THE REGIONAL MUNICIPALITY

OF PEEL

STANDARD SPECIFICATIONS

FOR

WATERMAINS

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W.1. GENERAL

The Regional Municipality of Peel Public Works (PW) Design, Specifications and Procedures Manual shall form a part of the Contract Documents.

The following Ontario Provincial Standard Specifications shall also form a part of these contract documents:

OPSS 415 Tunnelling

OPSS 416 Jacking and Boring

OPSS Horizontal Directional Drilling

OPSS 503 Site Preparation for Pipelines

OPSS 504 Preservation, Protection and Reconstruction of Existing Facilities

OPSS 514 Trenching, Backfilling and Compacting

OPSS 515 Rock Excavation for Pipe Lines and Associated Structures

OPSS 516 Excavating, Backfilling and Compacting for Manholes and Valve Chambers

OPSS 517 Dewatering

OPSS 538 Shoring and Bracing

OPSS 701 Construction Specifications for Watermain Installation in Open Cut

OPSS 702 Cathodic Protection on New and Existing Watermain

The Safe Drinking Water Act shall also form a part of these contract documents; Safe Drinking Water Act, 2002 – O. Reg. 170/03 as amended.

W.2 SCOPE

The contractor shall furnish all the necessary materials, labour, tools, plant and equipment to construct watermains in accordance with the Contract Documents and Drawings.

W.3 MATERIALS

W.3.1 General

Pipe size and class shall conform to the requirements shown on the contract drawings and/or specified in the Special Provisions. Pipe material shall be selected in accordance with the Material Specifications unless otherwise specified on the contract drawings and/or in the Special Provisions.

All valves, hydrants, fittings and accessories shall be in accordance with the Material Specifications and shall be compatible with the class and type of pipe with which they will be used. All materials contacting potable water must meet NSF/ANSI 61 and all lubricants/chemicals to meet NSF/ANSI 60.

Stainless steel bolt and nuts are to be used on all fittings and joint restraints.

All metallic fittings, valves and joint restraints must be wrapped end to end with an approved corrosion protection system that includes petrolatum primer (paste), petrolatum moulding mastic, and low temperature petrolatum tape.

The contractor shall submit for review, shop drawings of any proposed 400 mm diameter and larger watermains, including special fittings and pre-cast cast in place valve chambers, prior to the manufacturing of watermain materials.

W.3.2 Concrete

Concrete for thrust blocks shall conform to the requirements of OPSS 1301 with a nominal minimum twenty-eight day compressive strength of 15 MPa. Concrete for precast valve chambers to conform to the requirements of OPSS 1351. Thrust blocks as per Region of Peel STD DWG 1-5-4 thru 1-5-7 (inclusive).

W.3.3 Pipe Bedding and Backfill Materials

Bedding material shall be placed as per Standard Drawings unless otherwise specified on the Contract Drawings or within Contract special provisions.

All granular bedding and backfill material shall conform to the requirements of OPSS 1010 and must not contain RCM/RAP.

All concrete bedding material shall conform to the requirements of OPSS 1301 with a nominal minimum twenty-eight day compressive strength of 15 MPa.

All approved native material shall be free from frozen lumps, cinders, ashes, asphalt refuse, organic matter, rocks and boulders or other deleterious materials.

W.4 CONSTRUCTION

W.4.1 Transporting, Unloading and Storing Pipe

Delivery and unloading of pipes and fittings at the job site shall cause the least possible delay to traffic.

All pipes, specials, fittings and gaskets that are unsound or damaged shall be removed from the site and replaced. All used, faded or discoloured pipe are unacceptable and shall be removed from site and replaced.

Mechanical equipment shall be used to unload the pipe.

Materials shall be placed in a safe storage location and the manufacturer's handling and storage recommendations shall be followed.

W.4.2 Installation of Pipes

Pipes shall, at all times, be handled with care to avoid damage. Damaged pipe shall be removed and shall be replaced at the Contractor's expense.

Pipe shall be lowered into the trench as per manufacturers handling recommendations and shall be laid with Bell ends facing the direction of laying, unless otherwise directed by Project Manager or designate.

