



**Engineering Procedure and Materials**  
**List**

**\*PLEASE NOTE FOR ANY ITEMS NOT FOUND IN THIS DOCUMENT  
PLEASE REFER TO NIAGARA PENINSULA STANDARD CONTRACT  
DOCUMENTS.**

**Engineering Procedure and Materials List**

**CONTRACT ITEMS - SUPPLEMENTARY**

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## **GENERAL**

### **A8. CONSTRUCTION SIGNS, TRAFFIC CONTROL AND TRAFFIC MANAGEMENT PLAN**

In addition to the conditions stipulated in the Niagara Peninsula Standard Contract Document, GC7.06 and OPSS 706 the following shall also apply:

Regulatory signs cannot be removed without approval of the City.

#### **TRAFFIC CONTROL**

A minimum of one lane of traffic shall be maintained at all times during construction

**No road closures will be allowed unless specifically authorized by the contract Administrator.**

#### **ACCESS**

It will be the Contractor's responsibility to inform the various businesses and residences of, and/or the placement of no parking signs the day before, in order to reduce/eliminate any problems with parked vehicles that may interfere with their operations. Access to the abutting businesses and residences must be maintained at all times.

The Contractor shall advise the Police Department, Fire Department and Niagara Emergency Medical Service on a daily basis, with current status of the construction as it pertains to the passage of traffic within the contract limits. The Contractor will co-ordinate with local transit to ensure minimum interruption to bus schedules. Transit, school buses and garbage service vehicles will be given priority to maintain their schedule.

The Contractor shall also maintain/provide existing pedestrian access at all times to the businesses and residents during all phases of construction in an acceptable manner.

### **B1. TEST HOLES (PROVISIONAL ITEM)**

In addition to the conditions stipulated in the Niagara Peninsula Standard Contract Documents the following shall apply:

The purpose of these test holes shall be to verify existing infrastructure where a design change may be required due to possible conflicts during construction **OR** for any other reason required by the Contract Administrator.

The Contractor shall provide all necessary labour, materials and equipment to excavate and backfill exploratory test holes at locations and depths as directed by the Contract Administrator.

The complete backfilling of Granular 'A', compacted to 100% Proctor Density, and the disposal of all excavated material shall be in accordance with the specifications as further outlined in this contract.

If not otherwise identified, a (3m x 3m x 5m) test pit size, for each expected location, should be assumed for estimation.

The supply and placement of Granular 'A' shall be paid for separately under the appropriate item in the Schedule of Quantities and Unit Prices.

This item is provisional and therefore, must be approved by the Contract Administrator.

### **B3. GRANULAR MATERIALS**

In addition to the conditions stipulated in the Niagara Peninsula Standard Contract Document, OPSS 314, 501, 514, 516 and 1010 the following shall also apply:

The price bid shall be complete compensation for the supply, hauling, placement, grading and compaction to 100% Standard Proctor Density of Granular 'A' material.

**As Confirmed by the Geotechnical firm appointed by the City and specified on Contract Drawings, native material and existing road base granular is to be used as backfill for watermain, sanitary and storm sewer trenches (provided compaction of 95% SPD can be achieved) except for the pipe bedding and the road base which should consist of Granular 'A'.**

Granular materials placed for roads, driveways, and sidewalks will be included in this item and placed at a depth as specified in the contract or as indicated on the drawings.

The unit price bid must include all labour and equipment to remove the excess Granular 'A' from the trenches prior to final restoration, and delivery of the material to a location specified by the Contract Administrator. The Granular 'A' must be removed in a manner that avoids contamination with asphalt, concrete or native material. Any contaminated material is to be removed at the Contractor's expense.

The unit price bid for this item shall include the final grading and compaction of the sub-base immediately preceding the placement of granular road base material.

### **B13. ADJUSTMENT OF APPURTENANCES**

In addition to the conditions stipulated in the Niagara Peninsula Standard Documents and OPSS 408, the following shall also apply:

Payment for these works shall include the adjustment of existing and newly constructed valve chambers, valve boxes, storm and sanitary sewer maintenance holes and frames.

The unit price bid shall include the supply and installation of precast adjustment units, all necessary labour, excavation, placement and compaction of Granular 'A' (as required) and the placement and compaction of hot mix asphalt (as required) so that the final elevation of each appurtenance matches the final elevation of the proposed asphalt works.

When replacement of frame and cover is warranted, please see **clause C6** of the City of Thorold Special Provisions for material specification.

**No poured concrete will be accepted for adjustment of existing and new Maintenance Hole frames and covers.**

Adjustment units for sanitary sewers shall be sealed to the structure, frame and adjacent units using an **approved bituminous tape material (a minimum 1 mm thick and 100mm wide), wrapped around the outside of joint, with 50 mm overlap on each side of the joint.** Adjustment units for all other structures shall be sealed to the structure, frame and adjacent units using approved methods.

## **B18. GRANULAR DRIVEWAYS**

In addition to the conditions stipulated in the Niagara Peninsula Standard Contract Document and OPSS 314, the following shall also apply:

Existing gravel driveways will be replaced with asphalt from the back of curb to the front on the sidewalk. If a gravel driveway is to be replaced beyond the sidewalk it will be replaced with gravel and the existing driveway depths are to be matched if thickness is greater than that specified in the Niagara Peninsula Standard Contract Document as a minimum requirement.

All granular driveways are to be compacted to 100% Standard Proctor Density.

Curb boxes and cleanouts are to be set flush with the new driveway surface.

Trenches in the driveways shall be completely backfilled with Granular 'A' with all granular material compacted to 100% S.P.M.D.D. or with native materials compacted to 95% S.P.M.D.D.

### **PAYMENT**

The unit price bid for this item shall be complete compensation to restore driveway aprons and driveways adjacent to sidewalk removals, as necessary, and as directed by the Contract Administrator.

All Granular 'A' required for driveway placement will be paid for separately under the appropriate item in the Schedule of Quantities and Unit Prices.

## **B24. APPLICATION OF WATER FOR DUST CONTROL (PROVISIONAL ITEM)**

In addition to the conditions stipulated in the Niagara Peninsula Standard Contract Document, the following shall also apply:

The Contractor will be required to supply own water for dust control measures. Payment for this item shall be at the unit price indicated in the Form of Tender.

Payment for this item shall be deemed full compensation for water costs, carrying costs and any other costs involved with filling, transporting and spreading operations. Payment will not be made for water used for compaction or other methods, only for dust control or suppression. Supporting documentation, such as water hauler tracking sheets, shall be required for submission to the Contract Administrator for payments.

This item is provisional and therefore, must be approved by the On-site Inspector.

## **B40. PAVEMENT MARKINGS**

In addition to the conditions stipulated in the OPSS 710, the following shall also apply:

The unit price for this item shall include all necessary labour, material and equipment to apply the line markings including all required layout.

All lines shall be a nominal 100 mm width.

Stop bars shall be 600mm width.

Markings on base asphalt shall be organic solvent based traffic paint. The line markings applied must be adequately visible until such time the top asphalt is applied. Markings that are

faded will be required to be reapplied at no additional charge to ensure the safety of the motoring public.

Line painting shall be applied to conform with the provisions of the Manual of Uniform Traffic Devices - Pavement, Hazard and Delineation markings. The paint used shall be yellow and white organic solvent based, non-coning, high temperature traffic paint or approved equal, as per OPSS 1712.

Pavement pre-marking shall be undertaken by the Contractor and approved by the Owner prior to the application of permanent markings. The unit price bid shall be deemed to have made allowance for pavement pre-markings and co-ordination of pavement pre-marking with the Owner.

#### **B41. SUPPORT EXISTING HYDRO POLES (PROVISIONAL ITEM)**

For the unit price bid the Contractor shall coordinate with the local hydro authority (Canadian Niagara Power, CNP) for the supply of all equipment and labour necessary to support existing hydro poles that are in close proximity to deep excavations and/or where the existing pole may be impacted by road works. The unit price bid shall be full compensation for all coordination, labour, equipment and material; for the support and protection of each hydro pole for as long as required during the construction.

#### **B42. REMOVE, SALVAGE, RELOCATE AND REINSTATE OF SIGNS AND MAILBOXES**

The unit price bid for this item will be full compensation for the removal, salvage, relocation and reinstatement of existing street signs (other than traffic/regulatory signage covered under NPSCD A8) and mailboxes within the construction limits and as identified in the Schedule of Quantities and Unit Prices.

Any existing signs removed by the Contractor to accommodate construction shall be kept operational by placement on a temporary support and shall be reinstated in accordance with the OTM, once the work operation is complete. Temporarily located existing signs shall be kept at the same height, offset and basic location from traffic as before removal.

