

CW 2110 - WATERMAINS

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CW 2110 - WATERMAINS**1. DESCRIPTION****1.1 General**

- .1 This specification covers supply and installation of watermains, watermain renewals, fittings, hydrant assemblies, valves, water services, connections to existing watermains, watermain repairs, appurtenances and related work.

1.2 Definitions

- .1 Fittings include main line tees, wyes, bends, crosses, reducers, couplings and plugs.
- .2 Appurtenances include repair clamps, tapping sleeves and connection saddles.
- .3 Hydrant assemblies include the tee on the watermain for the hydrant, 150 millimetre hydrant lead pipe from the watermain, valve on hydrant lead pipe, fittings, pre-cast concrete base block and cast-in-place concrete thrust blocks in accordance with SD-006 and SD-007.
- .4 Trenchless installation methods are methods of installing pipe inside a hole that has been made between shafts by coring, boring, horizontal directional drilling, jacking, tunnelling and extraction of an existing pipe or similar methods with minimal excavation and surface disruption.

1.3 Referenced Standard Construction Specifications

- .1 CW 1120 - Existing Services, Utilities and Structures
- .2 CW 2030 - Excavation, Bedding and Backfill
- .3 CW 2160 - Concrete Underground Structures and Works
- .4 CW 2125 - Flushing, Hydrostatic Leakage Testing and Disinfection of Watermains and Water Services
- .5 CW 3150 – Gravel Surfacing
- .6 CW 3230 - Full-Depth Patching of Existing Slabs and Joints
- .7 CW 3235 - Renewal of Existing Miscellaneous Concrete Slabs
- .8 CW 3240 - Renewal of Existing Curbs
- .9 CW 3310 – Portland Cement Concrete Pavement Works
- .10 CW 3410 - Asphaltic Concrete Pavement Works
- .11 CW 3510 - Sodding
- .12 CW 3520 - Seeding

1.4 Referenced Standard Details

- .1 SD-001 – Standard Pipe Bedding Classes
- .2 SD-002 – Standard Trench and Excavation Backfill Classes
- .3 SD-004 – Concrete Thrust Blocks for Horizontal Watermain Fittings
- .4 SD-005 – Concrete Thrust Blocks for Vertical Watermain Fittings
- .5 SD-006 - Standard Fire Hydrant Assembly
- .6 SD-007 - Short Fire Hydrant Assembly
- .7 SD-008 – Location Map For Watermain Valve Closing Direction
- .8 SD-012 – Water Service 20 Millimetre to 50 Millimetre
- .9 SD-013 - Small Diameter Copper Watermain For Cul-de-Sac Loop
- .10 SD-016 – Standard Watermain Valve Installation
- .11 SD-017 – By Pass Valve Assembly for 350 to 450 Millimetre Watermains
- .12 SD-018 - Watermain and Water Service Insulation

1.5 Referenced Approved Products

- .1 AP-001 – Standard Valve Box
- .2 AP-013 - Minneapolis Style Curb Box for 20 and 25 Millimetre Minneapolis Style Curb Stops
- .3 AP-014 - Minneapolis Style Curb Box for 38 and 50 Millimetre Minneapolis Style Curb Stops

2. MATERIALS**2.1 Approved Products**

- .1 Use only those products listed as Approved Products for Underground Use in the City of Winnipeg found on the City of Winnipeg, Materials Management web site at:
<http://www.winnipeg.ca/matmgt/spec/>

2.2 Watermain and Water Service Pipe

- .1 150 to 300 millimetre watermain pipe in accordance with AT 4.1.1.10 of the Approved Products for Underground Use in the City of Winnipeg.
- .2 350 to 500 millimetre water service in accordance with AT 4.1.1.11 of the Approved Products for Underground Use in the City of Winnipeg.
- .3 19 to 50 millimetre water service in accordance with AT 4.1.2.10 of the Approved Products for Underground Use in the City of Winnipeg.

2.3 Watermain and Large Diameter Water Service Fittings

- .1 PVC injection moulded fittings.
 - .1 150 and 200 millimetre tees, elbows and tapped couplings in accordance with AT 4.1.1.61 of the Approved Products for Underground Use in the City of Winnipeg.
 - .2 150 to 300 millimetre couplings and plugs in accordance with AT 4.1.1.61 of the Approved Products for Underground Use in the City of Winnipeg.
- .2 PVC fabricated fittings
 - .1 250 and 300 millimetre tees, elbows, crosses, couplings, reducers, and caps in accordance with AT 4.1.1.64 of the Approved Products for Underground Use in the City of Winnipeg.
- .3 Cast iron fittings
 - .1 150 millimetre and larger cast iron fittings in accordance with AT 4.1.1.60 of the Approved Products for Underground Use in the City of Winnipeg.

2.4 Watermain and Large Diameter Water Service Pipe Gaskets

- .1 Rubber gaskets in accordance with ASTM F477.
- .2 Where required, elastomeric compounds for oil and gas resistant gaskets to be rated as "excellent".

2.5 Small Diameter Water Service Fittings

- .1 19 to 50 millimetre ASTM B62 composition bronze high-pressure with flared ends for copper water

service connections in accordance with AWWA C800.

- .2 19 to 50 millimetre water service plugs to ASTM B62 composition bronze high-pressure with AWWA taper thread in accordance with AWWA C800.

2.6 Hydrants

- .1 Post type, dry barrel with compression shutoff in accordance with CAN/ULC-S250 and AWWA C502.
- .2 Designed for working pressure of 1.0 MPa
- .3 Provided with two 65 millimetre threaded hose outlets, one 100 millimetre threaded pumper connection, 150 millimetre riser barrel with break away flange, 125 millimetre bottom valve and 150 millimetre bottom inlet with push-on joint with harnessing lugs for watermain lead pipe connection.
- .4 Drain to be omitted or plugged.
- .5 Hydrants to open counter clockwise.
- .6 Components used for hydrant adjustment purposes including barrel extensions, stem extensions, stem couplings, breakaway flanges or kits, rubber seals, flange gaskets and fasteners to be original equipment manufacture (OEM) for the style of hydrant being adjusted.

2.7 Valves and Valve Boxes

- .1 150 to 400 millimetre, direct bury, non-rising stem, resilient seated wedge gate valve rated at 1 MPa in accordance with AT 4.1.1.80 of the Approved Products for Underground Use in the City of Winnipeg.
- .2 Valve body to be epoxy coated in accordance with AT 4.1.1.80 of the Approved Products for Underground Use in the City of Winnipeg.
- .3 Valve ends to be push-on type with full depth insertion in accordance with AT 4.1.1.80 of the Approved Products for Underground Use in the City of Winnipeg.
- .4 Direction of closing to be in accordance with SD-008.
- .5 Valve boxes to be in accordance with AP-001 and AT 4.1.1.81 of the Approved Products for Underground Use in the City of Winnipeg.

