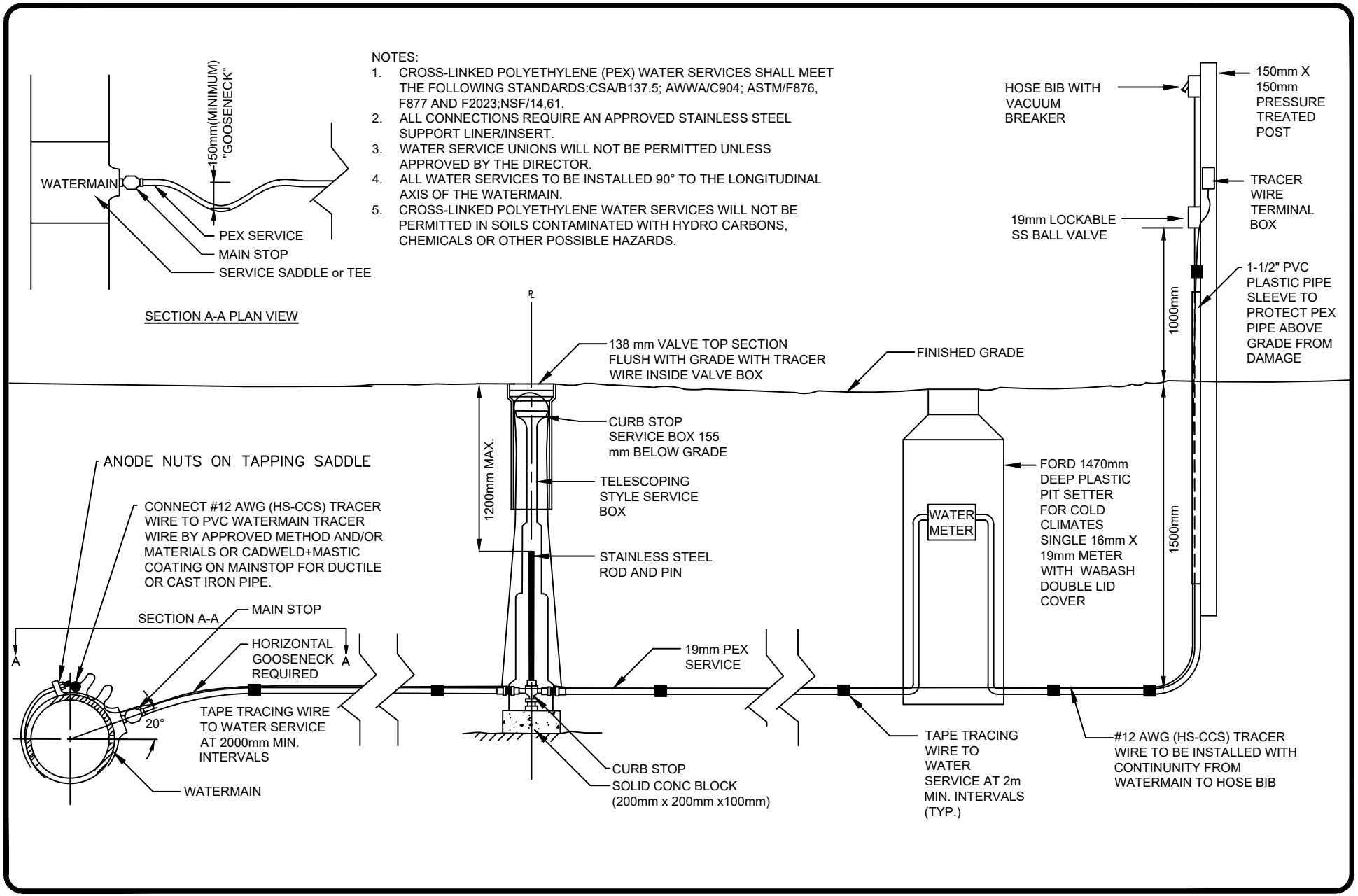

owen sound

PUBLIC WORKS & ENGINEERING DEPARTMENT
ENGINEERING SERVICES DIVISION
OWEN SOUND ONTARIO

Title

19mm PEX COMMUNITY GARDEN WATER SERVICE

No.	DESCRIPTION	DATE	BY
	REVISIONS		

DSN: COS	METRIC
CHK: MP	SCALE: N.T.S.
DRN: COS	DATE: 2023/01

A

FILE No.: N/A

Drawing No.

OSS-413A

PUBLIC WORKS AND ENGINEERING DEPARTMENT
ENGINEERING SERVICES DIVISION

SPECIFICATIONS
FOR
WATERMAIN CONSTRUCTION

Revised: 2021 June 04

1. GENERAL CLAUSES

1.1 WORK TO BE DONE

Unless otherwise specified herein, the prices quoted in the Tender shall provide for all labour, material, construction tools and equipment, and any transportation services necessary to complete all the work required under this contract.

The Engineering Services Division of the Public Works and Engineering Department of the City of Owen Sound will be the sole authority in charge of any and all aspects of new water works construction or replacement unless otherwise advised in writing by the Manager of Engineering Services, further herein after referred to as the City's representative or designate. If the City's representative is of the opinion that the number of workers, pieces of equipment, tools or plant are insufficient to perform the work at hand to the specified standards, in a reasonable time period; or that the contractor's operation is placing undue stress on the existing water system; or unnecessarily long or uncalled-for interruption to customer service, the City's representative will advise the contractor to make whatever changes are considered necessary. The contractor will promptly and efficiently comply with these directions.

1.2 SHUTTING DOWN OR CHARGING WATERMAINS

The contractor shall not shut down or charge any live or existing watermain or operate any gate valve, hydrant, air relief valves or other control for any purpose. **Operation of commissioned live valves, hydrants, air relief valves and curbstops is to be performed solely by the Water Section forces of the Public Works and Engineering Department of the City of Owen Sound.** Advance notice of at least one full working day is required to be made to the City's representative when valve operation is necessary, except in emergencies. Contractors may only operate non-commissioned water appurtenances.

1.3 NOTIFICATION TO WATER USERS

Residential water users who are supplied from a watermain to be shut down shall **be notified by the contractors 24 hours prior to shutting down.**

Commercial and industrial water users who are supplied from a watermain to be shut down shall be notified by the contractors at least 48 hours prior to shutting down.