Mailboxes are to be removed, and relocated, and reinstated as necessary, which includes installation of temporary concrete pad and temporary access to the tentative location. As soon as it is practical, relocation and placement of concrete pad and permanent access is to be reinstated.

Payment for this item will be made upon final and permanent installation of signs and mailboxes.

#### **B43. REMOVE, STORE AND REINSTATE STREET FURNITURE**

The unit price bid for this item will be full compensation for the removal, storage and reinstatement of existing street furniture such as trash receptacles, benches etc., within the construction limits and as identified in the Schedule of Quantities and Unit Prices.

The removal of such street furniture will be temporary, to accommodate the new construction. It will be the Contractor's responsibility to properly handle and store the street furniture so as to eliminate any risk of damage. As soon as is practical, the Contractor will reinstate the street furniture as noted on the contract drawings or directed by the Contract Administrator.



Street furniture suffering any unnecessary damage due to the Contractor's carelessness will be replaced at his/her own expense as determined by the Contract Administrator.

Payment for this item will be made upon final and permanent installation of all street furniture disturbed as part of the project works.

#### **B44. ROAD RESTORATION**

In the event that Storm Sanitary, Water Main construction trenches are not restored prior to the closure of asphalt plants for winter, the trenches shall be restored to the satisfaction of the Owner and the Contract Administrator. Should the Contractor not restore the trenches prior to the winter months, the Contractor will be responsible (**at no additional costs to the City**) for any and all costs associated with performing winter road maintenance and inspections to conform with Minimum Maintenance Standards – Ontario Regulation 239/02, until the hot mix asphalt is completed.

#### **SEWERS**

#### **C6. PRECAST CONCRETE MAINTENANCE HOLES, CATCHBASINS & DITCH INLETS - ITEMS C6.1 (Sanitary) & C6.2 (Storm)**

In addition to the conditions stipulated in the Niagara Peninsula Standard Contract Document and OPSS 407, the following shall apply:

All existing asphalt and concrete shall be sawcut prior to excavation and the Contractor must take all due precautions so as not to disturb any areas outside the limits required to install the proposed works safely. All areas, as determined by the Contract Administrator, outside of these safe limits shall be repaired completely at the Contractor's expense.

Excavation, removal and disposal of surplus excavated materials shall be included in the unit price. The removal and disposal of any existing structure shall be paid under the appropriate item.

The Contractor shall make due allowance in the unit prices tendered for any bypass pumping, dewatering, sheathing, shoring and bracing to complete the work.

Kor'n Seal adapters or an approved equivalent shall be used in all cases where PVC pipe is to be connected to concrete structures. Where concrete pipe is used, a concrete cradle shall be required at each structure connection in addition to Fernco large diameter maintenance hole connectors.

#### **MAINTENANCE HOLES (STORM / SANITARY)**

Materials and installation shall be in accordance with OPSS 407 and any other specifications referenced therein and include sawcutting, excavation, placement, benching, aluminium safety rungs, safety gratings, bulkheads, adjustment units and maintenance hole couplings for PVC pipe, as well as bedding, backfill, and compaction.

MH frames and covers shall be adjustable, as manufactured by **Bibby-Ste-Croix Model C-50-ONT, CIP (Cedar Infrastructure Products Inc.) or equivalent**. Follow manufacturer's installation recommendations. MH top elevation shall be set to blend with the surrounding grades.

**All sanitary maintenance holes shall be of monolithic base.**

CATCHBASINS (CB)

The frame grating shall be in accordance with OPSD 400.010, 400.020 or 400.030.

The CB shall provide for a minimum 1.5m depth to invert of CB lead unless otherwise specified and the placements of a minimum 75mm to a maximum 300mm of precast concrete adjustment units, per OPSD 704.010.

DITCH INLET CATCHBASIN (DICB)

The grating shall be galvanized steel honeycomb in accordance with OPSD 403.010.

PAYMENT

The unit price bid for this item shall be complete compensation for all labour, equipment and material (including frame, covers and/or grates) to do the work as specified above and in OPSS 407.10.01.

The supply and placement of Granular 'A' shall be made separately under the appropriate item in the Schedule of Quantities and Unit Prices.

**C7. CLEANOUTS/INSPECTION TEES**

In addition to the conditions stipulated in the Niagara Peninsula Standard Contract Document, the following shall apply:

Cleanout/Inspection tee units shall be installed for all new and replaced existing sewer laterals.

The unit price tendered shall include all necessary labour, materials and equipment to complete the work in accordance with the specifications of this contract including but not limited to, sawcutting, removals, disposals, surface preparation, backfilling, grading, compaction and restoration.

Cleanout units shall consist of PVC Class DR-28 pipe material and shall be delivered complete with all components such as cap, stem, tee, reducers, couplings, etc.

Cleanout caps shall be Crowle Cast Iron Fitting No. 271 or approved equal. Cleanouts installed within asphalt or concrete areas shall be covered with paving stones set to match the asphalt or concrete elevation. Further installation instructions and specifications are detailed under SPCS Items B15, B16 and B17. In all other areas caps shall be placed approximately 25mm below the ground surface.

In the transitions between varying lateral material types and diameters, only acceptable couplings will be approved.

The Contractor **must** submit a sample of the cleanout unit, cap and assembly to the City for approval **one (1) week prior to construction.**

#### PAYMENT

The unit price bid shall cover the supply and installation of cleanout units at or near the property line and shall include the cost of all connections to the sanitary sewer laterals.

The supply and placement of Granular 'A' shall be made separately under the appropriate item in the Schedule of Quantities and Unit Prices.

Permanent restoration shall be made separately under the appropriate items in the Schedule of Quantities and Unit Prices.

### **C8. REMOVE & DISPOSE OF MAINTENANCE HOLES, CATCHBASINS & PLUG SEWER LATERALS - ITEMS C8.1 (Sanitary) & C8.2 (Storm)**

The following shall apply:

Unless otherwise directed by the Contract Administrator, or as specifically noted on the contract drawings, the resulting void backfill shall be select native excavated material including existing granular road base, placed in maximum 300mm loose lifts and compacted to 95% of Standard Proctor Maximum Dry Density (S.P.M.D.D.) at optimum moisture content. The Contractor is to include in their price all handling, hauling, stockpiling, placement and compaction costs associated with native material backfill.

This item only pertains to existing Maintenance Holes and/or Catchbasin that are outside the original alignment.

The existing pipes shall be plugged at all open ends. The existing frames and tops are to be salvaged and delivered to the City's Operations Building at 1543 Beaverdams Road, or as directed by the Contract Administrator.

### **C9. PLUG, GROUT AND ABANDON OLD SEWER PIPES AND /OR STRUCTURES ITEMS C9.1 (Sanitary) & C9.2 (Storm)**

Sections of the existing sanitary sewer or storm sewer, as noted on the contract drawings or directed by the Contract Administrator, are to be plugged at both ends with watertight seal plugs and the pipe grouted with unshrinkable fill.

Conversely, sanitary/storm sewers or leads may be permanently removed from existing maintenance holes or catchbasins. Therefore, the existing structures will require plugging, patching and parging as noted on the contract drawings or directed by the Contract Administrator.

The unit price bid for this provisional item shall be complete compensation for all labour, material and equipment necessary to complete all work for this item.

**C10. SEWER AND/OR STRUCTURE CONNECTIONS -ITEMS C10.1 (SANITARY) & C10.2 (STORM)**

This item shall be used for all necessary inlet/outlet modification required to existing structures to facilitate the new pipe connections including but not limited to coring of the structure, benching and the use of approved adaptors for connection of PVC pipe to concrete structures.

The Contractor shall make an allowance in the unit price bid to accommodate any necessary plugging and grouting of the inlet to the existing maintenance hole wall where the combined clay pipe was removed.

Kor'n Seal adaptors or an approved equivalent shall be used in all cases where PVC pipe is to be connected to concrete structures. Where concrete pipe is used, a concrete cradle shall be required at each structure connection in addition to Fernco large diameter manhole connectors. (OPSD 708.020)

**BASIS OF PAYMENT**

The unit price bid shall be full compensation for all labour, equipment, materials to complete the connection of new pipe to existing structures including plugging and grouting of the MH walls as required.

**C11. ROCK EXCAVATION IN TRENCH ITEMS C11.1 (SANITARY) & C11.2 (STORM)**

The provisions of OPSS 403 shall apply as amended or extended herein.