2.8 Corporation Stops

- .1 19 to 50 millimetre corporation stops to be in accordance with AT 4.1.1.31 of the Approved Products for Underground Use in the City of Winnipeg.

2.9 Curb Stops and Curb Stop Boxes

- .1 19 to 50 millimetre curb stops to be in accordance with AT 4.1.2.40 of the Approved Products for Underground Use in the City of Winnipeg.
- .2 Curb stop boxes to be in accordance with AP-013 and AP-014 and in accordance with AT 4.1.2.41 of the Approved Products for Underground Use in the City of Winnipeg.

2.10 Watermain Appurtenances

- .1 Repair clamps to be in accordance with AT 4.1.1.69 of the Approved Products for Underground Use in

the City of Winnipeg.

- .2 Mainline and wide range couplings to be in accordance with AT 4.1.1.63 and AT 4.1.1.65 of the Approved Products for Underground Use in the City of Winnipeg.
- .3 Tapping sleeves to be in accordance with AT 4.1.1.70 of the Approved Products for Underground Use in the City of Winnipeg.
- .4 Connection saddles to be in accordance with AT 4.1.1.30 of the Approved Products for Underground Use in the City of Winnipeg.
- .5 Fasteners, tie rods, clamps, nuts and bolts to be stainless steel in accordance with ASTM Specification A320. ANSI Type 316 marked with raised or indented numerals.
- .6 Joint harness for PVC fittings in accordance with ASTM F1674.
- .7 Corrosion protection wrapping in accordance with AWWA C217. Acceptable product, Denso LT Petroleum Tape.
- .8 Rigid extruded polystyrene foam insulation in accordance with CSGB Specification 51-GP20M (Type 4).
- .9 Zinc anodes to be in accordance with AT 4.1.3.20 of the Approved Products for Underground Use in the City of Winnipeg.
- .10 Continuity bonding wire to be #6 AWG 7 strand copper wire with TWU minus 40 degree C insulation (colour: green).
- .11 Polyethylene wrap in accordance with CAN/CGSH-51.34M. Thickness to be 0.15 millimetres (6 mil).

2.11 Watermain Casing Pipe

- .1 Black steel in accordance with ASTM A53 thickness to be in accordance with the Drawings and Specifications.

2.12 Cast-in-Place Concrete and Grout

- .1 Cast-in-place concrete and grout in accordance with CW 2160.

2.13 Bedding and Backfill Material

- .1 Bedding and backfill material in accordance with CW 2030.

2.14 Temporary Pressurized Water Supply Pipe

- .1 Temporary pressurized water supply pipe and fittings to be in accordance with CAN-B137 and be suitable for outdoor exposure, pressure rated service and meet National Sanitation Foundation Standard #14 & #61 for plastic piping system components and related materials.

3. CONSTRUCTION METHODS

3.1 Excavation

- .1 Remove existing pavement in accordance with CW 3230, CW 3235, CW 3240 and CW 3410.

- .2 Excavate in accordance with CW 2030. Excavate and prepare trench a sufficient distance in ahead to not to interfere with installation of the pipe.

3.2 Bedding

- .1 Place and compact sand bedding material in the bottom of the excavation in accordance with CW 2030 and SD-001 to the grade and elevation shown on the Drawings. Level across full width of excavation and leave ready for pipe installation.
- .2 Foundation material will not be required in shafts for watermains installed using trenchless methods unless indicated otherwise in the Drawings and Specifications or directed by the Contract Administrator.

3.3 Installation in a Trench

- .1 Assemble and install pipe in accordance with the manufacturer's instructions and AWWA Manual of Water Supply Practices M23, PVC Pipe – Design and Installation. When complete the watermain is to have a smooth and uniform invert.
- .2 Place pipe on compacted bedding ensuring uniform support under bell and pipe body throughout its full length. Work and compact bedding material under sides of pipe to provide proper haunching.
- .3 Protect exposed pipe ends with an approved stopper to prevent excess amounts of water, earth and debris from entering pipe as work proceeds.
- .4 Install pipe to the line and grade shown on the Drawings or as determined by the Contract Administrator in the field within a horizontal and vertical variance of +/- 100 millimetres.
- .5 Pipe joint deflections to be within the manufacturer's recommendations.

3.4 Installation Using Trenchless Methods

- .1 Install watermain using trenchless methods where alignment is under or crosses existing and proposed pavements, existing boulevards, trees, utility poles and structures and at other locations in accordance with the Drawings and Specifications or as directed by the Contract Administrator.
- .2 Excavate shafts and provide shoring in accordance with CW 2030.
- .3 Provide the locations and sizes of shafts to the Contract Administrator for review before excavating.
- .4 Join pipe sections together before inserting into the installation hole. Pull or push the entire length of pipe from the end of the last pipe into installation hole with bell ends facing away from the pulling or pushing direction. Installation methods where tension is applied to a pipe section will not be permitted.
- .5 Ensure the force applied to the section of pipe being pulled or pushed into the installation hole does not cause spigots to be inserted into the bell beyond the manufacturer's recommended insertion depth.
- .6 Pull back the entire length of pipe already in the installation hole if a length of pipe is to be withdrawn from the installation hole.
- .7 Plan trenchless installation operation to join watermain pipe sections at fitting and valve locations without using extra couplings.
- .8 Remove existing watermains by the extraction method and install the new watermain in the remaining hole where new watermains are installed on the same horizontal and vertical alignment as the existing

watermain.

- .9 Place pipe on compacted bedding in shafts ensuring uniform support under bell and pipe body throughout its full length. Work and compact bedding material under sides of pipe to provide proper haunching.
- .10 Protect exposed pipe ends with an approved stopper to prevent excess amounts of water, earth and debris from entering pipe as work proceeds.
- .11 Install pipe to the line and grade shown on the Drawings or as determined by the Contract Administrator in the field within a horizontal and vertical variance of +/- 100 millimetres.
- .12 Keep pipe joint deflections within the manufacturer's recommendations.
- .13 Repair damage to underground and surface structures due to surface subsidence and soil heaving caused by trenchless installation methods.
- .14 Where field conditions are such that watermains cannot be installed using trenchless methods install watermains in a trench using the class of backfill specified in CW 2030 for the installation location after receiving written approval from the Contract Administrator.

3.5 Installation in a Casing Pipe

- .1 Install the steel casing pipe of the specified thickness and diameter at the location, limits, line and grade shown on the Drawings using trenchless methods. Join individual casing pipe lengths with a continuous weld.
- .2 Securely attach 4 equally spaced cedar straps, skids or blocks or manufactured casing spacers around the watermain arranged at 45 degrees to the horizontal and vertical axis of the pipe. The straps, blocks, skids or spacers should be sized to ensure the watermain does not rest on the pipe bells and is centred within +/-10% of the centreline of the casing pipe.
- .3 Cedar straps, blocks or skids can be the full length of the watermain pipe except for the bell or of the length and spacing recommended by the pipe manufacturer to provide proper support.
- .4 Install the watermain inside the casing pipe in accordance with Clauses 3.4.4, 3.4.5 and 3.4.6 of this specification.

