DIVISION 4.2
CITY OF SARNIA
SEWER STANDARDS

2023

STORM AND SANITARY SEWER MATERIAL, CONSTRUCTION METHODS AND TESTING PROCEDURES

A. MATERIALS

1. STORM AND SANITARY SEWER PIPE

Place Sewer pipe and appurtenances meeting the specification outlined below, (unless the pipe material is stated on the contract drawings or otherwise specified):

i) Main Line

SDR (smooth walled) polyvinyl chloride (PVC) pipe must be used for sewers for sizes up to 450mm (18") diameter. The sewer pipe shall be SDR 35 PVC and shall be certified by CSA; CSA B182.2 and ASTM approved, conform to OPSS.MUNI 1841 and manufactured by Rehau Industries Inc., ADS Inc., Royal Pipe Co., lpex Inc., Diamond Plastics Corporation, Northern Pipe Products or National Pipe and Plastics Inc.

Concrete pipe with gasketed bell and spigot jointing can be used for sewer sizes 525mm (21") diameter and above. Concrete Reinforced Pipe must comply with CSA A257.2.

Pipe material above 525mm (21") diameter shall be at the discretion of the contractor.

Sanitite HP, as certified under CSA 182.13 made from polypropylene, can be used for sewer sizes 300mm (12") diameter to 1500mm (60") diameter. Sewer sizes between 300mm and 600mm diameter must be dual wall and meet or exceed 320KPa. Sewer sizes between 750mm and 1500mm must be triple wall and meet or exceed 320KPa. All factory joints shall be double factory installed gaskets. When using Sanitite HP, all lateral connections must be made with Inserta Tees specific to the mainline diameter and obtain joint performance of 15PSI. Must use hole saws manufactured by the supplier. Sanitite HP can be used in Storm Sewer systems, not Sanitary Sewer systems.

All service connections shall be made using manufactured tees. Inserted tees are not acceptable.

ii) Service Laterals

SDR (smooth walled) polyvinyl chloride (PVC) pipe must be used for laterals and shall be SDR 28 PVC and certified by CSA; CSA B182.2 and ASTM approved, conform to OPSS MUNI 1841 and manufactured by Rehau Industries Inc., Royal Pipe Co., lpex Inc., Diamond Plastics Corporation, Northern Pipe Products or National Pipe and Plastics Inc.

Sanitary Sewer laterals shall be 150mm diameter and white in colour. Storm Sewer laterals shall be 150mm diameter and green in colour.

Where laterals are to connect to services, 150mm (6") x 100mm (4") diameter PVC glued Wye, 100mm (4") PVC SDR 28 diameter riser pipe is required. Riser pipe to be single pipe length only, joints within risers are not permitted.
Clean out caps to be cast iron cap and/or must be locatable and installed to finished grade. Caps to be Emco# DF 44 c/w solvent weld bushing or approved equal. See drawing 2700

iii) Concrete Pipe Service Connections

Service connections to concrete pipe shall be made using manufactured PVC tees. Service connections may be made by using manufactured concrete tees or by core drilling the concrete pipe.

Core Bell Adaptor Coupling or an approved equivalent may be used for sewer lateral 100mm(4") diameters to 250mm (10") diameter installed on concrete pipe 300mm (12") diameter or larger. Kor-N-Tee Adapter is not an approved alternate. The applicable class of concrete pipe will be as specified in the tender item or in the Special Specifications.

iv) PVC (Ribbed or Profiled)

PVC (ribbed or profiled) service pipe may be used on private site plans for sanitary mainline sewers and SDR 28 or SDR 35 PVC service pipe. All service connections shall be made using manufactured tees. Pipe shall be CSA and ASTM approved and manufactured by Rehau Industries Inc., Royal Pipe Co., lpex Inc., Diamond Plastics Corporation, Northern Pipe Products, Hanson Pipe and Products. A transition from ribbed or profile pipe to SDR

smooth walled or concrete pipe must be made through a manhole before sewer line outlets onto the City's right of way.

vi) Culverts

Culverts shall be new Aluminized Type 2 corrugated steel pipe (CSP) with a 2.8 mm wall thickness in all cases. All corrugation profiles shall be of helical lockseam manufacture using 68mm x 13mm corrugations for culverts 1600mm dia. and smaller and 125mm x 25mm corrugations for greater than 1600mm dia. Pipe with 125mm x 25mm shall be used if 68mm x 13mm corrugations.