This item shall be applied to excavations where conditions prohibit the use of standard excavation equipment as defined below:

**Broken Rock:** Rock material that can be removed using standard excavation equipment equipped with rock teeth. In this specification, standard excavation equipment shall be Caterpillar 345CL Hydraulic Excavator or equal with 257 kW power and 1.9m<sup>3</sup> bucket capacity.

**Bedrock:** Rock material that cannot be removed using excavation equipment equipped with rock teeth and requires breaking up using a Hoe Ram or other mechanical breaking equipment.

The unit price bid for bedrock removal shall include all labour, equipment and materials necessary to complete the work. The work shall consist of excavating and removal of bedrock (any and all rock quality designation – RQD) encountered during the trenching operation, breaking of bedrock by mechanical means and removal from site to an approved disposal site.

The Contractor is required to obtain agreement from the Contract Administrator that refusal to standard excavation has occurred.

This item shall include bedrock excavation by controlled hoe ramming. Bedrock excavation by means of drilling and blasting will not be permitted.

**PAYMENT**

Bedrock excavation for these installations shall be limited to a maximum depth of 300mm below the O.D. of the pipe and a maximum trench width of the pipe O.D. plus 1000mm. Measurement for payment shall not exceed this maximum.

Payment of bedrock excavation in the open trench will be made by a field measurement. Measurement for payment shall be cubic meters (m<sup>3</sup>) calculated by average end areas and shall be paid for under the appropriate item in the Schedule of Quantities and Unit Prices.

**Payment for bedrock excavation shall be for any and all RQD encountered.**

ALL OPERATIONS SHALL BE CONDUCTED IN SUCH A MANNER AS TO PREVENT UNDUE HEAVING OF THE ROADWAY AND DAMAGE TO UTILITIES, STRUCTURES AND ALL PROPERTY.

## **WATERMAIN**

### **D1. WATERMAINS**

In addition to the conditions stipulated in the Niagara Peninsula Standard Contract Document and OPSS 441, the following shall also apply:

#### **MATERIALS**

Watermain shall be Polyvinyl Chloride Pipe – AWWA C900, Class 150 (DR18) unless otherwise specified on the contract drawings.

Joints and fittings shall be compatible with pipe material and class and shall be in accordance with OPSS 441. Fittings shall be mechanical joint, ductile (cast) iron, or grey (cast) iron manufactured to AWWA C110 standards with cement lining to CSA B131.4 or PVC manufactured to AWWA C900 CSA B137.3 standards.

Tie rods shall be 20mm diameter, high strength to ASTM A325 standards, and electrically conductive and coated with T.C. Mastic.

#### **INSTALLATION**

All watermain installation shall be by open cut trench excavation method except when specified elsewhere in the contract documents and drawings. If installation by horizontal directional drilling (HDD) is specified, the limits of HDD shall be as indicated on the contract drawings unless modified in the field by the Contract Administrator. The unit price bid for installation by HDD shall be deemed to include all allowances and costs associated with this installation method, as specified.

The Tenderer shall note that where it is necessary to install the new watermain deeper than the depth specified to avoid elevation conflict with certain utilities, the unit price bid shall be deemed to include due allowance for this contingency. This may include deflecting a new main or service by up to 600mm.

During the watermain installations, the Contractor shall be responsible to maintain the proper functioning of each sanitary, storm and water service lateral located in the field or shown on the construction drawings, at no additional cost to the contract.

The unit price bid shall also include the removal and disposal of all abandoned underground services/pipes (of any material) in conflict with the new alignment of the watermain. Any abandoned services shall be capped and sealed on both sides of the remaining sections.

## GENERAL CONSTRUCTION

Care shall be taken during construction to minimize any contamination of the pipe from soil or water during installation; only clean pipe shall be installed. Contractors and Contract Administrators should be reminded of this prior to commencing construction.

If, in the opinion of the Contract Administrator, trench water or an excessive amount of dirt or debris has entered the new pipe during construction, additional sampling may be requested in accordance with Section 5.1.2 of ANSI/AWWA C651, at the discretion of the Manager of Water and Wastewater, or designate.

The existing watermain and water services must remain in operation until all water services have been connected to the new mains, except during transfer periods. When shutting down water mains for any reasons, all those affected are to be notified. If there is no response at the door, a notice is to be completed and left at the premises (mailbox). This must be completed a minimum of 24 hours prior to the closing of the main in all cases. This procedure must be followed to avoid any conflict with householders or business owners. The Water Department must be notified when water mains, services or fire hydrants are shut down or used in any way. In addition, the Fire Department must be advised whenever fire hydrants are out of service. The charging of the watermain is to be controlled using a control valve and cross-connection control device, backflow preventer.

The Contractor must de-chlorinate all water flushed from the watermains and water services before outletting the water to the sewers, on the ground or into ditches. The water must be de-chlorinated to indicate a free chlorine residual of less than 0.05 mg/l. The unit prices bid for this item shall be deemed to have made due allowance for this requirement.

All operation of the live water system shall be performed or supervised by a certified operator (holding a valid certificate) according to O. Reg. 128/04.

Operation of the water system includes disconnection of any service from a live water system, reconnecting of any service to a live water system and any works performed on a live water system (ex. maintenance repairs, any connections to the live system).

The City will provide the Contractor with a certified operator to supervise all works required which are to be completed to the live water system. The City may require the assistance of the Contractor in operating the water system at no additional cost to the contract.

The Contractor is responsible for ensuring that the Construction Supervisor is given 24 hours' notice, when possible, as to when the operation of the live system is scheduled to take place.

Non-compliance of this requirement is a contravention of the Safe Drinking Water Act. Failure to comply with this Act will subject the Contractor to any penalties, fines or consequences as deemed applicable by the Ministry of the Environment and Climate Change.

## EXISTING MAINS AND UTILITIES

In many areas, the new watermain is to be constructed in close proximity to the existing watermain. The Contractor is required to take all precautions and provide all support required to protect the existing watermain from damage until the new main is commissioned. The existing watermain and water services must remain in operation until all water services have been connected to the new mains, except during transfer periods.

Known utilities shall be exposed in advance of construction in that location. A minimum of three (3) pipe lengths and a maximum of five (5) lengths of open trench shall be maintained to allow for adjustment of grade to avoid utilities and sewer service laterals. No extra payment will be considered for removal and re-excavation to avoid obstructions.

#### TRACER WIRE

In addition to the stipulations outlined in the Niagara Peninsula Standard Contract Documents and OPSS 441, the following shall apply:

Electrical continuity shall be positively provided between all metal components including nuts, bolts, glands, valves, pipes, fittings, tie rods, tracing wire, etc. to ensure that all metal can be cathodically protected. Tracing wire shall be wrapped around all valves, fittings and hydrants, and **bonded to each by cadweld**. Wire splices shall be soldered and taped.

New watermains and hydrant leads shall be installed with vinyl coated #8 gauge copper wire, to enable future pipe locations/detection. This tracer wire shall be stripped and pig-tail attached at each hydrant lead. The pig-tail will extend the length of the hydrant lead and brought to finished grade and attached to the hydrant break-away flange. Also, the tracer wire shall be stripped at each service connection, and pig-tail attached and connected to each service with a CSA approved ground clamp. All tracer wire splices shall be taped with electrical tape. Do not bring the tracer wire up into main valve boxes.

#### CONCRETE BLOCKING AND ANCHORING

All valves and fittings shall be supported independently with concrete blocking and anchoring so that vertical and thrust loads are not transmitted to connected pipes.

All concrete support (OPSD 1103.010 and 1103.020) shall be manufactured using Type 20 Portland cement, poured against undisturbed ground with bond-breaker provided against all pipe, joints, valves, bolts and fittings. It shall be the Contractor's responsibility to ensure that all ground is suitable for pipe, valves and fittings support and shall bring to the Contract Administrator's attention any possible unsuitable conditions.

All mechanical joint restraint and restraint harness assemblies are to be: Typical Mechanical Thrust Restraint for PVC Pipe. Georg Fisher coupling restraints are required to connect new PVC watermain to the existing Asbestos Cement watermain. All other connections between new PVC watermains and existing watermains shall be HYMAX-Grip coupling restraints or an approved equivalent.

#### CATHODIC PROTECTION

Zinc Anode DZP-1100-24 anodes to be used at each hydrant, multiple fittings (up to 3) and on cast iron and ductile iron pipe where connections are made to the watermain.

Zinc Anode DZP-550-12 anodes to be used at each line valve, fitting (bend, reducer, cross, tee) and each water service. **Damaged anodes will not be accepted** (i.e. exterior must be intact)

#### BEDDING AND COVER

Bedding and cover shall always be Granular 'A' material; recycled materials will not be accepted for this purpose.