All users shall be informed in writing as to the hour and anticipated duration of the shutdown. Alternative water sources may need to be found i.e. Hospital/Factories etc.

The City shall provide a list of properties effected by construction and where notices must be delivered due to interrupted services.

1.4 INSPECTION

The City's representative may provide inspection services on a 48 hours notice basis to the contractor. Such inspection service will be required before any work on the water distribution system is attempted. All work must be approved by the City's representative before a certificate for payment is issued.

This inspection service will be provided free of charge during normal working hours.

The contractor will be charged for any expenses incurred to the City of Owen Sound for any unplanned inspection or work by the City's representative (final hook-ups/flushing/chlorinating etc.) or their agents required during a Saturday, Sunday and all declared Public and civic holidays or after normal working hours. (7:30am – 4:00pm, Monday – Friday)

1.5 LINE & GRADE

The contractor shall assume full responsibility for line and grade of watermain and services and must set and maintain the necessary stakes to properly define the general location, alignment, elevation and grade.

The depth of cover for all watermain and services shall be 1.7m minimum. **Any variation in depth of cover must be approved by the City's representative. If required depth of cover cannot be achieved due to other underground services conflicts, insulation will be required as per the construction drawings and specifications.**

See Appendix A for OSS-419.

1.6 LOCATION OF OTHER UTILITIES

The contractor is responsible for onsite locations of all other utilities before starting alterations or installations of watermains. Hand digging may be required to determine depth and location of existing utilities such as Bell, Gas or Cable.

1.7 PROTECTION OF OTHER UTILITIES

The contractor shall adequately brace and secure existing utilities to the satisfaction of the utilities' representatives, during watermain installations or alterations. No extra payment beyond the contract unit prices will be allowed for this work.

1.8 DAMAGED PIPE

Pipe damaged during construction shall be restored to the satisfaction of the owner, using fittings and pipe specified by the owner at no extra cost to the owner.

1.9 SALVAGE

Old lead pipe, hydrants, cast iron pipe, valves, service valve boxes and all material may be salvaged at the discretion of the City's representative. Salvaged material shall be returned to the Public Works Division of the City of Owen Sound yard during normal working hours. (7:30am – 4:00pm, Monday – Friday)

1.10 REMOVAL OF EXCESS MATERIAL

Excess material left from watermain installations must be removed from the site after backfilling has taken place. It shall be the contractor's responsibility to find a suitable site for this material. The cost of removing this material shall be included in the unit prices quoted.

1.11 ABANDONED WATERMAIN

The ends of 50mm diameter and smaller malleable water service pipe shall be bent over and hammered close. Galvanized pipe 25mm – 50mm in diameter must be capped. All other watermain 50mm or larger must be capped with an MJ cap unless alternative method is approved by the City's representative.

1.12 REMOVAL OF ABANDONED WATER PIPE

If removal of abandoned pipe is required the contractor shall be responsible for its removal and disposal. The contractor must remove the pipe in such a manner as not to disrupt the integrity of existing or new utilities or property.

1.13 ACCESS TO ADJOINING PROPERTIES

The contractor shall endeavour to maintain driveway access to adjoining properties along the route of watermain installation. Trenches shall be backfilled as quickly as possible and the surrounding roadway swept and cleaned so that no complaints of dust nuisance will be reported. Adequate barriers and illumination shall be provided by the contractor to prevent the public from falling into the trench during evening hours and weekends. No roadway may be completely blocked off without the permission of the City's representative.

1.14 DEWATERING EXCAVATIONS

The contractor shall supply all equipment and labour necessary to dewater the excavation when making connections to the existing watermain and during the installation of watermain and appurtenances. The cost of dewatering the trench shall be included in the unit prices quoted.

1.15 SIGNING OF THE WORK ON CITY ROADS

The Public Works and Engineering Department of the City of Owen Sound has adopted the "Manual of Uniform Traffic Control Devices Ontario Traffic Manual Book 7" as its standard for the signing of construction projects and for the detouring of traffic. The contractor shall abide by this manual.

1.16 SUPPORT OF WATERMAINS

At any point where a sanitary sewer, sanitary house connection, storm sewer, catch basin lead, new watermain, installed under this contract, crosses below any existing watermain, the contractor shall be required to install all temporary shoring and bridging considered necessary by the City's representative as per Standard Occupational Health and Safety Act and approved standards. No supporting structures shall be permanently placed under watermains or services and the trench shall be backfilled and compacted to approved specifications to ensure that no future settlement occurs. In the event that a cast iron, PVC or asbestos cement watermain is fully undermined, the trench shall be backfilled with a non-shrinkable backfill material to a point not less than the top of the watermain. Or alternatively the watermain shall be cut out and replaced with ductile iron pipe to the satisfaction of the City's representative.

2. MATERIALS SUPPLIED BY CONTRACTOR

2.1 WATERMAIN PIPE SUPPLY

Please refer to the City of Owen Sound Approved Manufacturers Products for Water Distribution System sheet.

2.1.1 CONCRETE PRESSURE PIPE (CPP)

Concrete pressure pipe shall be A.W.W.A. standard pre-tensioned concrete cylinder pipe meeting the requirements of A.W.W.A., C-303 specifications or standard pre-stressed concrete pressure pipe meeting the requirements of A.W.W.A. C-301 specifications. Prior to the manufacture of any concrete pipe or fittings, the contractor shall submit to the City's representative, for its approval, three (3) sets of piping layout and detailed shop drawings. The drawings shall be in sufficient detail to show general construction of all parts and quality of materials and workmanship to be used in construction.

Specifically, this information shall include complete dimensions and weights of pipe, details of manufacturing methods, materials to be used, including material specifications and strengths, design calculations, spacing and sizes of struts, and other details such as are necessary to permit appraisal of the pipe to be supplied under the contract.
All concrete pressure pipe and fittings shall be designed and constructed for the following working pressures, earth covers, allowance for water hammer etc., (unless specified elsewhere).

Working Pressure	690 kPa
Field Test Pressure	1,050 kPa
Water Hammer Allowance	40%
Earth Cover	1.7 to 6.0 metres
Additional External Loads	Highway H-20 S16

External pipe loading shall be calculated and based on a trench width equal to the outside diameter of the pipe, plus 1.0 m. For purposes of pipe design, the Tenderer shall consider the pipe to be installed in Class "B": bedding, with load factor of 1.9.