Multiple culverts shall be connected using a standard corrugated coupler fitted with bolts and angle attachments.
End protection shall be rip rap ends with 1.5:1 side slopes. The rip rap shall be placed on a layer of filter fabric and consisting of 100mm x 250mm quarry stone or approved equal.

2. FILTER CLOTH

Filter cloth shall be a non-woven geotextile with U. V. resistance sufficient to retain 70% of the original strength or better after 22,500 hours of exposure as per ASTM D 4355, and shall have a minimum mass of 146 grams per square meter as per ASTM D 5261 and shall be 140N Mirafi geotextile as manufactured by Nicolon/Mirafi Group or 4546 grade geotextile as manufactured by Amoco Fabrics and Fibres Company or 270R grade geotextile as manufactured by Terafix.
Filter cloth shall have a 25% overlap when used for subdrains.

3. SUBDRAINS

i) HDPE Pipe – Road Side

"Boss 1000" or "Challenger 1000" Perforated high density polyethylene (HDPE) pipe manufactured by Armtec Infrastructures Incorporated or approved equal. Pipe shall be 150mm (6") diameter and have split coupling connectors, wrapped with an approved filter cloth. Subdrain excavation shall be at 300mm below subgrade and installed 300mm behind back of curb. Granular bedding shall be 20mm clear stone and have a minimum cover of 100mm all around the Subdrain. Pea stone bedding is not an acceptable material. See typical City of Sarnia drawing detail 160-JM.

ii) HDPE Pipe – Storm Manholes

"Boss 2000" or "Challenger 2000" Perforated high density polyethylene (HDPE) pipe manufactured by Armtec Infrastructures Incorporated or approved equal. Pipe shall be 150mm (6") diameter and have split coupling connectors, wrapped with an approved filter cloth as per City of Sarnia 2071-S1 being a length of 6.0 meters each side of the manhole. . Granular bedding shall be 20mm clear stone and have a minimum cover of 100mm all around the subdrain Pea stone bedding is not an acceptable material.

4. BACKFILLING MATERIALS

i) Pipe Bedding and Cover Material

Bedding shall be as per City of Sarnia Standard Drawing 108-SF, detailing 20mm Granular Clear Crushed Stone to the spring line. Granular A pipe cover to 300mm above top of pipe.

All pipe bedding to comply with OPSD 802.030 and OPSD 802.031

ii) Backfill Material

All backfill material shall be Granular B Type I in OPSS.MUNI 1010 or be approved excavated native material complying to the requirements of select subgrade material in OPSS.MUNI 1010, and be approved for use by the City Engineer. On all service laterals, backfill to be placed up to 600mm below finished grade to property line, unless otherwise directed by the Geotechnical Engineer.

5. MANHOLES – STORM AND SANITARY

Manholes and their adjustment units shall be made of precast concrete and conform to OPSD 701 and OPDS 1001 series unless indicated. Manhole tops to be precast taper tops. Flat top manholes shall be used only where depth of cover or other extenuating circumstances precludes the use of taper tops. Where grade adjustments are required, a minimum of one to a maximum of three adjustment rings as per OPSD 704.010.

All Sanitary Manholes shall be pre-benched and have a completely finished surface. The sizing and benching of manholes shall be determined by OPSD 701.021 and as per manufacturer's recommendations.

All Storm Manholes to be manufactured with a 300 mm deep sump, benching is not required. 150mm diameter subdrains into storm manholes to be cored.

Pipe connections to Storm or Sanitary Manholes shall be rubber booted with "Kor-n-Seal" boots for pipe sizes up to 450mm (18") diameter PVC Pipe. Concrete cradle as per OPSD 708.020 for all concrete pipe sizes, boots are not required for concrete storm connections.
Manhole frames and covers shall conform to OPSD 401.01 and be Type "A" closed cover without lugs. The manholes must be orientated so that the cover is centered over the pipe and in line with the ladder rungs. Manhole steps shall be in compliance with OPSD 405.020. Safety platforms shall be aluminum and be supplied and installed as per OPSD 404.020.

6. PRECAST CATCHBASINS

Catchbasin and their adjustment units shall be made of precast concrete and conform to OPSD 705.010. Where grade adjustments are required, a minimum of one to a maximum of three adjustment rings as per OPSD 704.010.
150mm (6") diameter subdrains into catchbasins to be cored and to be a minimum 1.0 meters below finished grade and 100mm (4") above the outlet pipe.
Pipe connections to Catchbasins shall be rubber booted with "Kor-n-Seal" boots or approved equal.
Catchbasin frames and covers shall conform to OPSD 401.081 and to be "Fish Style" as provided by Bibby-Ste-Croix, Star Pipe Products or East Jordan

7. BACKWATER VALVE DEVICES

In construction of a Single Family Dwelling/Single Detached/ Semi Detached/ Row housing/ or existing service alterations that are served by a public sanitary sewer and where plumbing fixtures are located below the level of the adjoining street (basement), a

backwater valve shall be installed in the sanitary building drain. The backwater valve shall be installed upstream, or in lieu of, the sanitary building drain cleanout. A backwater valve that is installed in a building drain may not serve more than one dwelling unit.