#### BACKFILL

As Confirmed by the Geotechnical firm appointed by the City and specified on Contract Drawings, the resulting void backfill shall be select native excavated material including existing

granular road base, placed in maximum 300mm loose lifts and compacted to 95% of Standard Proctor Maximum Dry Density (S.P.M.D.D.) at optimum moisture content. The Contractor is to include in their price all handling, hauling, stockpiling, placement and compaction costs associated with native material backfill.

Recycled material (RCM or RAP) may be substituted for trench and void backfill per the requirements outlined in NPSCD B5.

The Contractor shall note that where it is necessary to install the new watermain deeper than the depth specified to avoid elevation conflict with certain utilities, the unit price bid shall be deemed to include due allowance for this contingency. This may include deflecting a new main up to 600mm.

The unit price bid shall also include the removal and disposal of all abandoned underground services/pipes (of any material) in conflict with the new alignment of the watermain. Any abandoned services shall be capped and sealed on both sides of the remaining sections.

The supply of Type DZP-1100-24 and DZP-550-12 zinc anodes shall be made separately under the appropriate items in the Schedule of Quantities and Unit Prices.

## **D2. VALVES**

In addition to the conditions stipulated in the Niagara Peninsula Standard Contract Document, OPSS 441 and 442, the following shall also apply:

### **MATERIALS**

Fittings shall be cast iron and mechanical joint ends to CSA B131.4.

Valves shall be cast iron gate valves manufactured to AWWA C500 with non-rising stem, IBBM, open left, with mechanical joints and 50mm square nut suitable for direct bury. They shall be drip-tight to test pressure of 1035 kPa.

Approved models are Canada Valve 55, Mueller Limited No. A2380-21/A2370-20, McAvity No. 20075-0, or American AVK Resilient Wedge Gate Valves.

Valve boxes shall be auger type cast iron with minimum inside diameter of 128mm with centering plate and cap marked "WATER".

### **INSTALLATION**

Gate valves and valve boxes shall be installed level and plumb and supported by concrete blocking, as shown in OPSD 1103. The anchor block shall secure the valve or tee or cross and shall be sized as for bulkhead thrust blocks. All concrete shall be 20 MPa and conform to OPSS PROV.1350.

Valves shall be restrained by bolts and stops or tied to an anchored fitting, except for 150mm valves attached to anchor tees where the tee is backed by adequate thrust blocking. Backfilling shall be conducted so the valve box will not be knocked off plumb. Backfill material will be the same as that used for backfilling the watermain pipe in the immediate area.

The valves shall be subjected to pressure test of 1035kPa, at the same time as the watermain is tested.

Prior to acceptance, the Contractor must demonstrate the operation of all valves to the Contract Administrator.



The supply of Type DZP-550-12 zinc anodes shall be made separately under the appropriate items in the Schedule of Quantities and Unit Prices.

### **D3. HYDRANT SETS**

In addition to the conditions stipulated in the Niagara Peninsula Standard Contract Document, OPSS 441 and 442, the following shall also apply:

The unit price for this item shall be full compensation for all labour, equipment and material necessary for a complete hydrant assembly including anchor tee, hydrant, 150mm hydrant valve, 150mm PVC lead, all necessary fittings, restraints and all necessary dewatering, trench support and bracing of existing utility poles and support and protection of existing watermain and other utilities as required.

### **MATERIALS**

Hydrants shall be manufactured to AWWA C-502 Standard Specifications OPSS 441 and 401, 2-piece barrel and stem, with ground level break-off flange.

Approved model is **American AVK** High Pressure, 250 PSI, Nostalgic, Dry Barrel Hydrant (27N/PHH/NG Nostalgic), with 114mm pumper nozzle (including a "STORZ" connection). Upper and lower stem rods should be made from 304 Stainless Steel.

Hydrants shall have self-draining openings plugged. Hydrants shall be ordered with a minimum 1.5m riser.

Tie rods shall be 20mm diameter high strength to ASTM A325 standards.

### **INSTALLATION**

The Contractor shall note the following additional requirements to those outlined in OPSS 441:

Existing utilities (i.e. gas mains, etc.) must be exposed to ensure hydrant can be installed in designated location. *The final location of all hydrants shall be determined in the field.*

All hydrant valves must be directly connected to a main anchor tee unless otherwise indicated on the contract drawings or directed by the Contract Administrator.

All hydrants shall be bagged when not in service – cover only to be removed upon approval from Contract Administrator.

Hydrant leads shall be installed with minimum 1.5 m cover. Where leads cross under ditches or this cover would be otherwise reduced or other obstructions are encountered, it may be necessary to install 22½ or 45 degree bends on the hydrant lead. Hydrants on leads less than 1.5m long shall be restrained by the use of tie rods. The tie rods including nuts shall be coated with TC Mastic.

Hydrant extensions shall be provided in 150mm or 300 mm lengths to ensure flange is maximum 100mm above finished grade. Where more than 300mm extension is required, adjustment may be directed with 45-degree bends.

Cathodic protection: Zinc Anode DZP-1100-24 anodes to be used at each hydrant. Tie rods shall be made electrically continuous with other metallic components for cathodic protection.

Hydrants shall be tested with the watermain; the hydrant-isolating valve must be open. The isolating valves shall also be tested at 1035 kPa with the hydrants in the open position. Hydrants and valves shall be flushed and disinfected to the approval of the Contract Administrator.

Salvaged hydrants shall be delivered to the City's Operations Building at 1543 Beaverdams Road, at no additional cost to the contract.

The tendered price shall also include all materials, labour and equipment necessary to carry out all adjustments to finished grade and such bends and fittings that are necessary to connect the lead to the new watermain avoiding conflict with all other utilities where necessary.

**FIRE FLOW TESTING, COLOUR CODING & NUMBERING OF HYDRANTS**

All flow testing and colour coding shall be done in accordance with the Ontario Fire Code, Section 6.6.6.1. Numbering of hydrants shall be done in conjunction with the City of Thorold staff.

All new or refurbished hydrants are to be fire flow tested by a qualified professional within one (1) week of the connection of the new/replaced watermain to the municipal water distribution system. The Contractor shall keep a written record of all testing procedures and results and this information will be immediately provided to the City.

Following the City's review of the fire flow testing results, and upon approval by the Contract Administrator, the Contractor shall colour code the new or refurbished hydrants with an oil base, gloss finish in accordance with the National Fire Protection Association (NFPA) 291, "Fire Flow Testing and Marking of Hydrants", as summarized in the following table.

<b>National Fire Protection Association (NFPA) 291</b>				
<b>Class</b>	<b>Rated Capacity</b>		<b>Capacity Indicating Colour Scheme</b>	<b>Benjamin Moore Paint Code</b>
	<b>GPM</b>	<b>(L/min)</b>		
AA	≥ 1500	≥ 5680	Light Blue	1B 2065-50
A	1000-1499	3785-5675	Green	4B 2036-20
B	500-999	1900-3780	Orange	4B P-500 2015-20
C	< 500	< 1900	Red	4B P-500 2001-20

The supply of Type DZP-1100-24 zinc anodes shall be made separately under the appropriate items in the Schedule of Quantities and Unit Prices.

#### **D4. WATER SERVICES**

In addition to the conditions stipulated in the Niagara Peninsula Standard Contract Document, OPSS 441 and 442, the following shall also apply:

This item shall be used for:

- Supply and installation of new water services associated with a new watermain installation;
- Replacement of all lead, iron, cast iron, and existing services less than 19mm copper from the new/existing watermain to the property line (curb stop) with new 19mm diameter Type "K" soft copper including the main stop, service saddle, curb stop and curb box at the property line. The Contract Administrator should be notified immediately when lead services are encountered. The Contractor and the Contract Administrator shall then notify the homeowner of the type and condition of their existing water service; and
- Replacement of any existing water services where they conflict with proposed works, from the new/existing watermain to property line or as required to be replaced due to its condition, as determined or directed by the Contract Administrator.

#### **PREPARATION**

The Contractor shall locate and expose the existing watermain prior to making the connection to confirm the pipe material, elevation and accessibility for the connection. No work will be allowed to proceed until all materials required to make the connection and to return the watermain to full service are on site.

Exploratory excavations will be required to locate curb stops and to determine the material and size to be connected to on private property. Suitable adapters to reconnect to the existing service will be required.

The maximum shutdown time for any valves which disrupt the water service to any homes or businesses shall be four (4) hours after which time the Contractor shall make such temporary water service connections as are necessary to provide a water supply to those homes or businesses affected. These temporary water service connections shall be installed at no additional cost to the contract.