All concrete used for the exterior coating of pipe and fittings shall be manufactured with Type 50 Cement.

It should be noted by the contractor that approval of pipe layout and shop drawings by the City, shall not relieve the contractor of his responsibility to supply pipe meeting all aspects of these specifications.

2.1.2 POLYVINYL CHLORIDE PIPE (P.V.C)

All pipes, fittings, and gaskets that are unsound or damaged shall be rejected. **All pipes up to and including 600 mm diameter shall be delivered to the Work Area with end covers installed at the factory on both ends and a tamper evident seal on the bell end only and components shall adhere sufficiently to withstand the stresses caused during shipment.** End covers shall prevent small animals, debris, and contamination from entering the pipe; however, a waterproof seal is not required. Tamper evident seals shall display the manufacturers name or logo or both. Seals shall straddle the cover and the pipe. Removal of the cover shall render the

tamper evident seal unusable either by breaking the seal or by leaving a message such as "VOID" on the pipe. Tamper evident seals are not required for non-reusable heat shrink plastic covers or foam plugs with punch-out centres. Pipes delivered to the construction site with damaged or missing end covers shall be field cleaned to remove all undesirable material along the entire length of the interior of the pipe and the end covers reinstalled. Manufacturer's handling and storage recommendations must be followed.

All pipe used must be brand new, especially for final connection. Old, used, battered pipe shall not be accepted. All P.V.C. C900 & PVCo C909 watermain pipe shall be designed and constructed for the following working pressures, earth covers, allowances for water hammer, etc. (unless specified elsewhere).

Polyvinyl Chloride (PVC) pipe, 350mm diameter to 1200mm diameter, shall be:

a) **designed to accommodate the operating pressure plus surge pressure,**
b) **certified by the Canadian Standards Association (CSA) to CSA B137.3,**
c) **colour coded blue and have cast iron outside diameters**

Submittals by the pipe manufacturer in the form of Shop Drawings:

- **Letter of Compliance**
- **Pipe design calculations**
- **Summary of fittings and method of restraint**
- **Installation Guide**
- **Tabulated Layout Drawings indicating restrained lengths for fittings and valves - stamped and signed by a Professional Engineer licensed to practice engineering in the Province of Ontario**

Working Pressure	690 KPa
Field Test Pressure	1380 KPa
Water hammer allowance	40%
Earth Cover	1.7 - 3.0 metres
Additional External loads	Highway H-20 S16

External pipe loading shall be calculated and based on a trench width equal to the outside diameter of the pipe, plus 1.0 m. For purposes of pipe design, the Tenderer shall consider the pipe to be installed in Class "C" bedding, with load factor of 1.9.

2.2 SERVICES

2.2.1 SERVICE PIPE

All service pipe shall be certified ASTM 13-88 Type 'K' soft copper tube, nominal diameter of 20mm and 25mm. Kinked, crushed or distorted tubing shall not be used. Solder type fittings shall not be used. Service pipe of standard sizes larger than 50mm shall be P.V.C as described in 2.1.2 unless otherwise specified.

Alternatively, 38mm and 50mm services or mains shall be Municipex complete with tracer and conforming to CSA B137.10 may be used in lieu of copper service pipe. All cuts must be made with a tubing cutter must be used when cutting PVC pipe.

All live taps must be performed by the Water Section of Public Works. An additional valve shall be supplied by Public Works to be installed at the property line unless otherwise negotiated.

See Appendix A for OSS-413, OSS-414, OSS-415

2.2.2 SERVICE SADDLES

Service saddles shall be used on all services larger than 25mm and on all services installed with P.V.C. C900 & C909 and asbestos cement watermain pipe. All service saddles will use a double bolt closure. All service saddles and tapping saddles will have anode nuts installed to the saddle.

The following service saddles have been approved for use by the City of Owen Sound in conjunction with **asbestos cement watermain pipe:**

Robar - 2706 DB or Engineering Services Division pre-approved equivalent.

Main tapping for service connections shall be done with a Footage Tools, Mini Tap (part No. T484-01) or City's representative pre-approved equivalent. **THE USE OF HAND DRILLS IS PROHIBITED.**

P.V.C. Watermain Pipe Service Saddles			**Tap Size**	**Main Size**
Ford AWWA	-	FS313	19mm to 50mm	100mm to 300mm
Robar AWWA	-	2616	19mm to 50mm	100mm to 300mm
Robar AWWA	-	2626	19mm to 50mm	400mm to 450mm

Saddle Installation Instructions for P.V.C. Pipe:

Must be installed to manufactures specifications.

2.3 RESTRAINED JOINTS

All mechanical joint fittings must be mechanically restrained with a retaining gland. Please refer to The City of Owen Sound Approved Manufacturers Products for Water Distribution System Sheet.

2.4 TYTON JOINT RESTRAINTS

Any Tyton joint requiring restraint must use approved bell restraint as prescribed in The City of Owen Sound Approved Manufacturers Products for Water Distribution System Sheet.

See Appendix A for OSS-417

2.5 FIRE HYDRANTS

Hydrants shall meet CSA specification B89.6 and AWWA C-502 latest revision. Hydrants shall be Mueller Century or M67B McAvity Brigadier. Hydrants shall be complete with 2-63.5mm nozzles with CSA standard thread and 1 CSA standard Storz quick 100mm pumper connection coupler. Hydrants shall be suitable for depth of "bury" of 2.25m. Hydrant colour to be chrome yellow. Storz pumper connection cover to be painted black. Drain ports are **not** to be plugged. Hydrants must open left and shall have bronze to bronze seat. **Hydrants shall be mounted with breakaway flange mounted between 100mm - 150mm above finished grade on hard finished services (ie. concrete and asphalt) and to a minimum height of 50mm above grassed area.**

All reasonable protection measures must be taken to protect the hydrant while backfilling. No dumping of material over the hydrant shall be permitted. Public fire hydrants shall be painted “Chrome Yellow”, private fire hydrants are to be painted “Fire Hydrant Red” (Sico 635-720-G378 HYDRANT RED CORROSTOP ULTRA or equivalent) with the Storz cover painted black after construction, should any damage occur during installation.