Work shall include opening the floor; making the connection to the internal plumbing pipe, being the final outlet connection to the dwelling, upstream of the building drain cleanout; all necessary fittings to make the connection; including a riser, acceptable backfill material to support the work and floor, access cover, and satisfactory restoration of the concrete floor.

Backwater valve device design and installation shall be installed and maintained by the owner at their expense and shall be readily accessible for inspection by County of Lambton Building Services. Backwater Valve Devices shall consist of a "normally open" design, conforming to CAN/CSA-B70, CAN/CSA-B181.1, CAN/CSA-B181.2, CAN/CSA-B182.1 and manufactured by Mainline backflow products Adapt-a-valve or approved equal.

All work to be done in conformance with the Ontario Building Code 2012.

This item shall include any plumbing permits required by the County of Lambton Building Services.

B. CONSTRUCTION METHODS

1. TRENCH EXCAVATION

i) General

For the purpose of shoring or bracing, a trench is defined as an excavation in which the depth is greater than the width of the bottom of the excavation.

Excavation shall include the removal of all water and materials of any nature which interfere with the construction work. Removal of ground water to a level below the structure subgrade will be necessary only when required by the plans or elsewhere in these specifications. Excavation for conduits shall be by open trench unless otherwise specified or shown on the drawings. However, should the Contractor elect to tunnel or jack any portion not so specified, he shall first obtain approval from the Engineer.

ii) Protection of Existing Utilities

It shall be the Contractor's responsibility to protect and support existing underground utilities such as gas and watermains, telephone and electric cables, sewers, etc., which may be encountered during the progress of the work. The Contractor shall arrange for stakeout of such utilities by the appropriate owning authorities prior to commencement of excavation. This shall be done at no extra cost to the City, and shall be included in the tendered unit prices.

All existing gas pipes, water pipes, electric conduits, sewers, drains, fire cisterns, hydrants, oil pipe lines, gas pipe lines, Bell Telephone conduits, railway tracks, and other structures, which, in the opinion of the Engineer, do not require to be changed in location, shall be carefully supported and protected from injury by the Contractor, and in case of injury, they shall be restored by him, without additional compensation, to as good condition as that in which they are found. Supply to the utility company shop drawings describing the method of support for the approval of the utility company.

Where pipes, conduits, or sewers are removed from the trench, leaving dead ends in the ground, such dead ends shall be carefully plugged or bulk headed with brick, mortar or concrete by the Contractor, without additional compensation.

iii) Maximum Length of Open Trench

Except by permission of the Engineer, the maximum length of open trench shall be 30 meters or the distance necessary to accommodate the amount of pipe installed in a single day, whichever is the greater. The distance is the collective length at any location including open excavation, pipe length and appurtenant construction, and backfill which has not been completed.

iv) Maximum and Minimum Width of Trench

The Contractor shall comply with the Occupational Health and Safety Act, latest version, and regulations for construction projects.

For pipe (except corrugated metal pipe), the minimum and/or maximum width of trench permitted at the top of the pipe shall be as shown on the standard drawings (OPSD 802.010). The sides to the trench shall be vertical.

For corrugated metal pipe, the trench shall be at least 300 mm wider for pipe 900mm dia or less; the trench shall be at least 500mm wider for pipe 900mm or greater than the diameter of the pipe to be installed as per OPDS 802.010

If the maximum trench width is exceeded, the Contractor may be required to provide additional bedding, another type of bedding, or a higher strength of pipe, as shown on the plans or approved by the Engineer.

2. TRENCH BACKFILLING

The trench backfill, from 300 mm over the pipe to the frost line, which is approximately 1.5 meters below grade, shall be approved imported fill material or acceptable native material placed in 300 mm layers and compacted to 95% of the maximum dry density, depending on the material. Where native material is acceptable for backfill, it must be used from the frost line to the subgrade, placed in 300 mm layers, and compacted to 95% of the maximum dry density.