The Contractor shall supply all labour, equipment and materials necessary to replace the water services from the watermain to the property line (curb stop).

A **City of Thorold Certified Water Operator** will perform live taps up to and including 50mm diameter. Taps larger than 50mm diameter will be the Contractor's responsibility and must be witnessed by a **City Certified Water Operator** (certified according to O. Reg. 128/04).

#### **MATERIALS**

**Services** shall be 19 mm diameter, type 'K' soft copper tubing, to ASTM B88 Standards unless otherwise noted on the contract drawings or directed by the Contract Administrator.

**Service Saddles** shall be Canada Brass Broadband full circle stainless steel or approved equal, complete with double stainless steel bolts.

**Main Stops** shall be Mueller 300 Ball, Mueller Ori-Corp, Cambridge Series 301 (Ball Style) or approved equal, manufactured to AWWA Standard C800 complete with AWWA threaded taper and compression connection for use with stainless steel service saddles, as described above.

**Curb Stops** shall be Mueller 300 Ball, Mueller Mark II Oriseal, Cambridge Brass Series 2000 or approved equal, manufactured to AWWA Standard C800 with flared or compression connections.

Teflon thread sealant only shall be used for threaded connections.

**Curb Boxes** shall be cast iron, extension-type (adjustable heights of 1.5m to 1.8m) such as Mueller A726, Clow #8D1, Bibby VSB1-6 (or approved equal) complete with suitably long **stainless steel rod** and **stainless steel cotter pin retainer clip**. The cap shall be a bronze ribbed cover marked "WATER" with a pentagon plug. The curb box shall be installed/adjusted such that the telescopic portion of the box does not rest on the curb stop.

Teflon thread sealant only shall be used for threaded connections.

### CONSTRUCTION

Minimum cover on services shall be 1.5m.

All copper tubing shall be laid in one continuous length (i.e.: no joints) between the main stop and the curb stop.

Where **water service lengths are greater than 20m**, a meter pit (to be supplied by the City of Thorold) shall be installed at a location determined by the Contract Administrator.

All water services shall have Type DZP-550-12 zinc anodes installed and attached to the curb stop with an electrical tail nut.

All water services with less than 1.5m cover and only with the direction of the Contract Administrator shall be replaced with new 19mm dia. soft copper (Type "K") tubing. Main stops, service saddles, curb stops and service boxes may be replaced if in poor condition and only with the direction of the Contract Administrator. These replaced services are to be brought to the property line, at the specified depth and only after the curb stop, raised to match the existing water service using sufficient specified new copper tubing with pre-manufactured couplings and fittings to properly complete the reconnection.

In cases where reconnection is required, exploratory excavation at the curb box will be required to determine the material and condition of the existing curb stop, curb box, rod and retainer clip. Replacement is to be conducted as directed by the Contract Administrator. Proper pre-manufactured fittings and couplings shall then be used to make the reconnection.

To ensure that there are no restrictions in new or reconnected services, flow testing may be conducted on the service by the City. The Contractor shall provide all necessary fittings at the curb stop to connect flow-testing equipment, including a 120 V power supply. In addition, a minimum of 280 kPa (40 psi) water pressure in the watermain to which the service is connected must be maintained.

### De-Chlorination

An approved neutralizing chemical shall be applied to all chlorinated water used for disinfection, testing and flushing, before being discharged into the environment (sewers, ground or ditches).

As per ANSI/AWWA C651, the water must be de-chlorinated to indicate a free chlorine of less than 0.02 mg/L. The unit prices bid for this item shall be deemed to have made due allowance for this requirement.

#### PAYMENT

The tendered unit price bids shall represent the Contractor's complete costs to supply, install and place the named items in accordance with these specifications. All unit prices tendered must allow for all the requirements stipulated above and all components of the work including excavation, backfilling and compaction in addition to supply and placement of all necessary materials, fittings and couplings.

Water services will be measured horizontally from the centre line of the watermain to the curb stop for payment and no allowance will be made for the goose-neck at the corporation stop or additional appurtenances or fittings necessary to carry out this work.

Separate items have been provided in the Schedule of Quantities and Unit Prices for each part of the new water service including the main stops (c/w service saddle with double stainless steel bolts), curb stops and boxes, when using copper tubing.

The supply of Type DZP-550-12 zinc anodes to be paid for separately under the appropriate item in the Schedule of Quantities and Unit Prices.

The complete cost to repair or replace any services and all appurtenances broken, cut or damaged during the execution and/or completion of the works associated with this contract shall be the responsibility of the Contractor.

#### **D5. MAIN STOP**

In addition to the conditions stipulated in the Niagara Peninsula Standard Contract Document, OPSS 441 and 442, the following shall also apply:

**Main Stops** shall be Mueller 300 Ball, Mueller Ori-Corp, Cambridge Series 301 (Ball Style) or approved equal, manufactured to AWWA Standard C800 complete with AWWA threaded taper and compression connection for use with stainless steel service saddles. **Service Saddles** shall be Canada Brass Broadband full circle stainless steel or approved equal, complete with double stainless steel bolts. **Factory made tees will not be accepted.**

#### PAYMENT

The tendered unit price bids shall represent full compensation for all equipment, labour and materials required to supply and install each main stop.

The supply of Type DZP-550-12 zinc anodes to be paid for separately under the appropriate item in the Schedule of Quantities and Unit Prices.

#### **D6. CURB STOPS**

In addition to the conditions stipulated in the Niagara Peninsula Standard Contract Document, OPSS 441 and 442, the following shall also apply:

**Curb Stops** shall be Mueller 300 Ball, Mueller Mark II Oriseal, Cambridge Brass Series 2000 or approved equal, manufactured to AWWA Standard C800 with flared or compression connections.

Teflon thread sealant only shall be used for threaded connections.

## PAYMENT

The tendered unit price bids shall represent full compensation for all equipment, labour and materials required to supply and install each curb stop.

The supply of Type DZP-550-12 zinc anodes to be paid for separately under the appropriate item in the Schedule of Quantities and Unit Prices.

## **D7. CURB BOX**

In addition to the conditions stipulated in the Niagara Peninsula Standard Contract Document, OPSS 441 and 442, the following shall also apply:

Curb boxes shall be cast iron, slide-type with an adjustable height of 1.5m to 1.8m, and **a stainless steel rod** and **stainless steel cotter pin retainer clip**. The cap shall be a ribbed cover with bronze cap and 25mm I.P.S. tapping. The service box shall be installed/adjusted such that the telescopic portion of the box does not rest on the curb stop.

## **D8. RECONNECT WATER SERVICES**

In addition to the conditions stipulated in the Niagara Peninsula Standard Contract Document, OPSS 441 and 442, the following shall also apply:

A **City of Thorold Certified Water Operator** will perform live taps up to and including a 50mm diameter. Taps larger than 50mm diameter will be the Contractor's responsibility and must be witnessed by a **City Certified Water Operator** (certified according to O. Reg. 128/04).

Tenderers shall note that payment for the required main stop will be made separately under the appropriate item in the Schedule of Quantities and Unit Prices.

All water services shall have installed Type DZP-550-12 zinc anodes to be paid for separately under the appropriate item in the Schedule of Quantities and Unit Prices.

## **D11. ABANDON OLD WATERMANS**

In addition to the conditions stipulated in the Niagara Peninsula Standard Contract Document and OPSS 441 and 510, the following shall apply:

All removed fire hydrants shall be salvaged and returned to the City of Thorold Operations Building at 1543 Beaverdams Road. The price for this item will also include the plugging of fire hydrant leads and removal of the hydrant valve, where applicable, at no additional cost to the contract under valve box/cap removal.

## **D13. WATERMAIN DISINFECTION AND TESTING**

In addition to the conditions stipulated in the Niagara Peninsula Standard Contract Document and OPSS 441, the following shall apply:

### TESTING AND SAMPLING PLAN

Prior to the pre-construction meeting the Contractor must submit to the Contract Administrator, a watermain testing and commissioning plan for approval per City of Thorold Operating Procedure, **D101 - Commissioning of New Watermain**.

As a minimum, the commissioning plan must include:

- The location for source water connection.
- The location of sampling points.

- The discharge location for flushing and dechlorination.
- Identified method of dechlorination.
- The final connection locations.
- Provisions for hydrostatic testing and disinfection of all water services (up to and including the curb stop).
- Provisions for temporary service whips (installed after the curb stops up to the existing grade) to allow for chlorination and flushing of all water services.