2.6 TRACER WIRE

Tracing wire shall be Direct Burial #12 AWG Solid (0.0808” diameter), 21% conductivity annealed copper-clad, high carbon steel, high strength tracer wire, 452lb average tensile break load, 30 mil. high molecular weight- high density polyethylene jacket (Blue) complying with ASTM-D-1248, 30-volt rating. Approved tracer wire for open cut application: Copperhead 12.30 BHS.

All tracer wire welds onto existing cast or ductile iron pipe shall be completely sealed with the use of Chace/Royston Handy Cap IP. In all cases, the pipe is to be properly cleaned and material shall be applied in accordance with the manufacturer’s instructions.

All splices or repaired wire connections in the tracer wire system shall be made using waterproof connectors specifically rated for underground applications. Approved tracer wire for open cut application: SnakeBite locking connectors, DryConn 3-way Direct Bury Lug, and DryConn Direct Bury Twist-on. Tracer wire shall have a Zinc anode installed as per OPSS 442 Table 5. The tracer wire shall run to each hydrant and be installed in a test point in a separate valve box upper section directly behind hydrant flush with proposed grade.

See Appendix A for OSS-404

3. CONSTRUCTION

3.1 CARE AND HANDLING OF MATERIALS

Pipe, fittings, valves, hydrants and all accessories must be loaded and unloaded by lifting with a hoist or skidding so as to avoid shock damage. Under no circumstances shall these materials be dropped. Pipe handled on skid ways shall not be skidded or rolled against pipe already on the ground. **Under no circumstances shall any of these fittings come into contact with chains or cables for lifting. Certified woven fabric material lifting straps must be used when lifting fittings.**

3.1.1 CONCRETE PRESSURE PIPE

The standard exterior coating on concrete pressure pipe is a chloride resistant concrete and although this pipe is durable, reasonable care shall be exercised. **If in the event that the exterior of the pipe is damaged prior to being put in service, the contractor must replace the damaged pipe at his expense**. Non-metallic slings shall be used and adhered to A.W.W.A. C600-82 Sec. 2.2.

3.1.2 P.V.C. WATERMAIN PIPE

P.V.C. C900 & C909 watermain pipe should be handled with special care as to avoid severe impact blows, abrasion damage and gouging or cutting by metal surfaces or rocks. **If in the event the P.V.C. pipe is damaged prior to being put in service, the contractor must replace the damaged pipe at his expense.** Non-metallic slings shall be used and adhered to A.W.W.A. C600-82 Section 2.2. The P.V.C. pipe must be stored under a roof and not exposed to direct sunlight while in storage.

3.2 EXCAVATIONS

All excavations shall be done in accordance with the latest revision of the Occupational Health and Safety Act.

For ductile iron pipe, the trench shall be excavated to the depth required so as to provide a uniform and continuous bearing and support for the pipe on solid and undisturbed ground at every point between bell holes. A maximum disturbed length of 0.6m near the centre of the pipe will be permitted for the withdrawal of the pipe sling or other lifting tackle. **The trench must be drained or pumped in-order to avoid the necessity of making joints under water and the possibility of surface water entering the pipe.**

3.3 DEPTH OF COVER

The watermain pipe and all water service pipe shall be installed or lowered so that the top of the pipe will be a minimum of 1.7m below the finished grade directly over the line of the watermain or service pipe **to a maximum depth of 3.0m for P.V.C or 6.0m for CPP (as per 2.1.2 & 2.1.1) unless previously approved by the City's representative.**

3.4 MAXIMUM LENGTH OF OPEN TRENCH

Except by permission of the City's representative, the maximum length of open trench when laying

or lowering watermain shall be 90m or the distance necessary to accommodate the amount of pipe installed or lowered in a single day, whichever is smaller. The distance is the collective length at any location including open excavation, exposed pipe length and appurtenant construction. All trenches that are to be left open overnight must be completely enclosed with safety fence regardless of location, to the satisfaction of the City's representative.

3.5 PIPE LAYING AND JOINTING

PVC watermain pipe shall be laid in accordance with the instruction manuals of the manufacturer. Proper implements, tools and facilities satisfactory to the City's representative shall be provided and used by the contractor for the efficient laying of the pipe and the setting of the required fittings, etc. All materials shall be lowered into the trench by suitable means. Under no circumstances shall these materials be dropped into the trench.

The inside of the bell and the outside of the spigot shall be brushed or wiped clean and free from oil and greases before the pipe is laid. The pipe shall not be laid in water or on blocks.

Ductile iron joints are to be electrically bonded using conductivity straps or lock wedges.

In order to ensure the proper location of underground structures, the contractor shall explore the excavation to locate such structures ahead of the laying and jointing operations so that should these structures differ in elevation and location to their position shown on the drawings, suitable changes in the watermain trench may be made in order that the watermain may cross over or under them without the use of bends. In certain instances it may be necessary to adjust existing underground structures to allow for watermain installation.

The contractor shall take special care to make sure that all tees and crosses are located in the proper position so that connection to hydrants, services and watermain can be made without the use of bends. The contractor will be given approximate locations of existing watermains and shall determine the actual location at the site. No extra payment shall be allowed for determining the location of these watermains. **The fitting of pipe sections using any mechanized aid is prohibited.**

For any new Cul-De-Sac designs a looped water network must be implemented. **See Appendix A for OSS-416**

3.6 SHUT DOWN PRECAUTIONS

At times when pipe laying is not in progress, the open ends of pipe shall be closed by a watertight plug or by other means approved by the City's representative. If water is in the trench, the seal shall remain in place until the trench is pumped completely dry.

3.7 CURVATURE OF THE PIPELINE

P.V.C watermain may be placed on a curved alignment by bending the pipe or deflecting the joints. All other types of approved pipe may use only joint deflection. Whatever method is chosen, the maximum curvature must be below the pipe manufacturer's maximum recommended radius of curvature**. In no case shall a service be tapped into a bent pipe. Pipe bending or joint**

deflection shall not be combined on the same line.

Wherever it is necessary to deflect the pipe from a straight line either in the vertical or horizontal direction, the amount of deflection shall not exceed that required for satisfactory jointing as recommended by the manufacturer.