3.6 Extraction of Existing Watermain to be Abandoned

- .1 Extract the existing watermain between shafts where the new watermain is to be installed by trenchless methods directly below an existing watermain that will be abandoned.

3.7 Backfill

- .1 Place and compact initial backfill above the pipe in accordance with CW 2030 and SD-001.
- .2 Backfill the remainder of the trench or excavation in accordance with CW 2030 and SD-002.

3.8 Hydrant Assembly Installation

- .1 Install hydrant assembly in accordance with SD-006 and SD-007.
- .2 Install hydrant plumb with pumper nozzle perpendicular to and facing the street.
- .3 Construct concrete thrust block at base of hydrant to not interfere with base flange barrel bolts.

- .4 Install hydrant assembly to the line and grade shown on the Drawings or as determined by the Contract Administrator in the field within a horizontal and vertical variance of +/- 100 millimetres.
- .5 Locate hydrant flange 50 to 150 millimetres above finished grade elevation.
- .6 Install new hydrant assembly on an existing watermain as follows.
 - .1 Excavate and expose the existing watermain at location shown on the Drawings or as directed by the Contract Administrator.
 - .2 Cut existing pipe square to axis and remove the required length of pipe.
 - .3 Install required fittings, new pipe, thrust blocks, couplings and other material necessary to make the connections. Install new gaskets in bell ends of existing pipe or fittings.
 - .4 Provide a 1000 millimetre length of PVC pipe on each side of a new hydrant tee installed on an existing Asbestos-Cement watermain.
 - .5 Install a continuity bonding wire between ends of cast and ductile iron watermains that have been replaced with a length of PVC pipe. Prepare an area 50 millimetres square on the top of the pipe surface by grinding or filing to bare metal and attach the continuity bonding wire using the Thermite Welding process (Cadwelding).
 - .6 Alternatively install a tapping sleeve in accordance with Section 3.14 of this specification.

3.9 Valve Installation

- .1 Install valves on watermains and large diameter water services in accordance with manufacturer's instructions and SD-016. Valves are to be the same size as the watermain and water service unless shown otherwise on the Drawings.
- .2 Install by-pass arrangement for valves 350 millimetres and larger in accordance with SD-017.
- .3 Install valve box plumb, centred on valve with top of box at finished grade. Provide valve stem extension in valve box.
- .4 Install new valves on existing watermains in accordance with methods in Section 3.8.6 of this specification.
- .5 Orient valve box lids to close with the direction of traffic where installed in pavement.
- .6 Install valves at locations and grades shown on the Drawings or as determined by the Contract Administrator in the field within a horizontal and vertical variance of +/- 100 millimetres.

3.10 Water Service Installation

- .1 Install water services as specified for watermains in Section 3.3 and 3.4 of this specification.
- .2 Install the curb stop so the operating key is inline with the water service when the curb stop is in the open position.
- .3 Depth of water service from watermain to property line to be above combined sewers, wastewater sewers and sewer services where possible and be 2.3 to 2.75 metres deep.

- .4 Locate curb stops for 19 to 50 millimetre diameter water services in street right-of-way 300 millimetres from property line in accordance with SD-012. Locate control valves for 150 millimetre and larger water services as follows.
 - .1 Regular water service: in street right-of-way 300 millimetres from property line.
 - .2 Fire protection service: within 1.0 metre of watermain.
 - .3 Combined regular water and fire protection service: within 1.0 metre of watermain.
- .5 Couplings will not be permitted on new 19 to 38 millimetre diameter water service installations under 20 metres in length.
- .6 Locate required water service pipe couplings outside of existing and future pavement limits unless approved otherwise by the Contract Administrator.
- .7 Install approved curb stops and curb stop boxes on all new water services or where an existing curb stop is to be replaced.**
- .8 Install cast iron replacement curb stop boxes for existing 19 and 25 millimetre curb stops and cast iron valve box for existing 38 and 50 millimetre curb stops. Cut suitable slots in lower casing of valve box to allow box to be centred over curb stop and to not allow weight of curb box to be transferred to curb stop and water service pipe. Provide minimum 38 millimetre x 285 millimetre x 300 millimetre long pressure treated lumber base beneath curb stop to attach curb stop to and support curb stop box.
- .9 Direct tap corporation stops into watermains except where connection clamps or tapping sleeves are indicated in Table 2110.1. Obtain the Contract Administrator’s approval to use connection clamps as an alternate to direct tapping.
- .10 Install 19 and 25 millimetre diameter corporation stops in top quadrant of watermain at an angle between 0° and 30° to horizontal. Install 38 and 50 millimetre corporation stops horizontally into watermain. Install corporation stops requiring connection clamps horizontally into watermain.
- .11 Locate tap holes for corporation stops no closer than 600 millimetres from the end of an individual pipe length. Stagger multiple taps and separate by a minimum of 450 millimetres along pipe.
- .12 Wrap threads of corporation stops with 3 to 4 layers of “Teflon” type pipe thread tape and tighten into watermains as follows leaving 1 to 3 threads showing.
 - .1 Asbestos-Cement, ductile and cast iron pipe: 70 to 80 Newton metres of torque.
 - .2 PVC pipe: 35 to 40 Newton metres of torque
- .13 Cut copper water service pipe with a suitable tube cutter, flare end with appropriate flaring tool and connect to corporation stop and curb stop. Ensure ends of pipe are cut square and true with burrs removed before flaring. Tighten flare nut using suitable wrench. Pipe wrenches or other serrated jaw type wrenches will not be permitted. The following torque values are provided as a guide, check with manufacturer to confirm recommended tightening torque.

Water Service Size	Maximum Torque
19 millimetre	100 Newton meters
25 millimetres	100 Newton meters
38 millimetres	135 Newton meters
50 millimetres	170 Newton meters

- .14 Form a combination vertical and horizontal gooseneck on 19 and 25 millimetre water service pipe adjacent to the corporation stop as shown on SD-012 without kinking and exceeding manufacturer's recommended maximum degree of curvature. Ensure top of gooseneck is a minimum 2.1 metres below

finished grade above the gooseneck.