Any changes to the sampling and testing plan requested by the Contractor must be made prior to commencement of construction and will be subject to the approval of the Manager of Water and Wastewater, or designate.

Failure to comply with the requirements under the Safe Drinking Water Act will subject the Contractor to any penalties, fines or consequences as deemed applicable by the Ministry of the Environment.

### TESTING AND CHLORINATION

The Contractor is responsible for supplying, installing and removing all necessary valves, fittings and taps required for removing air and/or draining the watermain, introducing swabs, filling, pressure testing and chlorinating.

All pressure testing, disinfection and dechlorination shall be supervised by a City of Thorold Certified Water Operator and documented.

All new watermain shall remain physically separated from the active municipal water distribution system (except as described below). Final connections to the municipal distribution system will only be permitted once the Contractor receives a copy of the Authorization for Final Connection form signed by the Manager of Water and Wastewater.

### SOURCE WATER

To obtain water for pressure testing and disinfection, a temporary connection to the municipal water system will be permitted as follows, subject to the approval of the Manager of Water and Wastewater:

- A water meter will be included in the temporary connection and provided by the City of Thorold.
- At minimum a Double Check Valve Assembly (DCVA), as provided and connected/disconnected by the City of Thorold Certified Water Operator, shall be used at an existing fire hydrant or watermain for the temporary source water connection.
- The DCVA will be permitted for use only if a testing certificate valid within one (1) year of its use can be produced.
- The temporary connection shall include a secondary control valve (e.g. attached to hydrant port) to allow Contractor access to water in the absence of a Certified Water Operator.
- The rate of draw from existing watermains shall be limited so that the system pressure does not fall below 250 kPa (36 psi). Pressure gauges shall be supplied and installed by the Contractor to confirm that adequate system pressures are maintained.
- Only Certified Water Operators will be permitted to operate the actual fire hydrant.

If additional water is required as a result of failure of the initial procedures to provide acceptable results, the additional cost will be charged to the Contractor at the prevailing bulk water charge rate.

### SWABBING

Prior to disinfection, all sections of the watermain shall be swabbed in accordance with Section D13 of the Niagara Peninsula Standard Contract Document, using a minimum of four (4) foam swabs per leg of watermain. The foam swabs shall be installed during construction.

All flushing and swabbing must be carried out under the supervision of the Contract Administrator or designate.

### HYDROSTATIC TESTING

Hydrostatic Pressure and Leakage tests shall be conducted simultaneously and in accordance with the OPSS 441.07.22, D102 (City of Thorold document), and as described below.

Hydrostatic testing shall be completed under the supervision of the Contract Administrator on all newly installed pressure pipe, joints, valves and all service lines (up to and including the curb stop) and only after all trenches have been completely backfilled and compacted in accordance with appropriate specifications.

Water shall be used for carrying out hydrostatic testing; alternative liquids or air testing will not be permitted. **The temporary water supply connection must be disconnected (physically separated) from the new watermain during the hydrostatic test.**

Only pressure gauges with a testing certificate valid within one (1) year of its use will be permitted. The test pressure shall be 1035kPa (150psi) for a two (2) hour test period. The Contract Administrator shall document the hydrostatic testing results on the appropriate section of **New Watermain Commissioning Document (D102)**.

### **PVC and Other Pipe**

The procedure for hydrostatic testing of PVC pipe shall be in accordance with OPSS 441.07.24.03.

### DISINFECTION AND MICROBIOLOGICAL TESTING

The provisions of ANSI/AWWA C651, OPSS 441 and the Niagara Peninsula Contract Document shall be followed except as amended or extended herein.

Chemicals used for disinfection shall meet the requirements of ANSI/AWWA B300 or ANSI/AWWA B301; swimming pool chemicals will not be permitted. The placement of calcium hypochlorite granules in the watermain during construction will not be permitted.

All disinfection and microbiological testing shall be carried out under the supervision of a Certified Water Operator.

### **Chlorination for Disinfection**

After hydrostatic testing has been completed successfully, the watermain shall be flushed with source water.

After flushing is complete, chlorination may commence as per ANSI/AWWA C651 **“Continuous Feed Method”**. Source water shall be added into the new watermain at a controlled rate and



liquid chlorine added so that a minimum total chlorine level of 50mg/L (maximum 100mg/L) is achieved throughout the new watermain.

Sampling points identified in the testing and sampling plan shall be used to verify chlorine levels.

Refer to Table B.1 - Appendix B of ANSI/AWWA C651 for the appropriate amount of chemicals required to achieve the desired level of chlorine. **The watermain shall be left charged with chlorine for a minimum period of twenty-four (24) hours.**

The maximum total chlorine level permitted will be 100mg/L. Overloading the test system with high levels of chlorine will not be permitted as it causes problems with test reliability and adds unnecessary risks associated with disposal, impact to the environmental and the health and safety of workers.

After the twenty-four (24) hour contact period, the chlorine level shall be measured throughout the watermain. The resulting chlorine level must be greater than 50% of the initial concentration. Should the chlorine level drop below 50% of the initial concentration, the main shall be flushed, rechlorinated, and retested under the direction of the City's staff.

A Certified Water Operator shall verify free chlorine levels using an approved field test kit.

An approved neutralizing chemical shall be applied to all chlorinated water used for disinfection, testing and flushing, before being discharged into the environment. Refer to Table C.1 - Appendix C of ANSI/AWWA C651 for the appropriate amount of chemicals required to neutralize chlorine.

A Certified Water Operator shall verify using an approved field test kit, that the chlorine residual concentration of the water discharged to the environment shall not exceed 0.02mg/L.

### **Microbiological Testing**

After the chlorination procedure has been successfully completed, the watermain shall be flushed and recharged with source water so that the free chlorine residual throughout the new watermain is equivalent to that of the distribution system (i.e. between 0.2mg/L and 4.0mg/L).

A Certified Water Operator shall verify free chlorine levels using an approved field test kit.

The watermain shall remain charged for a minimum period of twenty-four (24) hours.

After the initial period described above, the first set of microbiological samples shall be taken; a second set of microbiological samples shall be taken at least twenty-four (24) hours after the first (minimum 48hrs after charging). The watermain shall not be flushed during the sampling period.

Two (2) consecutive sets of samples with acceptable results must be achieved before the watermain will be considered acceptable for final connection.

Test failures will be handled as follows:

**1<sup>st</sup> round** : if sample results fail = flush and resample

- 2<sup>nd</sup> round** : if sample results fail = flush, re-chlorinate and resample
- 3<sup>rd</sup> round** : if sample results fail = flush, swab, re-chlorinate and resample

The number of samples required shall be as follows:

- One (1) sample for every 200m (655 ft) of new watermain;
- Plus one (1) sample from the end of the line (opposite end from source location);
- Plus one (1) additional sample on each branch greater than 6m (20 ft);
- Watermain less than 50m (164 ft) long shall have a minimum of sample sites, one at each end of the main.

Each sample shall be tested for the following parameters and maximum acceptable concentrations:

Total Coliform	0 Counts
E. Coli	0 Counts
Fecal Coliform	0 Counts
Heterotrophic Plate Count (HPC)	≤10 Counts

Only a Certified Water Operator will take water samples and all microbiological testing shall be completed at the City of Thorold approved testing laboratory. The Site Inspector and /or Contract Administrator will ensure the safe delivery of the water samples to the laboratory.

All laboratory test results shall be reviewed and either approved or failed by the Manager of Water and Wastewater.

**PAYMENT**

Measurement for payment will be lump sum based on meeting the minimum sampling point requirements as specified herein. Final connections of new main to the existing watermain/distribution system shall be paid for separately under the appropriate item in the Schedule of Quantities and Unit Prices.

Payment shall be full compensation for all equipment, labour and material necessary to provide the required sample locations including the installation and removal of any temporary valves, blow-offs and services.

**D17. WATERMAIN CONNECTIONS**

In addition to the conditions stipulated in the Niagara Peninsula Standard Contract Documents and those included within these supplementary special provisions, the following shall apply:

**APPROVAL**

Final connection to the active water distribution system will only be permitted after the appropriate testing has been completed, satisfactory results have been achieved and approval for connection has been provided by the Contract Administrator.

The Manager of Water and Wastewater will review the completed **New Watermain Commissioning Checklist** along with any relevant supporting records. If results are acceptable, the Manager of Water and Wastewater will authorize final connection to the municipal water distribution system by completing the appropriate section of the **New**

## **Watermain Commissioning Checklist.**

A copy of the Authorization for Final Connection, signed by the Manager of Water and Wastewater, shall be provided to the Contract Administrator and Contractor to serve as authorization for the Contractor to make the final connection.