If, in the opinion of the City's representative, the deflection is excessive, tyton joint or mechanical joint bends complete with thrust blocks will be used. The use of restraining glands is a requirement when bends are necessary. This cost shall be borne by the contractor.

3.8 INSTALLATION OF SPECIAL FITTINGS AND ANODES

All valves, bends, tees, hydrants, anodes and any other accessories shall be jointed or fitted to the system in a manner acceptable to the manufacturer's specifications and approved by the City of Owen Sound.

3.9 SETTING VALVE AND SERVICE BOXES

All valve boxes and service boxes shall be left in good condition by the contractor. The valve and service box tops shall be at ground level so as not to cause a hazard. When paving or sodding, the tops shall be lifted to the new finished grade. Curb stops shall be installed at the street line.

Curbstop service boxes must be pre-set on the service and be set to grade. The service box must be adjustable to finish grade of extended **maximum of 100mm** above finished grade. **If the service box is higher than 100mm above finished grade it must be adjusted from the bottom by cutting off the excess from the bottom, then re-pinching the bottom of the pipe to prevent the pipe from being pulled out. At no time will a repair top be allowed on a new service. Only threaded extensions will be accepted to raise the service box.**

Any boxes, valves or other appurtenances damaged during construction shall be restored with new and equal materials to the satisfaction of the City's representative. A walk-through inspection by the City's representative and the contractor will be arranged to determine the extent of any damages. **Valve boxes must be set to proper finished grade prior to installation of asphalt base coat.**

Valve boxes may be set in such a manner that the valve operating nut is centred in the lower section of the valve box. A valve box guide plate must be installed in accordance with the manufacturer's instructions. In the case where a guide plate cannot be utilized (under direction of the City's representative) the valve box must bear on compacted granulars and **must** be centred on the operating nut. The operating nut must be completely accessible even after finished surface asphalt coat is applied. Any re-adjustment to make the valve operational will be the contractor's responsibility.

Valve box bottoms must sit 50mm below guide plate. At no time should the bottom of the valve box be touching the body of a valve.

The use of pavement levellers for new valve boxes will not be allowed. All new and existing valves must be accessible for operation at all times.

For in chamber valve extensions **refer to OSS-418 in Appendix A.**

3.10 SETTING HYDRANTS

Hydrants shall be connected to the main with an anchor tee and a 150mm valve.

Clear 19mm stone for adequate barrel drainage and hardwood thrust blocking shall be provided.

Unless otherwise specified, the hydrants shall be installed plumb and positioned so that the hydrant nozzles are parallel to the property line, with Storz connection facing the roadway. The hydrant shall be set so that there is no more than 0.6m separation from the street property line to the back of the hydrant barrel. Fire hydrants will be supplied by the contractor. **If the coating has been damaged through transportation or the installation procedure, the contractor shall coat the above ground portion of the hydrant to renew and repaint to original condition.** The City's representative shall decide if hydrants need recoating. Coating to be supplied by the contractor and must meet Standards approved by the City's representative.

See Appendix A for OSS-411 and OSS-412.

3.11 WATERMAIN LOWERING

All watermains, which will have less than 1.7m of cover measured from the top of the pipe in a vertical direction to finished grade, must be lowered so that the minimum cover will be at least 1.7m to finished grade.

See Appendix A for OSS-420 and OSS-421.

3.12 LOWERING AND RELOCATION OF SERVICE PIPE

3.12.1 SERVICE PIPE 38MM OR LESS IN DIAMETER

Any water service constructed of material other than copper shall be considered obsolete and must be replaced. This includes the portion of a lead jumper beyond the curb stop to the customer's galvanized or copper service.

Water service pipe shall be installed without the use of couplings.

All service pipe stops and goose necks projecting from the main in a vertical direction must be relocated in new tapped holes slightly above the spring line of the main unless the minimum depth of cover over such goose neck is less than 1.7m .

No water service shall have less than 1.7m of cover measured to finished grade directly above the service. Where the depth of the main is less than 1.7m the water service shall be installed horizontally from the watermain for a maximum distance of 1.0m. Provide insulation to that portion which does not conform to 1.7 m of minimum depth. That portion of the service, which is greater than 1.0m from the watermain shall have a minimum cover of 1.7m. All water services of 50mm or less nominal inside diameter shall be relocated by the contractor to pass below any storm drain or lead which is less than 1.7m below finished grade. No service pipe will be installed within

150mm vertically of a storm drain, sewer or catch basin lead.

No relocated water service shall be allowed to pass within 1.5m of any catch basin or storm sewer manhole or within 0.6m of a sanitary manhole. Any existing water service must be relocated to comply with this requirement.

If the water service cannot avoid the minimum distance requirements from adjacent structures an approved insulation barrier must be installed.

The contractor will be required to guarantee all relocation work for a period of two years. **Any freeze-up problems encountered during this period will be thawed, lowered and/or insulated and repaired at the contractor's expense if the specifications have not been adhered to in any respect.**

3.13 WATER SERVICE INSTALLATION AND RENEWALS

Copper water services will be installed with a minimum cover of 1.7m and a maximum cover of 2.0m from the watermain to the street line or as specified by the City's representative.

The water services may require more than 1.7m of cover to avoid any conflicts with existing and proposed sewers, sewer laterals, Bell Canada Plant, Union Gas Plant, or any other buried utilities. Any deviations of water services to avoid other utilities shall cross over or under them without the use of factory made bends or couplings at the City's representative discretion.

The unit price quoted will be full compensation for all water service pipe installed regardless of depth within the limits stated above and beyond the maximum limits in order to avoid conflicts with other utilities. Mainstops shall not be spaced closer than 0.5m apart and shall be tapped at the position shown on the appropriate Standard Drawing or within 0.5m of a bell.

A "Goose Neck" must be formed into the service pipe and "laid over" into a horizontal position.

A curbstop and box must be installed and the box must be plumb. A 2.3 kg anode shall be attached to the ground clamp installed a minimum of 0.3m from the curbstop on the copper services with the anode placed on the City side of the curbstop.

For a pre-serviced lot, a service box shall be marked with a 25mm X 50mm stake clearly marked with blue paint and extend 0.6m above finished grade.

