reservoir for supply of water to the distribution mains.
- j) **“Cathodic Protection”** is a technique used to control the corrosion of a metal surface by making it the cathode of an electrochemical cell.

2.0 DESIGN SUBMISSION REQUIREMENTS

- The Functional Servicing Report, shall include, but not necessarily be limited to;
 - ✓ Main sizing, location and looping
 - ✓ Pressure boundaries, booster stations
- Drawing size shall be A1 (594 mm x 841 mm)
- Plan and profile horizontal metric bar scale shall be 1:500 or 1:250 and the vertical scale shall be 1:50.
- All drawings shall be neat, legible and shall conform to CKL drawing standards.
- All watermains, hydrants, water valves, pipe diameter, material type, pipe class, pipe bedding and service connections shall be shown on all drawings.
- All engineering drawings must clearly identify services being removed, services being abandoned but not removed, existing services that will remain, proposed services and future services.

3.0 DESIGN FLOWS

Watermain Capacities

Watermains shall be sized to carry the greater capacity of the maximum day plus fire flow or the peak hour demand. Fire flow shall be calculated as outlined in the current edition of *“Water Supply for Public Fire Protection”* issued by the Fire Underwriters Survey of the Insurance Bureau of Canada, unless otherwise approved by the City of Kawartha Lakes

The minimum required fire flow for single family, detached dwellings is 4,500 L/min. Proposed Fire Flows less than minimums indicated would be subject to recommendation by a qualified Professional Engineer and approved by the City on a case by case basis.

Residential and Domestic Water Demands

The values of 450 L/capita/day and 2.3 persons per unit shall be used when determining residential and domestic water demands. The information in the *MOE*

Guidelines (Section 3.4.2, Table 3.1) shall be used to determine the minimum rate, maximum day and peak flow rates for the system.

Commercial and Industrial Water Demands

When determining the commercial and industrial water demands the value of 0.4 L/ha shall be used.

Schools and Institutions Water Demands

When determining the institutional water demands the value of 0.32 L/ha shall be used.

Fire Flow Testing

Fire flow testing shall be arranged through the Supervisor – Overall Responsible Operator, Water Wastewater Division and will be charged in accordance with Schedule A-3 of By-Law 2018-234 – Consolidated Fees By-law or as amended. 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 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 flow test, the closest hydrant downstream of the building supply line should be the Test Hydrant of Residual Hydrant where system pressures are taken, and the subsequent downstream hydrant will be the flowing hydrant to obtain pilot 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 Kawartha Lakes website under Planning and Development. This spreadsheet shall be submitted in PDF and Excel file format with the fire flow test report.

Fire Flow Test Reporting

At a minimum, the 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 information;
- 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, number of outlets, outlet inside diameter (IN), discharge coefficient, residual pressure (PSI), Pitot Pressure (PSI), Flow (U.S. GPM). A minimum of two 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 achieves the desired flow (i.e. max. day plus fire flow);
- Test readings should be plotted on a Pressure Vs Flow Graph
- Test report cannot be completed more than two years prior to submission

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

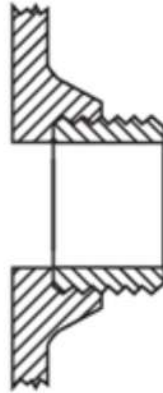
d = diameter of the outlet (inches)

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.

4.0 WATER SUPPLY SYSTEM PRESSURES

In accordance with MECP Design Guidelines for Drinking – Water Systems (2008), a minimum operations 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 pressure exceeds 550 kPa (80 psi), PRVs are required inside the building after the meter. Pressure during maximum day demand plus fire flow shall not fall below 140 kPa (20 psi).

5.0 FRICTION FACTORS

The following “C” values shall be used in the Hazen Williams equation for the design of water distribution systems, unless actual pipe materials and “C” factors are known:

Pipe Diameter (mm)	“C” Factor
Up to 150	100
200 to 300	110
350 to 600	120
Over 600	130

The Hazen Williams Equation is:

$$Q = 0.84918 \text{ CAR}^{0.63} \text{S}^{0.54}$$

C = Coefficient of Roughness

R = Hydraulic Radius (m)

S = Slope of the Energy Grade Line (m/m)

A = Cross-Sectional Flow Area (m³)

The above “C” factors represent long-term values. A “C” factor of 140 shall be used to calculate maximum velocities for transient pressure estimations, or for checking pump motor sizes for run out conditions.