Pipes and bedding materials shall not be laid on frozen ground. Pipes shall be handled with special care during temperatures below freezing and as required by the manufacturer. All work shall be protected from freezing.

Pipes shall be laid on the prepared bed, true to the line and grade as shown on the Contract Drawings. The barrel of each pipe shall be in contact with the shaped bed throughout its full length.

Pipe shall be kept clean as work progresses. Pipe shall not be installed if it has clay, soil, chemicals or other deleterious material on the inside surface of the pipe.

Water shall not be allowed to flow through the pipe during construction. The trench shall be kept in dry condition and pipe shall not be laid in water. A removable watertight bulkhead shall be installed at the open end of the last pipe laid whenever work is suspended. The Contractor is not allowed to install any watermain until he has a night plug on site. The night plug is to be used every time when work is stopped.

Pipe shall not be laid until the preceding pipe joint has been completed and the pipe is carefully embedded and secured in place.

W.4.3 Pipe Bedding and Backfill

Bedding materials shall be placed as shown on the Standard Drawings unless otherwise shown on the Contract Drawings or within Contract special provisions.
The bed shall be shaped true to line and grade, free from depressions and high points, according to the grades of the bottom of the watermain pipe. The pipe shall then be lowered to the trench, as per manufacturer's recommendations, and laid on the bedding. The remaining bedding material shall be placed simultaneously on each side to the spring line of the pipe.

Where concrete bedding is specified, the pipe shall be supported on grade and alignment by solid concrete block having the same

minimum compressive strength as the specified bedding, spaced so that no movement of the pipe occurs during placement of concrete.

At pipe joints, bedding material shall be left clear of the joints to permit their completion as specified elsewhere. After the connection has been completed, approved bedding material shall be placed under the joint and thoroughly tamped to the compaction specified.

Pipe bedding and backfill shall be compacted as follows:

a)	Bedding Material	100% Standard Proctor Density
b)	Backfill Material	
	i) Under pavement, gravel road, driveway gravel shoulder, sidewalk, curb and within 1.5 m of the edge of pavement	100% Standard Proctor Density
	ii) Other areas	95% Standard Proctor Density

Unshrinkable fill is to be used when specified by the Special Provisions and/or Road Cut Permit and/or shown on drawings shall conform to OPSS 1359.

Excavations backfilled with unshrinkable fill shall be covered with:

a) Steel plates shall be rated for minimum of H-20 loading in paved areas, driveways and areas used by vehicles.

b) Wood planks or other material approved by the Engineer in areas used by pedestrians.

W.4.4 Jointing Pipes

W.4.4.1 General

Joint surfaces shall be clean. Pipe ends shall be lubricated with material recommended by the pipe manufacturer.

Manufacturer's instructions for jointing pipes shall be followed.

Pipes shall be aligned to previously laid pipe.

Pipe shall be pulled or pushed only by hand or power operated winch. A backhoe shall not be used for homing the pipe.

Joints shall be prevented from opening after the pipe has been laid.

W.4.4.2 Jointing Ductile Iron Pipe

W.4.4.2. (a) Mechanical Joints:

The gland shall be positioned on the pipe with the lip extension toward the joint. The gasket shall be slipped on the pipe with the thick edge towards the gland.

The spigot end shall be pushed to its seat in the bell. The gasket shall be pressed to seat it evenly around the joint.

Move gland into position for bolting; insert all bolts and make nuts finger tight, keeping the spigot end centrally positioned within the bell. Bring up the gland evenly -- first tighten the bottom bolt then the top one and remaining bolts alternately from side to side.

Tighten the nuts half a turn at a time with a calibrated torque wrench. All nuts shall be tightened uniformly to the torque specified in AWWA C111/A21.11.

W.4.4.2. (b) Bell and Spigot Joints:

The gasket shall be placed in the groove of the bell making certain it is properly seated. (Warm the gasket in cold weather.)

The gasket shall be lubricated with an NSF/ANSI 60 certified product.

Pipes to be joined shall be aligned and the spigot shall be carefully entered into the bell unit until the spigot end just makes contact with the gasket.

The entry of the spigot into the bell shall be completed by hand or by use of a jack-type pulling tool until the second reference mark is flush with the face of the bell. A backhoe shall not be used for homing the pipe.