TABLE CW 2110.1 - WATERMAIN TAPPING METHOD

WATERMAIN MATERIAL AND SIZE	WATER SERVICE SIZE			
	19 millimetre	25 millimetre	38 millimetre	50 millimetre
Asbestos-Cement				
100millimetre	CS	CS	NA	NA
150millimetre Class 150	CS	CS	CS	CS
150millimetre Class 200	CS	CS	CS	CS
200 to 400 millimetre	CS	CS	CS	CS
Ductile and Cast Iron				
100 millimetre	DT	DT	TS	TS
150 millimetre	DT	DT	CS	CS
200 to 500 millimetre	DT	DT	DT or CS	DT or CS
PVC (CI OD)				
150 to 300 millimetre	DT	DT	CS	CS
350 to 450 millimetre	CS	CS	CS	CS
PVC (IPS)				
150 to 300 millimetre	CS	CS	CS	CS

Legend
 DT - Direct Tap
 CS - Connection Saddle required
 NA - Not Allowed
 TS - Tapping Sleeve required
 CI OD - Cast Iron Pipe Outside Diameter
 IPS - Iron Pipe Size

3.11 Fitting and Thrust Block Installations

- .1 Install fittings at locations and elevations shown on the Drawings, where required to connect to existing watermains and where directed by the Contract Administrator.
- .2 Construct cast-in-place concrete thrust blocks for fittings in accordance with SD-004, SD-005 and as follows.
 - .1 Thrust block to bear against undisturbed soil.
 - .2 Cut soil to have a smooth vertical face and be at the proper angle to the fitting.
 - .3 Ensure horizontal struts or braces required for shoring are not located within limits of concrete thrust blocks.
 - .4 Install a minimum 0.15 millimetre (6 mil) thick polyethylene sheet bond breaker between cast iron fittings and concrete.
- .3 Provide 24 hours notice to the Contract Administrator before concrete is placed to allow inspection and approval of thrust block formwork.

3.12 Watermain and Water Service Insulation

- .1 Insulate watermains and water services in accordance with SD- 018 where cover to final grade will be less than 2.1 metres, at locations shown on the Drawings and where directed by the Contract Administrator.

3.13 Connecting to Existing Watermains and Large Diameter Water Services

- .1 Where connecting to an existing watermain or large diameter water services requires removal of a plug in a fitting or end of pipe, connection will be considered an in-line connection – plug existing.
- .2 Where connecting to an existing watermain or large diameter water service requires removal of a fitting or valve, connection will be considered an in-line connection – no plug existing.
- .3 Where connecting to an existing watermain or large diameter water service requires installation of a tee, connection will be considered a perpendicular connection.
- .4 Excavate and expose existing watermain or large diameter water service at locations shown on the Drawings or as directed by the Contract Administrator and remove existing fitting, valve, plug, concrete thrust block and required length of pipe to make the connection.
- .5 Install a new gasket in the bell of the existing pipe or fitting.
- .6 Cut the end of the existing pipe square to the axis of the pipe.
- .7 Install required fittings, valves, new pipe, thrust blocks, couplings and other material necessary to make in-line or perpendicular connection.
- .8 Use 150 x 150 x 150 millimetre tee with a 150 to 100 millimetre reducer when making perpendicular connection to an existing 100 millimetre watermain. Install reducer immediately adjacent to tee.
- .9 Repair clamps will not be permitted for use as couplings when connecting to existing watermains.
- .10 Repair existing watermains and large diameter water services as directed by the Contract Administrator that were damaged by carelessness during construction.

3.14 Connecting to Existing Watermains With Tapping Sleeve and Valve

- .1 Excavate and expose the existing watermain at the location shown on the Drawings or where directed by the Contract Administrator.
- .2 Remove all dirt, debris, rust and scale from the existing watermain pipe before installing tapping sleeve.
- .3 Install tapping sleeve, drill hole of the required size in side of existing watermain and install tapping valve in accordance with the manufacturer's recommendations.
- .4 Construct a concrete thrust block of the required size in accordance with SD-004 at tapping sleeve locations except for hydrant leads.
- .5 Tapping sleeves and valves will not be permitted for use on 150 millimetre and smaller watermains and where the connecting pipe is less than 2 pipe sizes smaller than the existing watermain.
- .6 Repair existing watermains as directed by the Contract Administrator that were damaged by carelessness during construction.

3.15 Connecting Existing Water Services to New Watermains

- .1 Locate existing water service and cut or extend water service pipe as required to connect to new watermain.
- .2 Connect required length of new 19 to 50 millimetre copper water service to existing water service pipe and corporation stop in new watermain in accordance with Section 3.10 of this specification.
- .3 Connect required length of new 150 millimetre diameter and larger water services to existing water service and new watermain in accordance with Section 3.13 or 3.14 of this specification.

3.16 Plugging and Abandoning Watermains and Water Services

- .1 Completely plug each end of watermain or large diameter water service sections that are to be cut-off and permanently abandoned with mortar or concrete.
- .2 Fit end of watermain or large diameter water service to be left for a future connection with a cast iron plug or cap. Wrap end with minimum 0.15 millimetre (6 mil) polyethylene and construct a concrete thrust block of the required size in accordance with SD-004.
- .3 Abandon existing large diameter water services on watermains in service as follows.
 - .1 Excavate to existing watermain and locate tee or tapping sleeve for service to be abandoned.
 - .2 Cut existing watermain pipe square to the pipe axis and remove existing tee or tapping sleeve and thrust block.
 - .3 Install new section of pipe in accordance with Section 3.3 of this specification and connect to existing watermain using approved couplings.
 - .4 Install a continuity bonding wire between ends of cast and ductile iron watermains that have been replaced with a length of PVC pipe. Prepare an area 50 millimetres square on the top of the pipe surface by grinding or filing to bare metal and attach the continuity bonding wire using the Thermite Welding process (Cadwelding).
- .4 Abandon existing small diameter water services on watermains in service as follows.
 - .1 Excavate to existing watermain and locate corporation stop for service to be abandoned.
 - .2 Turn corporation stop to off position and cut water service pipe a maximum of 300 millimetres from the watermain. Crimp both ends of abandoned water service pipe flat.
 - .3 Remove service saddle if one is in place and install approved stainless steel repair clamp centered over hole in watermain in accordance with Clause 3.17.4 of this specification.
 - .4 Locate curb stop and remove top casing or cut-off casing a minimum of 900 millimetres below grade.

3.17 Repairs to Existing Watermains During Construction Activities

- .1 Repair breaks that occur on existing watermains within and adjacent to the Site during construction of surface or underground works using an approved stainless steel repair clamp or by replacing the existing pipe with a length of PVC watermain pipe as directed by the Contract Administrator.
- .2 The Contract Administrator will determine if a particular watermain break was due to carelessness or

other circumstances.

- .3 Locate break and excavate to existing watermain in accordance with CW 2030.
- .4 Remove dirt, debris, rust and scale from existing watermain and install repair clamp in accordance with manufacturer's recommendations
- .5 Cut existing watermain pipe square to the pipe axis, remove required length of existing watermain pipe as directed by the Contract Administrator and install new watermain pipe in accordance with Section 3.3 of this Specification.
- .6 Backfill as directed by the Contract Administrator in accordance with CW 2030 and SD-002.
- .7 Install a continuity bonding wire between ends of cast and ductile iron watermains that have been repaired with a length of PVC pipe. Prepare an area 50 millimetres square on the top of the pipe surface by grinding or filing to bare metal and attach the continuity bonding wire using the Thermite Welding process (Cadwelding).