6.0 WATERMAINS

The design of the water system must ensure that all proposed municipal watermains are located on municipal property.

Blocks

Where the watermain cannot be placed under a municipal right of way, a block of land will be conveyed to the City. The requirements are as follows

Type of Service, Size & Depth	Minimum Width of Block
Single sewer or watermain less than 600 mm dia., and less than 3.7 m deep, centered on Block.	6.0 m
Single sewer in excess of 3.7 m depth or single watermain larger than 600 mm dia., centered on Block.	9.0 m
A combination of two mains, either sewer or water, less than 3.7 m deep centered on Block.**	9.0 m
A combination of two mains, either sewer or water, over 3.7 m deep, no closer than 3.0 m to Block limits.**	12.0 m

Type of Service, Size & Depth	Minimum Width of Block
Major trunk sewer.** (Possible future twinning)	20.0 m
Three or more mains, no closer than 3.0 m to Block limits.	Add 3.0 m to items with ** for each additional main.

Minimum Sizes of Pipe

- Sizing and looping of watermains shall be determined at the preliminary stage of the development.
- Residential systems shall be designed with a minimum of 150 mm diameter watermain.
- Industrial, commercial and institutional systems shall be designed with a minimum of 300 mm diameter watermain, unless otherwise approved by the City.

Minimum Depth of Pipe

- Watermains shall be installed with a minimum cover of 1.8 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.

Dead Ends and Cul-De-Sacs

The distribution system shall be designed to provide looping and to eliminate dead end sections. When avoiding dead ends is impossible, the contractor shall provide a fire hydrant for flushing purposes and a maximum of 20 houses shall be permitted.

A cul-de-sac detail is provided as *City of Kawartha Lakes Detail – Cul-De-Sac Water Looping Detail, CKL-100*.

7.0 MATERIALS

For acceptable watermain products, refer to the *City of Kawartha Lakes Approved Manufacturers' Products List*. All watermain materials, products and appurtenances once delivered to site shall be inspected by CKL WWW Staff or CKL Engineering Staff prior to installation.

A “distribution main” is watermain carrying potable water. The primary functions of the distribution main are to distribute water to customers through service connections, and to provide fire protection through hydrants. Distribution mains range in size from 150 mm to 300 mm. Distribution Mains shall be constructed of Polyvinyl Chloride (PVC) to

AWWA C900, or approved equivalent.

A “feedermain” is any watermain where the primary function of such main is for the transmission of potable water from a water supply plant to a reservoir for supply of water to the distribution mains. Feeder mains shall not be tapped for individual service connections. Feeder mains shall be constructed of Concrete Pressure Pipe.

If watermain is being installed via horizontal directional drilling, then High Density Polyethylene (HDPE) Pressure Pipe shall be used providing a geotechnical survey indicates favourable conditions. Following installation, HDPE shall not be connected for a minimum of 2 days to allow the pipe to contract. Further delays may be required as recommended by the manufacturer. All horizontal directional drilling pipe shall be constructed according to OPSS 450 “Construction Specification for Pipeline and Utility Installation in Soil by Horizontal Directional Drilling”.

8.0 VALVES

Valves shall be specified and supplied in accordance with the *City of Kawartha Lakes Approved Manufacturers’ Products List*.

Mainline Valves

Resilient seat gate valves shall be used on all water mains 300 mm in diameter or less in size.

If resilient seat gate valves are proposed on water mains 400 mm in diameter, approval of the City through the Director of Public Work or their designate must be granted. This approval shall be based on the location of the watermain, pipe material and whether the valve is to be installed on a new or existing watermain.

Gate valves with a by-pass system shall be used on all water mains 400 mm or greater in size.

A by-pass system is to consist of two flanged nozzles cast integrally with pipe body, flanged elbows and a flanged resilient seat gate valve. The by-pass system shall be suitable for the same working and test pressures as associated with the main valve.

All valves shall be of the approved type with non-rising stem and a 50 mm square operating nut, opening counter clockwise. When the depth of the operating nut is greater than 2.0m below finished grade an extension stem shall be used.