W.4.4.3 Jointing Concrete Pressure Pipe

W.4.4.3(a) Bell and Spigot Joints:

A cotton or burlap diaper shall be placed around the bell end of the pipe already in place.

A rubber gasket shall be placed on the spigot end of the pipe to be laid ensuring that the stretch and volume of the gasket is equalized around the entire circumference of the pipe.

The pipe shall be aligned and the spigot end shall be inserted into the bell of the pipe already in place.

A feeler gauge is to be used to check location of the rubber gasket around the entire circumference of the joint. The pipe shall be pushed until the spigot enters the full depth of the socket and is retained in position.

Cement mortar consisting of one part Portland cement conforming to CSA CAN3-A5-M and three parts mortar sand conforming to OPSS 1004 shall be poured around the assembled joint. Ensure that the diaper is securely placed around the joint recess.

W.4.4.3 (b) Welded Joints

Welding of joints is to be carried out by qualified welders, in strict accordance with the pipe manufacturer's instructions for performing the weld. The joint shall be cement grouted as per Section W.4.4.3 (a) after the welding is completed.

W.4.4.3 (c) Grouting Inside Joint Recesses

The inside joint recess of the concrete watermain 750 mm diameter and larger, shall be finished by placing a sufficient amount of the joint mortar in the bell end against the shoulder of the lining, just prior to installing it in the line. When the pipe has been laid in place, the joint shall be finished off smooth with the inside surface of the lining. The joint mortar shall be composed, by volume, of one part cement, two part sand and dry mixed with sealbond and moistened with just enough water to provide a stiff plastic mix which will not fall out of the joint.

W.4.4.4 Jointing Polyvinyl Chloride (PVC) Pressure Pipe

If gaskets are supplied separately; clean gaskets shall be inserted into the clean groove of the bell end of the pipe.

The spigot shall be lubricated with an NSF/ANSI 60 certified product. The spigot end shall be inserted and pushed into the bell up to but not beyond the depth of the stop reference mark.

Field cut pipe shall be uniform and square; bevel and insertion distance mark shall correspond to that of the factory pipe of the same diameter.

W.4.4.5 Restrained Joints

Restrained joints shall be installed to manufacturer's specifications.

W.4.5 Cutting of Pipe

Whenever cutting of pipe is required, the pipe shall be cut in conformance with the recommendations of the pipe manufacturer.

W.4.6 Thrust Restraints

W.4.6.1 General

All plugs, caps, tees and reducers that are liable to "draw" or blow-off shall be protected as follows:

a) by means of concrete blocking for 300 mm in diameter and smaller.

b) by means of concrete blocking with tie rods and clamps, for 300 mm in diameter and smaller, if water has to be turned on immediately.

c) by means of restrained joints and concrete blocking for 400 mm in diameter and larger and/or as shown on the contract drawings.

Steel rods or clamps shall be stainless steel or as directed by the Project Manager or designate.

W.4.6.2 Concrete Blocking, Anchors and Cradle

Concrete blocking shall be constructed as shown on the Standard Drawings and/or the Contract Drawings. Concrete cradle and concrete encasement around the pipe shall be placed where shown on the drawings or as directed by the Project Manager or designate.

W.4.6.3 Restrained Joints and Concrete Blocking

All plugs, caps, tees, bends and reducers for watermain 400 mm in diameter and larger shall be constructed with restrained joints as shown on Contract Drawings in addition to concrete blocking.

W.4.7 Tracer Wire

Where plastic pipe is used, a tracer wire consisting of 12-gauge TWU stranded copper, light coloured plastic coated tracer wire must be installed with the pipe. The wire shall be laid along the pipe in the bottom of the trench and strapped to the pipe with tape at intervals not exceeding 6m. The wire shall be brought to the surface at all valve boxes of hydrant valves and line valves and a continuous length of wire shall be used between surface points. The wire should be taped to the outside of the valve box so as not to interfere with the operation of the valves. In the case of hydrants, the tracer wire is to be attached to the pipe by means of tape and looped around the base of the hydrant. Any wire joints made at tees etc. must be made with Marr connectors or solder and then wrapped with insulating tape to prohibit corrosion of the wire.