3.18 Installation of Sacrificial Zinc Anodes on Existing Metallic Watermains and Copper Services

- .1 Install approved 10.9 kilogram sacrificial zinc anodes on existing metallic watermains, hydrant leads and large diameter water services whenever they are exposed and will remain in service after work is completed. Provide anodes as follows.
 - .1 One anode for every 3.0 metres of existing pipe exposed.
 - .2 One anode on existing pipe on either side of a new tee, cross or length of repair pipe.
- .2 Install 10.9 kilogram sacrificial zinc anodes on copper watermains adjacent to water services as shown on SD-013.
- .3 Install 10.9 kilogram sacrificial zinc anodes on copper water services as shown on SD-012 and as follows.
 - .1 Locate one anode adjacent to the curb stop and one anode adjacent to the corporation stop where the corporation stop is more than 4.5 metres away from the curb stop for new water service installation and for water service renewal from existing curb stop to existing watermain.
 - .2 Locate one anode adjacent to curb stop where new curb stop and curb stop box is installed on an existing copper water service.
 - .3 Locate one anode adjacent to corporation stop where an existing copper water service is reconnected to a new PVC watermain and the existing metallic watermain is removed.
- .4 Install anodes as follows.
 - .1 Handle anode by the body only and do not lift by connecting wire.
 - .2 Remove plastic wrapping around anodes if provided. Do not remove cardboard packaging.
 - .3 Lay anode flat in bottom of excavation parallel to and at least 0.5 metres away from watermain or water service.
 - .4 Perforate the entire length of the top half of the cardboard packaging with a sufficient number of 12 millimetre diameter holes to allow water to soak into the conductive backfill within the packaging. Do

not allow the conductive backfill to spill out.

- .5 Cover the anode with excavated material before installing bedding for watermain or water services.
- .6 Wrap the anode connection wire 1½ times around the watermain or water service before attaching. Leave sufficient slack on anode connecting wire to prevent stain on wire from backfill.
- .7 Prepare an area 50 millimetres square on the top of the pipe surface by grinding or filing to bare metal and attach the anode connecting wire using the Thermite Welding process (Cadwelding).
- .8 Attach anode connecting wire to lugs on the corporation stop and curb stop where provided otherwise attach the anode connecting wire to the copper water service with an electrical copper alloy ground clamp.
- .9 Place initial backfill in excavation taking care to not dislodge the anode connecting wire from the anode.
- .10 Pour a minimum of 60 litres of potable water over backfill where anode is located after the watermain or water service is bedded and initially backfilled. Eliminate addition of water if backfill material is sufficiently wet.

3.19 Installation of Continuity Bonding Between Copper Water Services and Abandoned Watermains

- .1 Provide continuity bonding between new and existing copper water services connected to a new PVC watermain and existing metallic watermains abandoned in place.
- .2 Install the continuity bonding wire as follows.
 - .1 Attach one end of the continuity bonding wire to an electrical copper alloy ground clamp installed on the copper water service pipe near the corporation stop or to a grounding lug provided on approved corporation stops.
 - .2 Attach the other end of the continuity bonding wire to either an electrical copper alloy ground clamp installed on an abandoned copper water service pipe still connected to the abandoned metallic watermain or directly to the abandoned metallic watermain.
 - .3 Wrap the continuity bonding wire 1½ times around the copper water service and abandoned metallic watermain before attaching. Leave sufficient slack on continuity bonding wire to prevent strain on the wire from backfill.
 - .4 Prepare an area 50 millimetres square on the top of the abandoned watermain pipe surface by grinding or filing to bare metal and attach the continuity bonding wire using the Thermite Welding process (Cadwelding).

3.20 Removal and Abandonment of Existing Valves, Valve Boxes and Hydrants

- .1 Remove existing valves by excavating to the existing watermain and removing, the valve, valve box and valve stem extension. Plug the ends of the watermain pipe in accordance with Section 3.16 of this specification.
- .2 Abandon existing valves by removing the upper casing of the valve box and valve stem extension inside.

- .3 Excavate and remove existing hydrant, hydrant valve and hydrant lead pipe from the hydrant tee on the watermain. Remove the existing hydrant tee on watermains remaining in service in accordance with Clause 3.16.3 of this specification. Plug hydrant drain pipe if one exists with mortar or concrete.
- .4 Load and deliver salvaged valves, valve boxes, valve stem extensions and hydrants as directed by the Contract Administrator to the Water and Waste Department, Water Services Division Yard located at 552 Plinguet Street. Unload valves, valve boxes and hydrants at the yard as directed by City personnel.

3.21 Adjustment and Relocation of Existing Hydrants

- .1 Raise existing hydrants as shown on the Drawings or identified in the Specifications or as directed by the Contract Administrator as follows.
 - .1 Obtain and follow hydrant manufacturer's instructions for extending hydrant.
 - .2 Remove the hydrant body and disconnect the existing stem coupling.
 - .3 Attach the required length of barrel extension, stem extension and stem coupling.
 - .4 Install new nuts, washers and bolts, a new gasket and breakaway flange on the barrel extension 50 millimetres to 150 millimetres above the final design elevation.
- .2 Lower existing hydrants as shown on the Drawings or identified in the Specifications or as directed by the Contract Administrator as follows.
 - .1 Remove the existing hydrant, thrust block and hydrant lead pipe as required.
 - .2 Install a new hydrant with the appropriate depth of bury in accordance with Section 3.8 of this specification.
 - .3 Install required fittings, new hydrant lead pipe, thrust blocks, couplings and other material necessary to make the connection to the existing valve or lead pipe. Install new gaskets in bell ends of existing pipe or fittings.
 - .4 Disconnect and plug drain on hydrant if one exists. Plug end of hydrant drain pipe to sewer with mortar or cement.
 - .5 Adjust the existing hydrant valve box to the required finished grade.
 - .6 Load and deliver salvaged hydrants to the Water and Waste Department, Water Services Division Yard located at 552 Plinguet Street. Unload valves, valve boxes and hydrants at the yard as directed by City personnel.
- .3 Relocate existing hydrants where shown on the Drawings or indicated in the Specifications or as directed by the Contract Administrator as follows.
 - .1 Type A Relocation – Using Existing Hydrant Tee and Extending Lead Pipe
 - .1 Excavate and remove the existing hydrant and hydrant valve from the hydrant lead pipe as shown on the Drawings and Specifications or as directed by the Contract Administrator. Replace broken or defective components as directed by the Contract Administrator.
 - .2 Install the existing hydrant at the location shown on the Drawings or indicated in the Specifications or as directed by the Contract Administrator in accordance with Section 3.8 of this specification.