All in-line valves shall be restrained as per *City of Kawartha Lakes Detail – Gate Valve and Valve Box on PVC Water mains, CKL 101*.

Valve Sizes

For watermains of 600 mm diameter or smaller, the size of the valve shall be the same size as the watermain. Valves on watermains 750 mm in diameter or larger, may be one size smaller than the watermain size.

Number, Location and Spacing

Three valves are required at a tee intersection and four valves are required at a cross intersection. The valves shall be located at the point where the projection of the street line intersects the watermain. Valve boxes and chambers shall be located in boulevards whenever possible. When not possible all valve boxes located in the travelled portion of the roadway shall be set to base course asphalt grade and shall be screw type. Valve boxes located outside the travelled portion of the roadway shall be set to finished grade.

Line valves shall be located such that no more than approximately 20 houses can be shut-off and isolated from the system at a time. The line valve spacing shall not exceed 240 m between valves.

Air Valves

Air valves shall be placed at all significant high points on feeder mains.

Drain Valves

Drain valves shall be located at the low points of all watermains that are 600 mm diameter or greater and shall be constructed in a chamber.

Valve Boxes

All valves 400 mm diameter or smaller shall have valve boxes and specified direct bury operators shall be used.

All valves larger than 400 mm diameter shall be installed in valve chambers. All valves in chambers are to be installed with extension stems.

The tops of valve boxes and valve chamber maintenance hole covers shall be set flush with finished grade.

Chambers

The use of chambers shall be minimized or eliminated whenever possible. All watermain valve, drain valve and air valve chambers shall be provided with a drain pipe connection to the storm sewer if feasible. No connections are permitted to the sanitary sewer. Storm sewer connections shall include a backflow preventer in an accessible

location. The location of the storm sewer connection shall be shown on the contract drawings.

9.0 HYDRANTS

Numbers, Spacing and Type

For Fire Hydrant specifications refer to *City of Kawartha Lakes Approved Manufacturers' Product List*. For construction, *City of Kawartha Lakes Detail – Hydrant Installation*, **CKL 102** shall be used.

All hydrants supplied shall include two 63 mm diameter ports and a 100 mm diameter Storz pumper nozzle and shall conform in all respects to the standards of the City of Kawartha Lakes. Drain holes shall be left open for drainage of the hydrant barrel. Drain holes shall be plugged in high groundwater areas or when deemed necessary to CKL.

Hydrants shall be installed such that the breakaway flange is 100 to 150 mm above the surrounding ground surface. Hydrant extensions, when required, shall be installed at the bottom of the hydrant barrel. No flanges on the hydrant barrel shall be permitted within 1.5 meters of the ground surface.

Anti-tampering Devices

Anti-tampering devices shall be installed on hydrants designated by the City of Kawartha Lakes. The device shall be installed by the City and shall remain in place until the final acceptance certificate is issued or until building construction is complete.

A fee shall be charged to the developer to cover the cost of supply, installation and removal of the device.

1. Fire Hydrant Spacing and Colour

Hydrants shall be installed on all watermains 150 mm diameter and larger, in a fire rated system, with the following maximum allowable spacing:

- 150 m in residential areas, (to provide for a maximum hose length of 75 m)
- 75 m in industrial, commercial and institutional areas (to provide for a maximum hose length of 37.5 m)

All hydrants shall be placed in an obstruction free zone of 1.5 m diameter to ensure hydrant is visible and accessible. All hydrant bonnets and port caps shall be painted as per the associated fire flow rating.

Hydrant Class	Colour	Flow
AA	Blue	5,680 L/min or greater (1500 usgpm)

Hydrant Class	Colour	Flow
A	Green	3,785 L/min – 5,675 L/min (1000-1499 usgpm)
B	Orange	1,900 L/min – 3,780 L/min (500-999 usgpm)
C	Red	Less than 1,900 L/min (500 usgpm)

- Hydrants with a Black Stortz Fitting do not get painted.
- Private hydrant barrels must be painted Red.

All proposed hydrant flange elevations shall be identified on the engineering design drawings.

The Fire Chief shall have the final authority on the location of structures or other items, which might interfere with the view or the accessibility of hydrants

2. Maintenance Hydrant (For Swabbing & Flushing)

Maintenance hydrants are required in non-fire rated systems to facilitate flushing and swabbing. Maintenance hydrants will be located at dead ends and within the system as required by Public Works, Water and Wastewater. The hydrants must be painted black.