W.4.8 Polyethylene Encasement

Where ductile iron pipe, fittings and appurtenances are used, Polyethylene encasement shall be installed around the pipe as per manufacturer's recommendations.

W.4.9 Change in Line and Grade

Grade and line changes will be by bends or pipe joint deflections noted on the contract drawings.

Any joint deflection shall be 50 percent of the manufacturer’s specifications. PVC “pipe barrel” deflection is prohibited.

W.4.10 Installation of Valves

W.4.10.1 Direct Buried Valves

Valves shall be installed at the locations shown on the Contract Drawings or as directed by the Project Manager or designate. Each valve shall be accurately aligned with connecting pipes and set centered and plumb with box cover flush with the finished grade. Valves shall be installed in accordance with the PW, Design, Specifications & Procedures Manual.

All bolts, nuts, couplings, rubber rings and connecting pieces shall be cleaned thoroughly before installation.

W.4.10.2 Valves in Valve Chambers

Valves shall be installed at the locations as shown on Contract Drawings or as directed by Project Manager or designate. Valves shall be installed in accordance with the PW, Design, Specifications & Procedures Manual.

W.4.11 Installation of Hydrants

Hydrants shall be installed at the locations shown on the Contract Drawings or as directed by the Project Manager or designate.

The hydrant, branch valve and box and hydrant lead shall be installed in accordance with the PW, Design, Specifications & Procedures Manual.

The hydrant shall be plumb with the nozzles parallel to the edge of pavement or curb line and the pumper connection facing the roadway. Each hydrant shall be supported with concrete blocking between the hydrant and undisturbed ground as specified.

W.4.12 Protecto Caps

On all direct-buried and in chamber valves and fittings "Protecto Caps" must be applied all bolts. This provides cathodic protection to the appurtenance as a whole.

The following table illustrates the relationship of bolt diameter versus cap weights:

Bolt Dia.	Cap Weight	Maple Agencies Part No.
12.5mm(1/2”)	90 gr	90P125
10mm (5/8”) small	90 gr	90P095
16mm (5/8”) large	185 gr	185P160
19 mm (3/4")	175 gr	175 P190
22mm (7/8")	150 gr	150P220
25mm (1")	270 gr	270 P250
29mm (1 1/8")	550 gr	550 P285

32mm (1 1/4")	525 gr	525P317
35mm (1 3/8”)	500 gr	500P350
38mm (1 ½”)	470 gr	470P381

W.4.13 Installation of Service Connections

Water service connections shall be installed from the watermain to the property line at locations shown on the Contract Drawings or as directed by the Engineer, after the watermain has been placed into operation.

Service piping shall be installed, by pressure tap connection in accordance with Standard Drawings. Service saddles shall be used in accordance with the PW, Design, Specifications & Procedures Manual.

Joints and all connections shall be made watertight.

Service boxes shall be set centered and plumb over curb stop at the property limit and flush with the finished grade.

The Contractor shall ensure minimum water service interruption during construction of the watermain. Each interruption of service during connection to the existing watermains or during the transfer of existing water services requires approval by the Engineer. If warranted, the Engineer may specify that certain water service interruption be restricted to off peak hours and/or weekends. No extra payment will be allowed for such off-peak hours and weekend works.

W.4.14 Shutting Down or Charging Mains

The Contractor shall at no time shut down or charge any watermain or operate valves. All closures are to be arranged with the Project Manager or their designate.

W.4.15 Connections to Existing Watermains

Connection of the new watermain to the existing watermain will be permitted only when the new main has passed the bacteriological test(s) and has been accepted by the Agency or as directed by the Project Manager or designate.

The Contractor shall submit to the Project Manager or designate for his review and approval the method and timing of the intended connection.

The Contractor shall provide forty-eight (48) hours notice to the Project Manager or designate prior to making connections to the existing watermains.

All connections to existing watermains shall be made under the supervision of the Regional Inspector. The removal of a plug or blow off from any existing watermain or fitting and reconstruction of the joint will be considered part of the work of constructing the new watermain.

W.4.16 Tapping of Watermains

The Contractor has to arrange with the Agency to perform taps from 100 mm up to and including 300 mm.

The Agency will charge the Contractor for the work as described in the latest user fee by-law.