- .3 Install required fittings, new hydrant lead pipe, thrust blocks, couplings and other material necessary to make the connections. Install new gaskets in bell ends of existing pipe or fittings.
- .4 Install hydrant lead pipe extension in accordance with Section 3.3 or 3.4 of this Specification.
- .2 Type B Relocation – Abandoning Existing Hydrant Tee
 - .1 Excavate and remove the existing hydrant and hydrant valve from the hydrant lead pipe as shown on the Drawings and Specifications or as directed by the Contract Administrator. Replace broken or defective components as directed by the Contract Administrator.
 - .2 Abandon the existing hydrant tee by removing the tee in accordance with Clause 3.16.3 of this specification.
 - .3 Install the existing or new hydrant and hydrant valve at the location shown on the Drawings and Specifications or as directed by the Contract Administrator and in accordance with Clause 3.8 of this specification.
- .4 Flush and disinfect adjusted and relocated hydrants and extended hydrant leads in accordance with CW 2125.

3.22 Exposing Existing Watermains and Sewer Services

- .1 Expose existing watermains at proposed connection locations and other locations as directed by the Contract Administrator far enough in advance of watermain installation to allow existing watermain inverts to be determined. The Contract Administrator will modify design grades as required.
- .2 Locate and expose existing sewer services far enough in advance of watermain installation to allow the Contract Administrator to determine if there is a conflict with the watermain grade. The Contract Administrator will modify watermain design grade or direct the sewer service to be re-graded if there is a conflict.
- .3 Replace sewer services removed to facilitate installation of watermain or that are damaged during excavation for the watermain installation.

3.23 Connecting to Existing Lead Water Services

- .1 Connect new copper water service to existing lead water service with a suitable sized flanged copper to lead adapter. Conventional copper to copper flared and compression fittings will not be allowed. Connect to existing lead water services at the property line a distance of 300 millimetre beyond new curb stops.

3.24 Replacement of Private Lead Services

- .1 Where it is determined a lead water service exists on private property, the Contract Administrator will provide the property owner with a notice of an opportunity to replace the lead water service in conjunction with watermain work in the vicinity.
- .2 Maintain the excavation at the curb stop open for up to 5 working days to allow connection of new water service if owner decides to replace existing lead service on private property. Proceed with remainder of the Work to not conflict with replacement of lead water service on private property.
- .3 Backfill the excavation after connection of the new water service or after 5 working days whichever occurs first unless directed otherwise by the Contract Administrator.

3.25 Temporary Pressurized Water Supply

- .1 Provide and maintain a temporary pressurized water supply to residential, commercial and industrial customers in accordance with CW 1120 where existing watermains will be shutdown or interrupted during installation of new watermains.
- .2 Locate temporary pressurized water supply lines where they will not interfere with or present a hazard to pedestrian and vehicle traffic or obstruct access to buildings and residences.
- .3 Install temporary pressurized water supply beneath collector or regional streets and where directed by the Contract Administrator using trenchless methods.
- .4 Connect temporary water service to the outside hose bib on building or residence or make arrangements with owner of building or resident for other connection location. Arrange with owner of building or resident to close the valve on the water service located by the water meter inside the building or residence.
- .5 Chlorinate, disinfect and flush temporary pressurized water supply lines in accordance with CW 2125 before connecting to buildings and residences.
- .6 Protect temporary pressurized water supply lines from freezing.
- .7 Remove temporary pressurized water supply lines once new watermains have been accepted and put into service. Arrange with owner of building or resident to open the valve on the water service located by the water meter inside the building or residence. Remove sand and debris that may have entered the water meter during construction of the Work as directed by the Contract Administrator.

3.26 Hydrostatic Leakage Testing and Disinfection

- .1 Perform hydrostatic leakage testing and disinfection of watermains and water services in accordance with CW 2125.

3.27 Boulevard and Pavement Restoration

- .1 Replace concrete pavement slabs, miscellaneous concrete slabs, curbs and asphaltic pavement in accordance with CW3230, CW 3235, CW 3240 and CW 3410 as indicated in the Specifications and as directed by the Contract Administrator. Use “early opening” concrete in accordance with CW 3310 as indicated in the Specifications and as directed by the Contract Administrator.
- .2 Restore boulevards and grassed areas by sodding or seeding using imported topsoil in accordance with CW 3510 and CW 3520 as indicated in the Specifications and as directed by the Contract Administrator.
- .3 Restore gravel surfaces in accordance with CW 3150 as indicated in the Specifications and as directed by the Contract Administrator.

4. MEASUREMENT AND PAYMENT**4.1 Watermain Installation**

- .1 Watermain installation will be measured on a length basis for each size, method of installation, type of bedding and type of backfill and paid for at the Contract Unit Price per metre for “Watermains” or “Watermain Renewals”. Length to be paid for will be the total number of linear metres supplied and

installed in accordance with this specification, accepted and measured by the Contract Administrator.

- .2 Measurement for length of watermain installed in a trench will be made horizontally at grade above the centreline of pipe through fittings.
- .3 Measurement for length of watermain installed using trenchless methods will be made horizontally at grade above the centreline of pipe through shafts. Measurement where the type of backfill used in shafts changes will be from the midpoint distance between adjacent shafts.
- .4 Extraction of existing pipe required to install new pipe will be included with payment for trenchless method of installation.
- .5 Measurement for length of watermain installed using trenchless methods between watermains installed in a trench will be made horizontally at grade above the centreline of pipe from face to face of the trench excavation.
- .6 Watermains specified to be installed using trenchless methods but were installed in a trench due to field conditions will be paid for at the Contract Unit Price per metre for trenchless installation.
- .7 Measurement for length of watermain installed in a casing pipe will be made horizontally at grade above the centreline of pipe for the length of the casing pipe.
- .8 Supply and installation of watermain casing pipe will be included with installation of watermain or watermain renewal.
- .9 Repair of damage to underground and surface structures due to surface subsidence and soil heaving caused by trenchless installation methods will be at own expense.
- .10 Correction of alignment and grade exceeding the allowable variance will be at own expense.

4.2 Extraction of Existing Watermains to be Abandoned

- .1 Extraction of existing watermains to be abandoned will be measured on a length basis for each size extracted and paid for at the Contract Unit Price per metre for "Extraction of Existing Watermains to be Abandoned". Length to be paid for will be the total number of linear metres extracted in accordance with this specification, accepted and measured by the Contract Administrator.
- .2 Measurement for length of existing abandoned watermains removed by extraction will be made from face to face of shafts.