In the case of a renewal service, the contractor shall connect the existing service to the new curb stop and remove all obsolete pipe, existing curbstop and box prior to backfilling and restoration. Under direction of the City's representative, curbstops must be installed at street line or up to 0.6m either side of street line. If existing curb stop is up to 2.0 m on private property, new service material shall be installed from the new curb stop (on property line) to the customer's galvanized or copper service on the house side of the existing curb stop. Contractors shall replace water services up to the property line, or when required to the existing transition between the City's service and the customer's service. In some cases this will necessitate work taking place in the customer's property. These cases shall be reviewed by the City's representative. Existing elbows

will not be permitted to complete street line connections. All lead jumpers will be removed and replaced with copper. All fittings used and locations of such shall be accurately recorded to the satisfaction of the City's representative as described elsewhere herein. If a lead or galvanized water service is found, the contractor must contact the City's representative to verify that the service is the same material entering the building.

3.14 CORROSION PROTECTION

3.14.1 DENSO MATERIALS

Where required, all flanged surfaces, nuts, bolts, tie rods, clamps, valves, sleeves, Victaulic couplings etc., shall be protected using "Denso" materials. These products shall be supplied and applied by the contractor in strict conformity with the manufacturer's specifications and recommendations. The above products are available from Canada Valve or from Denso of Canada Ltd., 75 Shields Court, Unit 3, Markham, Ontario, L3R 9T4, telephone 416-940-8255.

3.14.2 CATHODIC PROTECTION

Unless otherwise stated in the special provisions, anodes shall be installed at all valves, tees, caps, elbows, reducers, sleeves, hydrants, curbstops, service saddles and each length of main. The anode shall be connected using the 'cadweld' method and shall be installed in accordance with the manufacturer's recommendations and specifications. All `cadwelds' are to be covered with Thermo Weld, Thermo Cap or Royston Handy Cap. The anode shall be connected to the copper water service 0.3m away on the "City side" of the curbstop. In addition, all fitting bolts are to be fitted with 19mm sacrificial zinc caps. All 19mm sacrificial zinc caps must be tightened finger tight, then tightened a ¼ turn with a 38mm socket. Cap shall be "Protecto-Caps" cat. No. 175P190 or approved equivalent.
Anode sizing chart for zinc anodes:

WATERMAIN MAIN SIZE	ANODE SIZE (kg)	SPACING
100mm	2.3	Per length over 3.0 m or fitting of similar size
150mm	2.3	Per length over 3.0 m or fitting of similar size
200mm	5.5	Per length over 3.0 m or fitting of similar size
250mm	5.5	Per length over 3.0 m or fitting of similar size
300mm	11.0	Per length over 3.0 m or fitting of similar size
Copper service	2.3	at each curb stop, 0.3m min away from city side of curb stop
Hydrant	5.5	at hydrant base
Tees, elbows etc.	2.3	On each fitting for 100mm-150mm pipe
Tees, elbows etc	5.5	On each fitting for 200mm-300mm pipe

3.14.3 ANODES

All anodes shall be packaged zinc anodes. The zinc anode coating shall have a 316 stainless steel core wire. The zinc anode casting is to be packaged in cardboard having a minimum diameter of 200 mm. The backfill material within the package shall be a Gypsum/Sodium Sulphate/Bentonite mixture having an electrical resistivity less than 50 ohm cm-wet. An insulated copper (AWG 10-12) wire 3 metres in length shall be brazed to the end of the core wire.

(Bren Technology., Maple Agencies and Corrosion Service Company Limited presently manufacture anodes to these specified requirements).

See Appendix A for OSS-422 for reference to anode testing station installation.

3.15 THRUST BLOCKS

3.15.1 DUCTILE IRON THRUST BLOCKS

Hardwood thrust blocks shall be placed between undisturbed ground and the fittings being installed. The contractor shall supply **hardwood blocking** at all bends, tees, etc. In addition to hardwood blocking, grip ring type restraint, will be used on Mechanical joint fittings and 'Field Loc' gasket type restraints for Tyton joint fittings.

3.15.2 CONCRETE THRUST BLOCKS

Ontario Provincial Standard Specifications (O.P.S.S.) or Mechanical Thrust restraint (as per A.S.T.M. F1674-96) shall be used on P.V.C. watermains. **Hardwood blocking must be installed between concrete thrust blocks and water fittings / valve, tee, bend, hydrant etc.**

Poured thrust restraints must be tied back from fitting / valve etc. Concrete shall not be directly poured on pipes / fittings or any other water appurtenances. **A minimum 8mil polyethylene film encasement must be used as required by AWWA C105-10.**

3.16 BEDDING

All watermains and appurtenances shall be bedded in accordance with the Contract Drawings and/or the Additional Specifications. For the purpose of this specification, all materials placed between the trench bottom and 300mm over the main shall be considered as bedding. All bedding to be Class "B", Granular “A” gravel.

Trenches shall be excavated, only where bedding is required, to a depth of 75mm below the specified elevation of the bottom of the proposed watermain.

Bedding material shall be placed for the full width of the trench and shall be mechanically compacted to 95% of maximum dry density, as determined by A.S.T.M. Designation D698.

3.17 BACKFILL

Unless otherwise specified, the backfill shall be imported Granular "B" backfill and shall be mechanically compacted to 98% of maximum dry density, as determined by A.S.T.M. Designation D698. Native material backfill will be permitted provided that the native material is of similar or

higher quality than Granular "B" backfill and is approved by the City's representative. A credit for this will be issued in a predetermined unit price as outlined in the Schedule of Unit prices. **At no time will asphalt or concrete be used as backfill.**

Approved native backfill will be permitted where the watermain will lie below an untraveled portion of the designated right-of-way provided the native material is not in a fluid or frozen state.

Backfill shall be considered as starting at 300mm over the watermain. All materials below this point shall be considered as bedding material.

Backfill for structures such as valve chambers shall start at the subgrade for the structure and shall be brought up simultaneously and equally on all sides of the structure.

As soon as possible after the pipe has been laid and bedded, the contractor shall proceed with backfill operations in order to prevent the main from "floating". **All pipe with the exception of the last 1.5 metres shall be covered with a minimum of 1 metre of fill before the contractor leaves the site at the end of a working day**. Care shall be exercised during backfill operations so that the watermain is not damaged or displaced.