### WATER SERVICE INTERRUPTIONS

The Contractor is responsible for notifying the Contract Administrator a minimum of 24 hours in advance, if existing watermains, services or fire hydrants are to be shut down or used in any way.

The maximum shutdown time for any valves which disrupt the water service to homes or businesses shall be four (4) hours after which time the Contractor shall make such temporary water service connections as are necessary to provide a water supply to those homes or businesses affected at no additional cost to the contract.

Additionally, the Contractor must note:

- **Only** the City of Thorold Certified Operator shall operate existing water valves;
- All operation of the live distribution system shall be performed or supervised by a City of Thorold Certified Water Operator (certified according to O. Reg. 128/04).
- Operation of the live distribution system includes:
  - Disconnection of any service from a length of live watermain;
  - Reconnection of any service to a length of live watermain; and
  - Any works performed on a live distribution system (ex. maintenance repairs, and connections to the live system).
- A minimum 48 hours advance notice to the Contract Administrator will be required to schedule the City of Thorold Water Operator
- City of Thorold may require assistance from the Contractor in operating the distribution system at no additional cost to the contract;
- Affected water customers shall be notified in writing, a minimum of 24 hours in advance of water supply interruptions.
- The Contract Administrator shall prepare the notice and the Contractor will be responsible for door-to-door delivery to the affected customers; and
- The Fire Department must be advised whenever fire hydrants are out of service;

### CONSTRUCTION

**Final connections to the municipal water distribution system are required to be less than 10 m (33 ft) in length and must be completed under the direct supervision of a Certified Water Operator.**

Following each new connection, the Certified Water Operator will conduct unidirectional flushing at suitable valves and hydrants beyond the limits of the new connections. A schematic of the flushing plan will be prepared by the Certified Water Operator and included as part of the commissioning checklist records.

Microbiological samples shall be taken by the Certified Water Operator upstream and downstream of the final connection locations, as soon after each connection as practical. The completed Chain of Custody form and laboratory test results shall be attached to the commissioning checklist and sent to the Manager of Water and Wastewater for filing.

The final commissioning checklist package (i.e. completed checklists, chain of custodies,

laboratory results, etc.) shall be assembled and provide to the Manager of Water and Wastewater for filing. Copies shall also be provided to the Engineering Division Contract Administrator for the project file, and the Contractor where requested.

#### PAYMENT

The unit price bid shall include all labour, material and equipment to make the final connection to the existing watermain as stipulated in OPSS 441.09.01.06 including all sawcutting, excavation, dewatering and trench support where necessary, bracing of any existing poles, watermain and other utilities where necessary, backfill and compaction all in accordance with the contract drawings and these specifications.

**Costs related to any interim or temporary connections to existing watermains, that may be approved by the Contract Administrator and serve the Contractor in terms of his order of operations, will be completed at no additional expense to the contract.**

The unit price shall also include all necessary pipe lengths and sizes, bends, adapters, other fittings, thrust restraints, etc. for a complete watermain installation.

#### **D18. WATER SHUT DOWN DELAYS (PROVISIONAL ITEM)**

The unit price bid for this item shall include an hourly crew rate for all equipment and labour.

This item will be used for delays due to the City's inability to shut down or isolate a section of watermain. This item will only be paid when the Contractor has made arrangements with the Contract Administrator 24 hours in advance. This item will also be paid where a break has occurred to a main or service which has not been shown on the drawings or has been improperly located in the field.

This item is provisional and therefore, must be approved by the Contract Administrator.

#### **D19. LEAKING WATER SERVICE REPAIR (PROVISIONAL ITEM)**

The unit price bid for this provisional item is to include all labour, material and equipment required to undertake repair work to leaking existing water services. This provisional item will only apply to those existing services discovered to be leaking that were not the direct result of the Contractor's activities.

The price bid will include all required couplings, fittings and adaptors required and up to 2 metres of copper piping to complete the repair. Additional piping will be paid under the item for new service installation (Item D4).

This item is provisional and therefore, must be approved by the Contract Administrator.

#### **D20. ADDITIONAL BENDS, TEES & FITTINGS (PROVISIONAL ITEM)**

The unit price bid this provisional item is to include all labour, material and equipment required for the supply and installation of additional bends, tees or fittings complete with all required thrust restraints, as required to accommodate significant design changes experienced during construction. Reference should be made to SPCS Item D1 for acceptable fitting specifications and required cathodic protection. The unit price bid shall make due allowance for these requirements and all required excavation and backfilling.

The supply and placement of Granular 'A' shall be paid for separately under the appropriate item in the Schedule of Quantities and Unit Prices.

This item is provisional and therefore, must be approved by the Contract Administrator.

**D21. WATER VALVE CLEANING & EXERCISE (PROVISIONAL ITEM)**

The unit price bid for this provisional item shall be deemed to be full compensation for any additional cleaning and exercise of water valves performed by the City within the project limits. The City will complete the required work and invoice the Contractor \$100.00 for each valve cleaned and exercised.

This item is provisional and therefore, must be approved by the Contract Administrator.

**D22. WATER SAMPLING STATION**

Water sampling stations shall be the "Test Tap" model as manufactured by DR Innovations Inc. (contact the City of Thorold for details)

The base of the station below grade shall be set on a concrete pad sized 300mm x 300mm by 50mm thick. Typical depth of bury shall be 1.8m with the station being set 1.2m above finish grade.

Service lateral connection to the station shall include service saddle at the main, main stop, 19mm type k soft copper to a 19mm curb stop complete with stainless steel service rod and curb box installed 1m out from the station, 19mm copper to station inlet. NOTE: Station inlet is 1 inch FIP – Reducing adapter type ¾ compression x 1" FIP required.

The unit price bid for this item shall include all labour, materials and equipment necessary to complete the installation.

**D23. EXISTING WATERMAIN REPAIRS (PROVISIONAL ITEM)**

Where applicable, the horizontal alignment of the new watermain is designed to allow the existing main to remain in service for the duration of the construction project (until the new main is commissioned).

The existing cast iron (CI) or asbestos cement (AC) watermain may be subject to breaks as a consequence of the construction works. The Contractor is required to take practical precautions and provide all support required to protect the existing watermain from damage until the new main is in service.

A Provisional Item has been included in the Schedule of Quantities and Unit Prices for the repair of main breaks on the existing CI or AC watermain should the Contract Administrator deem them to be of no fault to the Contractor.

**PAYMENT**

Measurement for payment will be by lump sum for each repair.

Payment will be made at the Provisional unit price bid tendered in the Schedule of Quantities and Unit Prices and shall be full compensation for all work required, including sheeting/shoring, dewatering, sawcutting, removal of existing pavement and road base, excavation in the trench (all types of soils), disposal of surplus excavated material and supply and placement of backfill.

The unit price bid shall also include payment for supply and installation of pipe, reducers, bends, fittings, tracer wire, restraints, thrust blocks and temporary and permanent support of all utilities encountered in the trench.

This item is provisional and therefore, must be approved by the Contract Administrator.

#### **D24. ROCK EXCAVATION IN TRENCH**

The provisions of OPSS 403 shall apply as amended or extended herein.

This item shall be applied to excavations where conditions prohibit the use of standard excavation equipment as defined below:

**Broken Rock:** Rock material that can be removed using standard excavation equipment equipped with rock teeth. In this specification, standard excavation equipment shall be Caterpillar 345CL Hydraulic Excavator or equal with 257 kW power and 1.9m<sup>3</sup> bucket capacity.

**Bedrock:** Rock material that cannot be removed using excavation equipment equipped with rock teeth and requires breaking up using a Hoe Ram or other mechanical breaking equipment.

The unit price bid for bedrock removal shall include all labour, equipment and materials necessary to complete the work. The work shall consist of excavating and removal of bedrock (any and all rock quality designation – RQD) encountered during the trenching operation, breaking of bedrock by mechanical means and removal from site to an approved disposal site.

The Contractor is required to obtain agreement from the Contract Administrator that refusal to standard excavation has occurred.

This item shall include bedrock excavation by controlled hoe ramming. Bedrock excavation by means of drilling and blasting will not be permitted.

#### **PAYMENT**

Bedrock excavation for these installations shall be limited to a maximum depth of 300mm below the O.D. of the pipe and a maximum trench width of the pipe O.D. plus 1000mm. Measurement for payment shall not exceed this maximum.

Payment of bedrock excavation in the open trench will be made by a field measurement. Measurement for payment shall be cubic meters (m<sup>3</sup>) calculated by average end areas and shall be paid for under the appropriate item in the Schedule of Quantities and Unit Prices.