4.3 Hydrant Assembly Installation

- .1 Hydrant assembly installation will be measured on a unit basis for each type and paid for at the Contract Unit Price for "Hydrant Assembly" and "New Hydrant Assembly on Existing Watermain". Number of units to be paid for will be the total number of hydrant assemblies supplied and installed in accordance with this specification, accepted and measured by the Contract Administrator.
- .2 Construction of concrete thrust blocks and installation of mechanical restrainers will be included with installation of the hydrant assembly.
- .3 Extensions or adjustments necessary to locate hydrant flange at required finished elevation will be included with the hydrant assembly.
- .4 Up to 3.0 metres of hydrant lead pipe measured from the connection to the hydrant tee on the watermain will be included with the hydrant assembly.

- .5 Hydrant lead pipe longer than 3.0 metres will be measured for payment in accordance with Section 4.1 of this specification.
- .6 PVC pipe and couplings required to connect a new hydrant assembly to an existing watermain will be included with the hydrant assembly installation.

4.4 Valve Installation

- .1 Valve installation will be measured on a unit basis for each size and type and paid for at the Contract Unit Price for “Watermain Valve” and “New Watermain Valve on Existing Watermain”. Number of units to be paid for will be the total number of watermain valves supplied and installed in accordance with this specification, accepted and measured by the Contract Administrator.
- .2 PVC pipe and couplings required to install a new valve on an existing watermain will be included with the valve installation.

4.5 Water Service Installation

- .1 Water service installation will be measured on a length basis for each size, method of installation, type of bedding and type of backfill and paid for at the Contract Unit Price per metre for “Water Services”. Length to be paid for will be the total number of linear metres supplied and installed in accordance with this specification, accepted and measured by the Contract Administrator.
- .2 Measurement for length of water services installed in a trench will be made horizontally at grade, above the centreline of pipe through fittings from the connection at the watermain to the specified termination point of the water service.
- .3 Measurement for length of water services installed using trenchless methods will be made horizontally at grade above the centreline of pipe through shafts from the connection at the watermain to the specified termination point of the water service.
- .4 Measurement for length of water services installed using trenchless methods between water services installed in a trench will be made horizontally at grade above the centreline of pipe from face to face of the trench excavation.
- .5 Water services specified to be installed using trenchless methods but were installed in a trench due to field conditions will be paid for at the Contract Unit Price per metre for trenchless installation.

4.6 Corporation Stops

- .1 Corporation stops will be measured on a unit basis for each size and paid for at the Contract Unit Price for “Corporation Stops”. Number of units to be paid for will be the total number of corporation stops supplied and installed in accordance with this specification, accepted and measured by the Contract Administrator.

4.7 Curb Stops

- .1 Curb stops will be measured on a unit basis for each size and paid for at the Contract Unit Price for “Curb Stops” or “Curb Stops – Replace Existing”. Number of units to be paid for will be the total number of curb stops supplied and installed in accordance with this specification, accepted and measured by the Contract Administrator.

4.8 Curb Stop Boxes

- .1 Curb stop boxes will be measured on a unit basis for each size and paid for at the Contract Unit Price for “Curb Stop Boxes” or “Curb Stop Boxes – Replace Existing”. Number of units to be paid for will be the total number of curb stop boxes supplied and installed in accordance with this specification accepted and measured by the Contract Administrator.

4.9 Fitting and Thrust Block Installation

- .1 Fittings on watermains and large diameter water services except tees for hydrant assemblies, will be measured on a unit basis for each type and size and paid for at the Contract Unit Price for “Fittings”. Number of units to be paid for will be the total number of fittings supplied and installed in accordance with this specification, accepted and measured by the Contract Administrator.
- .2 Construction of concrete thrust blocks and installation of mechanical restrainers and joint harnesses will be included with installation of fittings.

4.10 Watermain and Water Service Insulation

- .1 Watermain and water service insulation will be measured on a length basis and paid for at the Contract Unit Price for “Watermain and Water Service Insulation”. Length to be paid for will be the total length of watermain and water service insulation supplied and installed in accordance with this specification, accepted and measured by the Contract Administrator.
- .2 Measurement of watermain and water service insulation will be made horizontally at grade along the centreline of the insulation.

4.11 Connecting to Existing Watermains and Large Diameter Water Services

- .1 Connecting to existing watermains and large diameter water services will be measured on a unit basis for each type and size and paid for at the Contract Unit Price for the Items of Work listed. Number of units to be paid for will be the total number of connections made in accordance with this specification, accepted and measured by the Contract Administrator.

Items of Work:

Connecting to Existing Watermains and Large Diameter Water Services

- i.) Inline Connection - Plug Existing
 - ii.) Inline Connection - No Plug Existing
 - iii.) Perpendicular Connection
- .2 Supply and installation of fittings except couplings will be measured for payment in accordance with Section 4.9 of this specification.
 - .3 Supply and installation of couplings will be included with the connection.
 - .4 Supply and installation of up to 1.0 metre of watermain pipe on each side of the new tee installed for a perpendicular connection measured from the centerline of the tee will be included with the connection.
 - .5 Supply and installation of watermain or large diameter water service longer than 1.0 metres will be measured for payment in accordance with Section 4.1 of this specification.

4.12 Connecting to Existing Watermains With Tapping Sleeve and Valve

- .1 Connecting to existing watermains with a tapping sleeve and valve will be measured on a unit basis for each size and paid for at the Contract Unit Price for “Connecting to Existing Watermains With Tapping Sleeve and Valve”. Number of units to be paid for will be the total number of units supplied and installed in accordance with this specification, acceptable to and measured by the Contract Administrator.

4.13 Connecting Existing Copper Water Services to New Watermain

- .1 Connecting existing 20 to 50 millimetre copper water services to new watermains will be measured on a unit basis for each size and paid for at the Contract Unit Price for “Connecting Existing Copper Water Services to New Watermains”. Number of units to be paid for will be the total number of units supplied and installed in accordance with this specification, accepted and measured by Contract Administrator.
- .2 Supply and installation of couplings and up to 1.0 metre of new copper water service pipe measured from the outside of the new watermain will be included in the connection.
- .3 Supply and installation of copper water service pipe longer than 1.0 metres will be measured and paid for in accordance with Section 4.5 of this specification.

4.14 Plugging and Abandoning Watermains and Water Services

- .1 Cutting off, plugging and abandoning of watermains and large diameter water services will be included with watermain work.
- .2 Abandoning existing large diameter water services on watermains in service will be measured on a unit basis for each size of water service abandoned and paid for at the Contract Unit Price for “Abandoning Large Diameter Water Services”. Number of units to be paid for will be total number of large diameter water services abandoned in accordance with this specification, accepted and measured by the Contract Administrator.
- .3 Abandoning existing small diameter water services on watermains in service will be measured on a unit basis for each size of water service abandoned and paid for at the Contract Unit Price for “Abandoning Small Diameter Water Services”. Number of units to be paid for will be total number of small diameter water services abandoned in accordance with this specification, accepted and measured by the Contract Administrator.