3. Blow-Off (For Flushing)

Blow-off set up for water service connections 100 mm to 300 mm in size shall be 50 mm in size. Refer to *City of Kawartha Lakes Detail – 50mm Self Draining Blow-Off*, **CKL 103** and the *City of Kawartha Lakes Approved Manufacturers' Products List*.

4. Yard Hydrant (For Sampling)

Yard hydrant sampling stations shall be installed at locations as directed by the City of Kawartha Lakes. For sampling station specifications and installation requirements refer to the *City of Kawartha Lakes Detail – 19 mm Yard Hydrant*, **CKL 109**.

5. Branch Valves and Boxes

All hydrants installed on watermains shall be installed with a 150 mm diameter branch valve and box, attached with an anchor tee.

10.0 RESTRAINED JOINTS

Joint restrainers and granular thrust blocks shall be used on all fittings and connections as per City of Kawartha Lakes Details; *Minimum Restraining Length (L) for PVC Watermains*, **CKL-104**, *Support for Mechanical Joints for PVC Watermains, Valves and Dead Ends*, **CKL - 105**, *Support for Mechanical Joints for PVC Watermains, Plugged Cross*, **CKL – 106**, *Joint Restraining Length for PVC Pipe*, **CKL 107**.

Joints to be restrained in all opposing directions of thrust forces. All joints encountered within the specified restraining length as indicated on the appropriate Standard Drawings, must be restrained. All joints shall be restrained in engineered fill applications

11.0 CATHODIC PROTECTION

Refer to the OPS and the *City of Kawartha Lakes Approved Manufacturers' List*, for location and sizing. Cathodic protection to be installed in accordance with *City of Kawartha Lakes Detail – Cathodic Protection / Bonding Cable / Tracer Wire for PVC and CPP Watermain Systems, CKL 108*. For a Metallic Watermain System cathodic protection is to be installed in accordance with OPSD 1109.010 or as amended.

Tracer Wire

Cathodic protection shall be provided for all tracer wires on PVC and Concrete Pressure Pipe (CPP) watermains. One 5.4 kg zinc anode shall be installed for every 1000 m of tracer wire. The location of anodes shall be shown on the construction drawings.

On open cut installations, provide one tracer wire in accordance with *the City of Kawartha Lakes Detail – Cathodic Protection / Bonding Cable / Tracer Wire for PVC and CPP Watermain Systems, CKL 108*.

On all Horizontal Directional Drilling (HDD) installations, provide two tracer wires, positioned on opposite sides of the pipe.

Tracer wire shall be installed on all feeder mains. Tracer wire shall be brought to the surface using 50 mm diameter valve boxes, spaced at 300 m intervals along the feeder main for locating purposes.

All tracer wire shall be tested in accordance to the OPS at the time of commissioning. Tracer wire conductivity must be re-confirmed by the developer prior to permission for placement of top course asphalt and prior to assumption of the development and release of final securities.

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

Should the City, Consultant or the Certified Water Operator Contractor performing the tracer wire continuity test 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.

Copper Service Connections

One 5.4 kg zinc anode shall be installed on all new copper service connections and all existing copper service connections that are exposed during any type of road reconstruction work.

Valves, Hydrants and Fittings on Non-Ferrous Watermains

One 5.4 kg zinc anode shall be installed on every valve and fitting connected to a non-ferrous watermain.

Fittings include bends, tees, crosses, sleeves, reducers, plugs, caps, joint restrainers and couplings.

Valves, Hydrants and Fittings on Existing Ferrous Watermains

All valves and fittings installed on existing ferrous watermains shall be cathodically protected by a 14.5 kg magnesium anode. Bonding cables shall be provided on each side of the fitting to the existing watermain. Bonding cables shall be No. 6, seven strand coated copper wire connected to the fittings and watermain by a thermite weld (Cadweld).

Connecting Non-Ferrous Watermains to Ferrous Watermains

When connecting a non-ferrous watermain to a ferrous watermain, the ferrous watermain shall be cathodically protected by a 14.5 kg magnesium anode.

Exposed Ferrous Watermain

When a ferrous watermain is exposed during construction of underground utilities, a 14.5 kg magnesium anode shall be installed at each location.