**Payment for bedrock excavation shall be for any and all RQD encountered.**

ALL OPERATIONS SHALL BE CONDUCTED IN SUCH A MANNER AS TO PREVENT UNDUE HEAVING OF THE ROADWAY AND DAMAGE TO UTILITIES, STRUCTURES AND ALL PROPERTY.

## **PROVISIONAL**

All items in this section are Provisional and shall be approved by the Contract Administrator before use.

### **E2. TRENCH OR ROAD SUB-EXCAVATION (PROVISIONAL ITEM)**

The provision of OPSS 314 shall apply as amended or extended herein.

The unit price for this item shall include all sub-excavation below the required trench bottom or unsuitable sub-grade material, any additional sheathing and shoring required, and disposal of excavated material. The supply and placement of 50mm crusher-run stone in the trench or sub-grade compacted to 100% Proctor Density is also included in the price indicated.

Payment shall be made by the cubic metre measurement based on the calculated volume of the theoretical trench width, the average depth and length of sub-excavation.

This item is provisional and therefore, must be approved by the Contract Administrator.

### **E3. 15MPa CONCRETE (PROVISIONAL ITEM)**

This concrete shall have a minimum 28-day compressive strength of 15 MPa. The price per cubic metre shall include supply and placement of concrete in trench at any depth and for whatever purpose as directed by the Contract Administrator.

This item is provisional and therefore, must be approved by the Contract Administrator.

### **E4. UNSHRINKABLE FILL (PROVISIONAL ITEM)**

The provisions of OPSS 1359 apply as amended herein.

Payment at the unit price bid for this item shall include all labour, materials and equipment necessary to complete the work for supplying and placing unshrinkable fill for backfill as shown on the contract drawings, or as directed by the Contract Administrator.

#### **PLACING**

The unshrinkable fill material shall be placed at a slump between 150 and 200mm. The material shall flow into the excavation so that it fills the entire space. Care shall be taken to ensure that no air is entrapped beneath horizontal projections or other locations in the excavation.

Where bracing, shoring and/or sheeting is used to support the sides of the excavation or to prevent movements that could damage other surfaces or adjacent pavements, this support system shall be removed as backfilling proceeds.

The backfill excavations shall be covered with wooden planking or other protection until the unshrinkable fill will support the weight of an adult person, or for at least 24 hours whichever is the lesser. No load shall be permitted over the backfill excavations during this period.

When unshrinkable fill is used as bedding, cover and/or backfill material around sewers and watermains a continuous plastic sheet bond breaker shall be installed around all pipes in contact with the fill material.

This item is provisional and therefore, must be approved by the Contract Administrator.

#### **E5. SHORING & BRACING LEFT IN PLACE (PROVISIONAL ITEM)**

The provisions of OPSS 404 shall apply as amended or extended herein.

Shoring and bracing construction shall conform to OPSS 404. Payment shall be made only for "shoring and bracing left in place" by order of the Contract Administrator.

This item is provisional and therefore, must be approved by the Contract Administrator.

#### **E6. ARCHAEOLOGICAL CONCERNS (PROVISIONAL ITEM)**

The project area lies in the areas where significant archaeological finds have occurred in past years. The area will be assessed prior to construction.

As a result the excavations for this project may be confined to areas where previous open cut excavations have occurred, where possible.

During excavation operations on the project, an archaeological staff person may be present. That staff will monitor the excavations for concentrations of cultural materials or human skeleton remains. That staff will collect the remains and also monitor sidewall excavations for undisturbed finds. The archaeological staff may interrupt operations on occasion for a period not to exceed two (2) hours.

The unit price for the provision of item for standby shall be full compensation for the standby of the crew resulting from archaeological intervention for a period greater than two (2) hours provided that every possible effort has been made by the Contractor to relocate the 'work area' to permit continuance of the construction during the cultural review of a specific area.

If for any reason, the cultural review results in an extended interrupted period, specifically exceeding a ten (10) hour period then the Contractor shall make the site safe for a shutdown period, as approved and directed by the Contract Administrator in 'writing'. The Contractor will be responsible for construction signage and site safety during the shutdown period. A new construction re-start date will be negotiated with the Contractor.

This item is provisional and therefore, must be approved by the Contract Administrator.

#### **E7. CHAIN-LINK FENCE REPAIR/TEMPORARY DISMANLEMENT**

Any chain-link fence that is within the grading limits of the contract or could be reasonably foreseen to be damaged during construction activities shall be removed, salvaged, and reinstated by the Contractor once it is reasonable to do so. The Contractor shall review all fence deemed necessary for removal before work commences. Any fence damaged during removal, storage or reinstatement shall be replaced with the same materials, at no additional cost, to the satisfaction of the Contract Administrator.

The unit price bid for this item shall include all labour, equipment and materials necessary to carefully remove, salvage and reinstate the chainlink fence.

This item is provisional and therefore, must be approved by the Contract Administrator.

#### **E8. TREE PROTECTION**



Trees not designated for removal shall be protected in accordance with Niagara Region and Local Municipal Tree Protection By-laws if applicable or OPSS 801. If the contract requires work to be completed within the dripline of a tree or trees which are designated not to be removed, operation of equipment within that dripline area shall be kept to the minimum necessary to perform the work required. In order to minimize root loss, the Contractor shall use vertical trench walls and appropriate wall support systems when excavating within the dripline of trees. All exposed roots over 25 mm in diameter shall be cut back cleanly to the soil surface within five calendar days under the supervision of, or carried out by, an arborist certified by the International Society of Arboriculture or accepted as a consulting arborist with the American Society of Consulting Arborists.

If root damage or loss is extensive, portions of the tree shall be pruned. All pruning shall be carried out by a certified arborist using approved arboricultural techniques and practices. The pruning of trees and shrubs shall be carried out in a manner that retains as much as possible of the plant's natural form. The Contractor shall be responsible for disposing of cut limbs and roots in an approved manner off site. In addition, the remaining root system shall be watered and fertilized by a qualified and experienced landscape contractor under the supervision of, or carried out by, a certified arborist. All costs associated with a certified arborist shall be borne by the Contractor. No extra payment will be made to the Contractor for vertical trenching and trench supports, pruning branches and roots, or watering and fertilizing trees when work is required within the dripline.

#### **Trees Located within the Right-of-Way**

When the branches of trees located within the right-of-way will interfere with the construction operation, they shall be pruned prior to equipment entering the dripline of the tree.

The branches shall be cut back to the nearest suitable trunk, crotch or lateral where they will no longer interfere with the construction operation.

#### **Trees Located on Private Property**

When the branches of trees located on private property are overhanging the right-of-way or easement and will interfere with the construction operation, they shall be pruned prior to equipment entering the dripline of the tree.

Prior to pruning, the Contractor and Contract Administrator shall contact the property owner to receive permission to cut the branches back to the nearest suitable trunk, crotch or lateral where they will no longer interfere with the construction operation. Should a property owner refuse entry to cut branches on private property, then the branches shall be cut vertically at the property line.

### **E9. ABANDONMENT OF PIPES AND CULVERTS**

The requirements for abandonment of existing pipes and culverts shall be in accordance with OPSS MUNI 510, November 2011, Construction Specification for Removal, except as amended herein:

#### **510.05.03 Abandonment of Pipes and Culverts**

The following text is added to the end of the paragraph under clause 510.05.03 of OPSS MUNI 510: *Grout strength shall be 15MPa in all abandoned sections of pipes and culverts.*

### **Appendix1. TREE PLANTING SPECIES**

## **URBAN STREET TREE PLANTING CHOICES**

Acer Rubrum and select cultivars — common name (Maple)  
Quercus Rubra — common name (Red Oak)  
Quercus Alba — common name (White Oak)  
Quercus Macrocarpa — (Buroak)

Platanus x Acerifolia — common name (London Plaintree)  
Gleditsia Triacanthos — common name (Shademaster Honey Locust)  
Tilia Cordata — common name (Little Leaf Linden)  
Celtis Reticulata — common name (Hackberry)  
Gymnocladus Dioicus — common name (Kentucky Coffee Tree)  
Liquidambar Syraciflua — common name (American Sweet Gum)  
Liriodendron Tulipifera — common name (Tuliptree)  
Ginkgo — common name (Ginkgo Biloba)

## **ORNAMENTAL TREE PLANTING CHOICES**

Cercis Canadensis — common name (Eastern Red Bud)  
Prunus Serraluta — common name (Kwanzan Cherry)  
Pyrus Calleryana — common name (Ornamental Pear)  
Syringa Reticulata — common name (Japanese Tree Lilac)