4.15 Repairs to Existing Watermains

- .1 Repairs made to existing watermains using stainless steel repair clamps will be measured on a unit basis for each size, length of clamp and type of backfill and paid for at the Contract Unit Price for “Watermain Repair - Repair Clamp”. Number of units to be paid for will be total number of repair clamps supplied and installed in accordance with this specification, accepted and measured by the Contract Administrator.
- .2 Repairs made to existing watermains by replacing up to 3.0 continuous metres of pipe will be measured for payment on a unit basis for each size and type of backfill and paid for at the Contract Unit Price for “Watermain Repair – Up to 3.0 Metres Long”. Number of units to be paid for will be the total number of watermain repairs up to 3.0 metres long supplied and installed in accordance with this specification, accepted and measured by the Contract Administrator.
- .3 Repairs made to existing watermains by replacing additional pipe continuous to the first 3.0 metres of pipe will be measured for payment on a length basis for each size and type of backfill and paid for at the Contract Unit Price for “Watermain Repair – In Addition to First 3.0 metres”. Length to be paid for will be the total number of linear metres of watermain repair additional to the first 3.0 metre repair supplied and

installed in accordance with this specification, accepted and measured by the Contract Administrator.

- .4 Repairs to existing watermains damaged by carelessness as determined by the Contract Administrator will be at own expense.
- .5 Supply and installation of continuity bonding wire will be included with watermain repairs.

4.16 Sacrificial Zinc Anodes

- .1 Sacrificial zinc anodes installed on existing metallic watermains and copper water services will be measured on a unit basis and paid for at the Contract Unit Price for "10.9 Kilogram Sacrificial Zinc Anodes" for the Items of Work listed on the Schedule of Prices. Number of units to be paid for will be the total number of anodes supplied and installed in accordance with this specification, accepted and measured by the Contract Administrator.

Items of Work:

- 10.9 Kilogram Sacrificial Zinc Anodes
 - i.) On Metallic Watermains
 - ii.) On 38 Copper Watermains
 - iii.) On Water Services

4.17 Continuity Bonding Wire Between Copper Water Services and Abandoned Watermains

- .1 Continuity bonding wire installed between copper water services and abandoned metallic watermains will be measured on a unit basis and paid for at the Contract Unit Price for "Continuity Bonding". Number of units to be paid for will be the total number of continuity bonding wires supplied and installed in accordance with this specification, accepted and measured by the Contract Administrator.

4.18 Removal and Abandonment of Existing Valves, Valve Boxes and Hydrant Assemblies

- .1 Removal and abandonment of existing valves, valve boxes and hydrant assemblies on watermains that will be abandoned will be included with installation of watermains and watermain renewals.
- .2 Abandonment of hydrant tees on watermains that will remain in service will be measured on a unit basis for "Abandonment of Hydrant Tees on Watermains in Service". The number to be paid for will be the total number of hydrant tees abandoned in accordance with this Specification, accepted and measured by the Contract Administrator.
- .3 Repair or replace valves and hydrants identified by the Contract Administrator to be salvaged that are not delivered to or are damaged by carelessness before or while being delivered to the Water Services' Yards will be at own expense.

4.19 Adjustment and Relocation of Existing Hydrants

- .1 Adjustment of existing hydrants by raising will be measured on a unit basis for "Raising Existing Hydrant". The number to be paid for will be the total number of raised hydrants made in accordance with this Specification, accepted and measured by the Contract Administrator.
- .2 Adjustment of hydrants by removing and lowering will be measured on a unit basis for "Removing and Lowering Existing Hydrant". The number to be paid for will be the total number of raised hydrants made in accordance with this Specification, accepted and measured by the Contract Administrator.
- .3 Delivery of salvaged hydrants to the specified location will be included with hydrant adjustment.

- .2 Relocating existing hydrants will be measured on a unit basis and paid for at the Contract Unit Price for “Relocating Existing Hydrant – Type A or Type B”. Number of units to be paid for will be the total number of hydrants relocated in accordance with this specification, accepted and measured by the Contract Administrator.
- .3 Up to 3.0 metres of new hydrant lead pipe measured from the connection to the existing hydrant lead will be included with “Relocating Existing Hydrant”.
- .4 New hydrant lead pipe longer than 3.0 metres will be measured for payment in accordance with Section 4.1 of this specification.

4.20 Exposing Existing Watermains and Sewer Services

- .1 Exposing existing watermains and sewer services to determine elevations will be included with installation of watermains and watermain renewals.
- .2 Sewer services removed and replaced to facilitate installation of watermains or watermain renewals or that are repaired or replaced due to carelessness during construction will be at own expense.

4.21 Regrading of Existing Sewer Services

- .1 Regrading of sewer services up to 1.5 metres in length will be measured for payment on a unit basis for each size of service and paid for at the Contract Unit Price for “Regrading Existing Sewer Service – Up to 1.5 Metres Long”. Number of units to be paid for will be the total number of sewer services regraded in accordance with this specification, accepted and measured by the Contract Administrator.
- .2 Regrading of sewer services longer than 1.5 metres will be measured for payment on a length basis for each size of service and paid for at the Contract Unit Price for “Regrading Existing Sewer Services – Longer Than 1.5 metres”. Length to be paid for will be the total length of sewer services regraded in accordance with this specification, accepted and measured by the Contract Administrator.
- .3 Measurement will be made horizontally at grade above the centreline of the sewer service through fittings from connection to connection to the existing sewer service.
- .4 Supply and installation of couplings and connections to existing sewer service will be included in regrading of sewer service.

4.22 Connecting to Existing Lead Water Services

- .1 Connecting to existing lead water services will be included in replacement of water service and curb stop.

4.23 Maintaining Curb Stop Excavations for Replacement of Private Lead Services

- .1 Maintaining curb stop excavations for replacement of private lead services by others will be measured on a unit basis per working day per excavation and paid for at the Contract Unit price for “Maintaining Curb Stop Excavations”. Number of units to be paid for will be total number of excavations per working day that are maintained in accordance with this specification, accepted and measured by the Contract Administrator.

4.24 Temporary Pressurized Water Supply

- .1 Provision of temporary pressurized water supply where existing watermains are shutdown or interrupted will be included with the watermain work being done.

4.25 Pavement Restoration

- .1 Renewal of existing concrete pavement slabs will be measured on a surface area basis per square metre in accordance with CW 3230. No separate measurement or payment will be made for Drilled Dowels or Tie Bars, the cost for which shall be included in the prices bid for renewal of concrete pavement slabs.
- .2 Removal and replacement of existing miscellaneous concrete slabs, curbs and asphaltic pavement will be measured for payment in accordance with CW 3235, CW 3240 and CW 3410.

4.26 Boulevard Restoration

- .1 Restoration of boulevards and grassed areas disturbed due to construction activities will be included with watermain work being done.
- .2 Restoration of boulevard and grassed areas beyond the limits of construction as directed by the Contract Administrator will be measured for payment in accordance with CW 3510 and CW 3520.