The contractor shall not backfill around a cast-in-place structure without the approval of the City's representative.

Where it has become necessary to excavate beyond the limits of normal excavation lines in order to remove boulders or other interfering objects, the void remaining shall be backfilled with the specified material.

All backfill materials shall be approved by the City's representative.

3.18 COMPACTION

Compaction shall be carried out using approved compaction equipment to obtain the required degree of compaction. When field tests indicate that the required degree of compaction is not being obtained with the equipment in use or with the procedure being followed, the contractor's operations shall be halted until the City's representative is satisfied that the contractor has made such modifications to his equipment and procedure to produce the required results.

Unless otherwise specified or approved by the City's representative, all earth fill shall be placed and compacted using the 300mm Layer Compaction Method. The fill material shall be spread in uniform full width layers not more than 300mm in depth. All stones over 100mm shall be removed and disposed of. All materials shall be compacted to 95% of maximum dry density (A.S.T.M. Designation D698). If the material moisture content is not high enough to achieve the required density, then water shall be applied by means of an approved method. When the material moisture content is considered too high, dry material shall be incorporated and the resulting materials thoroughly mixed. Alternatively, the wet material shall be dried by blading, disking or other approved methods.

3.19 CONNECTION TO EXISTING WATERMAINS (FINAL CONNECTIONS)

The contractor shall make connections to existing watermains where indicated on the plans and where required by the City's representative during the progress of the work. The contractor shall not be required to make connection to watermains under pressure unless otherwise instructed in the tender documents.

The contractor shall notify the Public Works Division of the City, forty-eight hours in advance, of his intentions to connect to existing watermains. The Public Works Division of the City shall arrange for a member of the City's staff to locate the existing watermain as accurately as possible.

The contractor shall exercise extreme care during these operations to ensure that no damage is done to the existing watermain. Any damage resulting from his operation shall be repaired at the contractor's expense. Connection shall be made only after the City's Public Works personnel have isolated the section of existing main. Care shall be taken to prevent contamination of the existing watermain and the new closure fittings and pipe shall be rinsed in chlorine solution prior to installation.

See Appendix A for OSS-423 and OSS-424.

3.19.1 SWABBING

All connections made to existing watermains that cannot be tested for disinfection and pressurisation shall be double hand swabbed with a minimum 10.8% sodium hypochlorite and handled with extreme care prior to making the connection. Swabs will be soaked in a clean container or barrel. Swabs must be one nominal size over pipe ID being swabbed. ie. 150mm diameter pipe requires a 200mm diameter swab to be used. Factory cut swabs may only be used during swabbing.

Swabs will be numbered, and all swabs must be recovered. A minimum of two swabs must be used per branch. All fitting must be soaked in a container of 10.8% sodium hypochlorite. After soaking, all fittings must be sprayed down and wiped out with a solution of 10.8% sodium hypochlorite.

3.20 AS-BUILT DRAWING

The Consulting Engineer shall provide as-built drawings in accordance with the following:

WATERMAINS (INCLUDING FINAL CONNECTIONS)

The Consulting Engineer shall accurately record locations prior to backfilling of all tees, valves, bends and deviations of the main. All measurements shall be referenced to property bars or lines. All measurements are to be right angle ties. A minimum of 2 right angle ties is required for all watermain items. All fittings used shall be accurately recorded. The size, manufacturer and model number shall be accurately recorded on the as-built drawing.

HYDRANTS

The contractor shall accurately record locations of all hydrant leads, secondary valves, bury depths and test stations or any additional extensions. The contractor shall accurately record the distance to the main from the hydrant. All information relating to sizes, manufacturer and model numbers for all fittings and related items shall be accurately recorded on the as-built drawings.

SERVICES

The Consulting Engineer shall accurately record the distance from the new curbstop to the main. The Consulting Engineer shall accurately record the curbstop location with respect to the dwelling controlled by that curbstop. All measurements shall be right angle measurements. The drawing shall indicate north point, the house location and street address. The customer's service size, material and depth of cover shall be referenced on the same drawing. In addition, all fittings used to make the street line connection shall be referenced (location, size and manufacturer). A minimum of two right angle ties is required for all service related items.

A service report form will be provided by the City's Public Works Division. This form shall be fully completed for each service and may be randomly checked by the City for accuracy. An example of a completed service report by the City has been included as part of these specifications.

Connections to existing watermains shall be made only upon completion of the hydrostatic and disinfection testing and the flushing of all new watermain and appurtenances.

4. TESTING

4.1 PRESSURE AND LEAKAGE TEST

The Consulting Engineer shall conduct hydrostatic pressure and leakage tests under supervision of a representative from either the Water Section or Engineering Services Division upon completion of watermain installation.

All backflow prevention shall be supplied by the contractor, and certified by an approved backflow technician at every installation.

The pressure test will be for a two hour period at 1034 kpa (150 psi) with zero leakage and zero pressure drop. If the pressure test meets this criteria, the system, as a whole, shall be accepted.

If the above criterion is not met, the section will be divided into sections no greater than 305m in length. Each section will be tested individually and will be required to meet the allowable leakage and test pressure criteria, as outlined in the AWWA Specification AWWA C0605-13 for **PVC** or **PVCO** and AWWA C600-17 for **Ductile Iron**.

The initial tie-in valve shall **NOT** be operated by the contractor under any circumstances.

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

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

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

The contractor shall not shut down or charge any watermain or operate any gate valve, hydrant, air relief valves nor any other control devices for any purpose. **Operation of valves, hydrants, air relief valves and curbstops is to be performed solely by the City Public Works Division forces.** Advance notice of at least one full working day is required by the City Public Works Division when valve operation is necessary, except emergencies.

Failure of the initial pressure test by the City's representative shall result in all of the City staff stall time to be charged to the Contractor.

4.2 DISINFECTION

The contractor shall **swab the main with foam swabs.** Following the swabbing of the main, a leakage pressure testing shall be performed. The contractor shall then proceed to chlorinate the main, and shall supply all chlorine compound, piping, pumps and labour and all other items required for the proper introduction of the chlorine **all in accordance with AWWA C651-14 or most current version thereof.** The contractor will use a clean bulk water truck with a pre-mixed solution to chlorinate new watermain (temporary main) or a clean 1000 litre tote depending on size of the project. The desired concentration is to be 100 mg/L. The accepted chlorine range is (50 mg/L – 150 mg/L). The proper vessel sizing of the chlorinating water is to be discussed with the the City's representative. The City's preferred test is a 24 hr test contact time, **all in accordance with AWWA C651-14 or most current version thereof.**

After chlorination the contractor will **de-chlorinate** the water being flushed, and flush into the sanitary sewer with permission from the Waste Water Treatment Plant Superintendent.