The number of hours will commence at the time of departure from Agency yard till return.

W.4.17 Boring/Tunneling

Notify the appropriate authority (Railway, MTO, etc.) and schedule work accordingly.

Meet all requirements of the applicable Road Cut Permit Conditions.

Where not specified in the contract documents, furnish and install welded steel casing pipe of the diameter, length and wall thickness specified, shown on drawings. Casing pipe shall be manufactured from structural grade steel conforming to CSA Specification G-40.1 and G-40.4 with electrically welded joints.

Supply the Project Manager or designate with detail drawings showing excavation, shaft, bracing, shoring and full description of the proposed tunnel construction procedure. Shaft drawings, bracing and shoring shall be certified by a Professional Engineer.

Tunnel/auger and jack the casing, advancing liner as materials are removed to complete crossing.

When installing watermains within steel liners, the following shall apply:

1) All casing spacers are to be made of T-304 stainless steel;
2) Bearing surfaces (runners) shall be ultra high molecular weight polymer or equivalent;
3) Positioning of spacers along the watermain is to be as per the manufacturer's specifications;
4) Position of pipe within liner to be centered and restrained, sufficient enough to provide no less than 19 mm (¾ inch) clearance between the casing pipe and the outside diameter of the bell;
5) The watermain shall be restrained laterally for the entire length of the liner and beyond when stated on the Contract Drawings;
6) Liner to be sealed using wrap around rubber ends complete with stainless steel (T-304) banding.

Where the Contract, Project Manager or designate specifies, supply material and grout the watermain pipe inside the casing. Assure that grout fills all spaces between the watermain pipe and the casing shown on the contract drawings

Complete surface restoration at bore pit locations including any granular material asphalt, concrete, sod, topsoil, etc., to match existing or as specified.

W.5 FLUSHING AND TESTING

W.5.1 Hydrostatic Testing

Hydrostatic pressure and hydrostatic leakage tests shall be conducted by the Agency or by the Contractor at his own expense under the supervision of the Regional Inspector upon completion of the watermain and backfilling.

A sustained hydrostatic pressure and hydrostatic leakage test, at 1000 kPa (150 psi), shall be conducted simultaneously for the duration of at least one hour on any test section. No pressure drop is allowed during the one-hour test period.

A test section shall be either a section between valves or the completed watermain as directed by the Project Manager or designate.

The test section shall be filled slowly with water and all air shall be expelled from the pipeline. A period of 24 hours shall be allowed before starting the test except for PVC pipe.

If the test pressure is conducted by the contractor with no pressure drop for one hour the test result will be considered satisfactory. The Agency, then, will approve or disapprove the result by a separate pressure test on the main.

If the pressure test fails, the Contractor shall identify and rectify the problem at his own expense. The Contractor shall then conduct subsequent pressure tests, at his own costs, until a satisfactory result is achieved. Then the Agency will re-test the same section of the watermain to verify the result.

Where any section of the main is provided with concrete reaction blocking, the hydrostatic pressure test shall not be made until at least five (5) days have elapsed after the concrete reaction blocking was installed.

All tapping sleeves and valves 100 mm diameter and larger are subject to hydrostatic pressure and leakage test by the Agency prior to the tapping being carried out.

The Contractor is not permitted to operate any valve that is considered Regional infrastructure. All closures are to be arranged with the Project Manager or their designate.

W.5.2 Swabbing of Watermain

Swabbing of watermain required if two consecutive bacteriological samples fail.

Watermains 150 mm diameter to 300 mm diameter shall be swabbed (following satisfactory completion of the pressure test) with swabs and chlorine solution to render the watermain clean. At least two (2) swabs shall be passed through each new hydrant and the ends of the new watermain.

Swabbing must be carried out by a company specialized in the field and approved by the Agency.

W.5.3 Flushing and Disinfecting Watermain

Following approval of the pressure test of the watermain, the Agency will undertake, at its own expense, flushing, chlorinating and sampling of the watermain. The Contractor should allow two weeks for sampling by the Agency. If the bacteriological test fails twice, any further test and mandatory swabbing, as defined above, will be at the Contractor's cost.

Watermains 50 mm in diameter are to be flushed and sampled only and do not require chlorination.