Thermite Weld Coating

All thermite weld connections shall be coated with an approved coating material.

Replacement and Testing of Anodes

The City of Kawartha Lakes may reject any anode for any reason and request a suitable replacement.

The City may have any anode(s) tested to guarantee the authenticity of its composition. The Contractor shall supply the anode(s) for testing at no expense to the City.

12.0 WATERMAIN INSULATION

All watermain and water service connections that do not meet the required minimum cover of 1.80 m shall be insulated in accordance with OPSD 1109.030 or amended unless otherwise approved by the City of Kawartha Lakes.

In general, the thickness of the insulation should be a minimum of 50mm for every 300mm reduction in depth of cover.

13.0 WATERMAIN INSTALLATION AND TESTING PROCEDURES

Connections shall be made in accordance with the Watermain Commissioning Standard Operating Procedures (SOP). This procedure covers the cleaning, disinfection, hydrostatic testing and sampling for the installation of all watermains. Additional details are provided in the Watermain Commissioning Work Plan and *Watermain Commissioning Checklist*.

Water, sanitary and stormwater locates, requested by Ontario One Call will be the responsibility of the Developer until the City receives and approves As Constructed information for installed services.

14.0 CONNECTIONS TO EXISTING WATER SYSTEM

The Contractor shall make every possible effort to ensure that the final connection is no more than one pipe length.

Once the final round of bacteriological tests has met the required standard, the connection to the existing watermain shall be performed.

Operation of existing gate valves shall be undertaken by CKL WWW Staff. The Contractor shall provide a minimum of 48 hours (business hours) advance notice to the City when arranging for this work and shall provide 24-48 hour advance notice to all homeowners that will be affected by the temporary interruption in water supply. (Contractor to supply "Interruption to Water Service Notice") A request for shutdown will not be entertained until all the bacteriological tests have passed, and the City in possession of the results.

A sump, minimum 300 mm depth, shall be excavated in the trench bottom and filled with clear stone to provide a location to collect and pump water.

Watermains shall be cut back to remove any temporary taps. The Contractor shall disinfect the connection watermain pipe as outlined below and shall, using all means possible, dewater the watermains and trench in a controlled manner as to not allow backflow of water into the watermains.

If trench water, dirt, or debris has entered the watermain during the final connection, the watermain shall be aggressively flushed and additional bacteriological samples shall be taken as directed by the City.

Connections Equal to or Less Than One Pipe Length

For a final connection length equal to or less than one pipe length, the new pipe, fittings and valves required for the connection shall be spray-disinfected and swabbed with a minimum 1% to maximum 5% solution of NSF chlorine, immediately prior to being installed. As well, the existing watermain being connected to shall be cleaned, in the immediate area of the connection, and spray-disinfected with the same solution.

Connections Greater Than One Pipe Length

For a final connection that is greater than one pipe length (6.1 m), the new pipe required for the connection shall be set up above ground, disinfected, and bacteriological sample rounds taken as required for new watermain. After two consecutive rounds of satisfactory sample results have been received for the 'pre-disinfected' pipe, the pipe can be used in connecting the new main to the active distribution system. Between the time the satisfactory bacteriological sample results are received and the time that the connection piping is installed, the ends of the piping must be sealed with clean, disinfected, watertight plugs or caps. If the timeframe exceeds 2 weeks, additional bacteriological sample rounds will be required unless otherwise approved by the Director of Public Works.

All caps shall be kept in place during the installation procedure until immediately prior to making the connection.

The existing watermain in the immediate area of the connection, as well as the newly required fittings and valves, shall be cleaned, and spray-disinfected with a minimum 1% to maximum 5% solution of NSF chlorine immediately prior to the connection.

15.0 WATER SERVICES

All water service connections shall be in accordance with City of Kawartha Lakes Water and Wastewater Services By-Law 2021-162, as amended.

All water service connections for single family dwelling, semi-detached, and linear row housing building shall be individual service connections.

The Ontario Building Code requires, "where the static pressure exceeds 550 kPa (80 Psi) a pressure reducing valve shall be installed to limit the maximum static pressure to not more than 550 kPa (80 Psi) in areas that may be occupied."

Connections to the watermain shall be by pressure tap connection using a stainless steel service saddle. Piping shall be connected at 45° above horizontal for copper, or above the springline for municipex, including a vertical and/or horizontal gooseneck.