5. MEASUREMENT AND PAYMENT

GENERAL

The intention of the unit prices in the "Form of Tender" is to give a complete price for each particular unit, accordance with the Contract Drawings and Specifications. If, upon completion of construction, the actual quantities show either an increase or decrease from those originally estimated, the actual quantities will prevail.

No payment will be made to the contractor for lowering or relocating any main or water service which has been damaged as assessed by the City's representative.

No payment will be made to the contractor for work done on the water distribution system unless the work is authorized, witnessed and approved by the City's representative.

6.0 TEMPORARY WATER MAIN

6.1 TEMPORARY BY-PASS LINE

The work shall include the supply of all labour, material and equipment required for the following operations - installing the temporary line, temporary fire hydrants and connections, valves where

required, supply connections, chlorination, protection of the installation from damage, temporary shut-off of private services by operation of curbstops or such other means as required, removal of temporary service connections and by-pass line and restoration of the site upon completion of the work. All temporary by-pass lines shall adhere to the same sampling requirements as municipal watermains, **all in accordance with AWWA C651-14 or most current version thereof.**

DR-18 suitable for potable water, temporary by-pass line shall be supplied by connections at each end of the line where practical or as shown on the drawings. Where the ends are at different pressure districts, a check valve shall also be installed. Valves or curbstops shall be installed in the by-pass in the vicinity of existing main line valves on the line or at other locations specified by the City's representative. The existing watermain shall not be removed from service until the installed by-pass line has acceptable bacterial test results and been approved by the City's representative in writing. **All in accordance with AWWA C651-14 or most current version thereof.**

Temporary water main by-pass lines greater than 50mm shall be placed so that they have a minimum buried cover of 1.0m and restrained in such a manner so that they will not rise to the surface after pressurisation. Temporary water main 50mm or less shall be run down each side of the street out of the way of construction. All temporary water main, where appropriate, shall be staked or coned off to protect the main and the public.

The contractor shall maintain the temporary by-pass in a safe and operative condition at all times and shall be responsible for the prevention of injury to persons and damage to property. Safeguards shall be provided by the contractor to the satisfaction of the City's representative but such provisions shall not relieve the contractor of full responsibility for the adequacy of protection.

Temporary by-pass lines 100mm or greater required to feed or maintain service while repair or new construction is being conducted must meet all new watermain construction requirements such as testing, isolation valving, blow offs at dead ends and restraints. At no time shall the temporary watermain cross over open trenches.

When directed by the City's representative, the contractor shall cut and remove asphalt across streets to permit burying the by-pass line. The by-pass line shall have 1m minimum depth of granular cover, and the asphalt and granular material shall be replaced when the by-pass line is removed.

6.2 REMOVAL OF BY-PASS AND TEMPORARY SERVICES

Upon restoration to service of a section of watermain, the contractor shall remove any corresponding section of temporary by-pass service pipe and temporary property service connections and shall satisfactorily restore the permanent property connections and leave street, sidewalks and adjacent property in as good or better condition from the original state.

6.3 SERVICE CONNECTIONS

Individual property connections shall be 19 mm aquamine female ends or 19 mm Municipex, CSA suitable for potable water designed for a working pressure of 517 kPa, free from defects and shall be **cleaned and disinfected** prior to connection. Connection shall be made to the existing curbstop **after** disinfecting and flushing, **all in accordance with AWWA C651-14 or most current**

version thereof.

All service connections shall able to be isolated at the temporary watermain. Black poly is not allowed to be used above ground and must be buried due to water quality issues caused by heat transfer.

6.4 PROTECTION OF PUBLIC

The contractor shall be required, at his own expense, to mound over the by-pass pipe with cold mix asphalt with a bond breaker, wherever it crosses a street, driveway or sidewalk in order to minimize hazards to vehicular or pedestrian traffic and to minimize restoration. Lights, reflectors and barricades or other safety devices, as may be required, shall be furnished, installed and maintained by the contractor. In general, the temporary service pipe shall be laid where it will cause the least obstruction, is least liable to be damaged and least hazardous to the public. In most cases location is shown on the drawings.

6.5 CONNECTION TO HYDRANTS

If required, all temporary by-pass service attachments to fire hydrants shall be made in such a manner that, if it becomes necessary, they can be easily removed so that the hydrant can be used for firefighting purposes. Approved backflow prevention shall be used. Notification to the City of Owen Sound Fire Department must be made by the contractor.

6.6 TEMPORARY HYDRANTS

If required, the contractor shall furnish, install and maintain temporary fire hydrants and the necessary valves and fittings. These temporary hydrants shall be placed in locations as instructed by the City's representative. The temporary hydrants shall be 62 mm diameter nozzles with 5 threads per 25 mm, to accept the City of Owen Sound Fire Department's hoses and shall be supplied with nozzle caps. The operating nuts shall be 32 mm square. The hydrants will be set in such a manner that the Fire Department will have no difficulty making a connection with a fire hose, and where they will cause least obstruction to vehicular and pedestrian traffic and will be least likely to be damaged. Temporary fabricated fire hydrants are acceptable. A sketch of the hydrant the contractor proposes to use must be submitted for approval prior to commencement of work.

All temporary hydrants, valves, fittings, and service pipe and all other material shall be adequate to withstand the pressures and conditions of use and shall provide adequate water-tightness.

Before shutting down the watermain that is to be removed, the contractor shall test all temporary hydrants and valves to be sure that they are in proper working order. Once put into use, the temporary hydrants shall be maintained until the existing hydrants are restored to service. The hydrants which are out of service during construction operations shall be clearly marked, with an approved bag, and referred to the City of Owen Sound Fire Department as to their status.

6.7 PRE-CONSTRUCTION

Pre-construction meetings shall be held to discuss and plan for temporary mains, by-passes and services prior to construction.

Appendix A