3. SHEATHING AND SHORING

The Contractor shall furnish, put in place, and maintain such sheathing, shoring, and bracing and at such locations and elevations as are necessary or as may be required to support and protect the sides, bottom and roof (if any) of the excavation, and to prevent any movement which can in any way disturb or weaken the supporting material below or beside the works or diminish the width of the excavation or otherwise disturb, damage, or delay the work or damage or endanger adjacent pavements, property, buildings, or other works. The cost of such measures shall be allowed for by the tenderer in the prices tendered in the Schedule of Items and Prices for the relevant structures or pipe laying.

If, in the opinion of the Engineer and at any location, the Contractor has not taken adequate or satisfactory measures to fulfill his responsibilities as set out in the preceding paragraph hereof or elsewhere herein, the Engineer may direct the Contractor to take corrective action, and on being so directed, the Contractor shall forthwith furnish, put in place, and maintain satisfactory sheathing, shoring, and bracing at no additional cost to the Owner.

Neither the absence of a direction from the Engineer or the Inspector to the Contractor with respect to sheathing, shoring, or bracing hereunder, nor the approval or disapproval by the Engineer or the Ministry of Labor Inspector of the measures taken by the Contractor hereunder shall relieve the Contractor of his responsibilities as set out herein.

4. DEWATERING

Unless the Municipality has identified dewatering as an item in the schedule of quantities due to extenuating circumstances, the Contractor shall at all times keep all excavations, trenches, and tunnels free from water at his own expense. He shall employ pumps, deep wells, well points, or any other method necessary to remove the water in a manner that will prevent loss of soil and maintain the stability of the sides and bottom of the excavation.

The contractor shall provide for the disposal of water removed from the excavation in such a manner as shall not be a danger to the public health, private property, or to any portion of the work completed or under construction either by him or any other contractor, or to the surface of the streets, and shall cause no impediment to the use of the streets by the public.

The Contractor shall not hold the Owner or other Contractors liable for leakage encountered by him in his work from existing sewers, watermains, or drains or from other sewers or drains under construction.

Gutters shall be kept open at all times for surface drainage and no damming or ponding of water in gutters or other waterways will be allowed except with the permission of the Engineer. The Contractor shall not direct any flow of water across or over pavements except through approved pipes or properly constructed troughs.

5. DEPTH OF TRENCHES

Trenches shall be excavated to the depth required for the foundations of the sewers, watermains, and appurtenances shown on the drawings. If the trench is excavated below required grade, the Contractor shall fill it to grade with approved structural fill at his own expense and to the satisfaction of the Engineer.

6. DISPOSAL OF EXCAVATED MATERIAL

No excavated material shall be stockpiled within street lines of any roadway. Material excavated within the limits of street lines shall be removed at the Contractor’s expense. In all other areas, the Contractor shall stockpile sufficient excavated material as may be required to fill completely any temporary diversions which he may construct for his own convenience, together with material required for normal backfilling around structures.
Excavated material in these areas in excess of that required for backfilling shall be disposed of at the Contractor’s expense.

7. PIPE BEDDING

i) Sub-Base

The surface upon which the sewer pipe is to be laid shall be firm and true to grade. If soft, spongy, unstable, or unsuitable material is encountered upon which the bedding material is to be placed, this unsuitable material shall be removed to a depth ordered by the Engineer and replaced with compacted bedding material.

ii) Concrete Bedding

Where concrete bedding is called for or specified, the concrete used shall be 20 MPA and shall be construed to the dimensions shown on the drawings. After the trench has been prepared, the pipe shall be carefully laid to line and grade and shall be supported on precast concrete blocks. After the concrete shall be placed to the lines and grades shown on the drawings, particular care shall be exercised to work the concrete under the pipe, care being taken that the alignment and grade are maintained.

Where it is deemed by the Engineer, the concrete bedding may be placed in two pours. When the bedding is placed in two pours, no concrete shall be placed until the initial slab poured has cured for a minimum of 24 hours. The above work shall be performed by the Contractor without extra cost to the owner.

iii) Concrete Encasement

Where the sewer pipe is to be encased in concrete, the external surface of the pipe shall be thoroughly cleaned before placing concrete.

iv) Concrete Cradle

Where the concrete cradle is poured to the sheathing of a trench, at least on thickness of building paper shall be placed between the sheathing and the concrete. Sheathing shall be withdrawn without displacing or damaging the cradle. All cradles shall be placed with a minimum 20 MPa concrete and in compliance with OPSD 708.020.

v) Granular Bedding

Granular bedding shall be laid to the dimensions shown on the drawing. Care shall be taken that there is even compaction of the bedding. The Contractor shall ensure that the material at the side of the pipe is compacted to the trench wall to the same degree as that underneath the pipe.