No service connection shall be made to feeder mains unless otherwise approved by the Director of Public Works.

For Commercial, Industrial and Multi-residential connections, separate domestic and fire water services must be installed in accordance with Water and Wastewater Services By-Law 2021-162, as amended. The water services shall not become operational until documentation, including acceptable laboratory test results from the accredited laboratory is provided to the City of Kawartha Lakes, verifying that all water system pipe on private property has been chlorinated, flushed and pressure tested according to the CKL, Ontario Building Code and Ministry of the Environment Conservation and Parks requirements.

Minimum Sizes of Pipe

The minimum size for service connections shall be 19 mm diameter. The exception being when the length of the connection from the main to the building setback exceeds 30 m, then the minimum size shall then be 25 mm (1") diameter.

Service connections for multiple family dwellings shall be sized to provide capacity equivalent to a 19 mm (3/4") diameter connection to each dwelling unit.

Service connections for blocks, commercial, industrial and institutional areas shall be sized and installed according to the guidelines recommended by the Fire Insurance Advisory Organization and intended use. Note that 75mm diameter service connections are not permitted within municipal owned lands.

Location

Water service connection location shall be in accordance with **CKL-112/CKL-112B Service Connection Location Single Family Residential Lots (New Connections)**. The location of water service connections for semi-detached lots shall suit the house style and approved by the City. Where possible, the water service should not be installed under the driveway. The curb stop for the water service connections will not be permitted in the driveway.

Minimum Depth of Pipe

The water service connection shall have a minimum cover of 1.80 m.

Mainstops

All domestic water service connections shall have stainless steel service saddles and mainstops installed at the watermain equal in size to the water service connection diameter.

Valves, Curb Stops & Boxes

All service connections 50 mm or less in diameter shall have curb stops and isolation valves installed at property line.

Materials

For watermain service connection materials refer to *The City of Kawartha Lakes Approved Manufacturers' Product List*.

16.0 MARKING AND RECORDING HOUSE SERVICE CONNECTIONS

A temporary location marker, consisting of a 38 mm x 89 mm (2" x 4") wood marker shall be placed at end of plugged or capped service connection. The top of the marker

shall be painted blue. The painted marker shall be placed at a point 300 mm above the plugged end of service pipe. The marker shall extend to 900 mm above the finished grade.

House service connections shall not be backfilled until inspected and measurements of locations have been taken. Measurements shall include both horizontal ties to nearby structures or landmarks and geodetic elevations. Location measurements shall be taken for both new and replacement services and recorded for submission to the City, using the *City of Kawartha Lakes As-Built Lateral Location Sheet*

17.0 WATERMAIN BREAKS

Watermain breaks shall be treated the same manner as noted in “Connection to Existing Water System”, (14.0).

18.0 WATER SERVICE DECOMMISSIONING

Permanent Service Decommissioning

When a water service connection is abandoned, small services shall be disconnected from the main by removing the main stop and inserting a plug into the existing main. Large services shall be disconnected by removing the tapping sleeve and valve or tee and valve or both from main and the fill piece shall be installed.

Temporary Service Decommissioning

When a water service connection is to be abandoned temporarily at the curb stop, the existing water service shall be shut off at the curb stop. The contractor shall expose the curb stop and existing water service. Once the curb stop and existing water service are exposed the existing service shall be cut and crimped 0.3 m minimum from the curb stop and left in place. The crimped end of the existing service shall be marked with a temporary location marker, (16.0) and backfilled to grade until new service is to be connected to existing curb stop.

19.0 WATER SERVICE METERS AND BACKFLOW PREVENTION

Water service meters and backflow prevention shall be in accordance with the Water and Wastewater Services By-Law 2021-162.

Where there is 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’s Water and Wastewater Services By-Law 2021-162. The backflow prevention devices will be selected, supplied, installed and tested at the Owner’s expense.

Commercial, industrial, institutional and multi residential projects that require two separate supply feeds for water, the domestic feed is to be metered at the property line and a double check valve is to be placed on the fire main. Any backflow prevention devices required for the domestic feed to achieve premise isolation shall be installed a maximum of 3.0m downstream of the water meter. An above ground heated chamber shall be placed at the property line to house the infrastructure.