The pipe shall be supported for the full length of the barrel with bearing along the bottom four-tenths of its diameter. The coupling or bell shall not rest on the bedding or subgrade. The bedding shall then be compacted under the haunches of the pipe. Where pipe is bedded on rock, 19mm clear stone will be supplied by the Contractor to a height of the exterior diameter of the pipe. Pea stone bedding is not an acceptable material.

vi) Pipe Lying

Pipe shall be carefully inspected in the field before and after lying. If any cause for objection is discovered in a pipe after it has been laid, it shall be subject to rejection. Any corrective work shall be approved by the Engineer.

Pipe shall be laid with the bell end of the pipe upgrade.

Pipe shall be laid true to line and grade with uniform bearing under the full length of the barrel of the pipe. Suitable excavation shall be made to receive the bell or collar which shall not bear upon the subgrade or bedding. Any pipe which is not in true alignment or shows any undue settlement after laying shall be taken out and re-laid at the Contractor's expense. Any change in direction shall be approved by the Engineer using radius pipe and/or fittings.

Trenches where pipe laying is in progress shall be kept dry and no pipe shall be laid in water or upon wet bedding, or on frozen ground. As the pipes are laid, they must be thoroughly cleaned and protected from dirt and water. No length of pipe shall be laid until the preceding length has been thoroughly embedded and secured in place so as to prevent any movement or disturbance of the finished joint.

No walking on or working over the pipes after they have been laid shall be allowed until there is at least 300 mm of cover over them, except as may be necessary in refilling the trench and compacting the backfill.

A watertight plug shall be used whenever pipe laying is not in progress. Care should be taken to prevent pipe flotation should the trench fill with water.

There shall be a minimum of 500mm of vertical separation between the watermain and any sewer or other pipeline which must be crossed.

8. MANHOLE AND CATCHBASINS

i) Manhole Shafts

Manhole shafts shall be constructed with the minimum number of prefabricated manhole units possible, until the total height of each manhole is approximately 400mm below the rimmed elevation shown on the contract drawings. The remaining distance to the frame shall be built up with approved precast concrete adjustment units. The manhole or catchbasin shall be installed so the shaft is plumb.

ii) Manhole and Catchbasin Frames

Manhole and catchbasin frames shall be secured against sliding. All ladders, safety gratings, and other fittings shall be specified. Prior to adjustment or rebuilding, the existing frame and grate or cover shall be carefully removed and salvaged. Once a manhole, catchbasin, or ditch inlet has been adjusted or rebuilt, the salvaged or new frame and grate or cover shall be set to the correct elevation.

iii) Safety Gratings

Safety Gratings are required in all manhole depth between 5.0m and 10.0m, grates shall be placed at midpoint. Manhole depth between 10.0m and 15.0m, grates shall be placed at third points as per OPSD 404.020.

iv) Openings in Manhole and Catchbasins

The Contractor shall make whatever size openings as necessary in the walls of manholes, catchbasins, ditch inlets, concrete culverts, and sewers by using an abrasive wheel, saw or boring machine, without damaging the remaining structure and securely and neatly grout in the required pipe(s).

Pipes placed in the wall of precast or cast-in-place structures as inlet and/or outlet shall have a joint within 300mm of the wall to allow for the extension of the sewer. The pipe shall be securely sealed into place using grout or pipe seals. Seals shall be installed according to the manufacturer's directions and the approval of the Engineer.

v) Pre-Cast Riser Sections

Where the top is to be lowered or raised, the cone section shall be removed and riser sections of suitable height shall be removed, substituted for, or added to the existing riser sections. The cone section shall then be replaced. Any height alteration on to the Pre-cast riser is not acceptable.

vi) Adjustment Covers

When manhole covers are to be raised to accommodate resurfacing of the adjacent pavement, the Contractor must use manhole concrete adjuster rings to raise the manhole cover a sufficient height to accommodate the thickness of resurfacing material.

All existing mortar and brickwork shall be removed from the top of the existing structures prior to adjustment or rebuilding with precast concrete adjustment units.

Where grade adjustments are required, a minimum of one to a maximum of three adjustment rings as per OPSD 704.010.
Additional manhole steps shall be required when the distance from the adjusted elevation of the structure to the first step would be in excess of 0.45 meters. Manhole steps shall in compliance with OPSD 405.020.

vii) Pavement Reconstruction During Adjustments

Were bituminous or concrete pavement must be removed to adjust or rebuild a structure, the edges of such pavement shall be neatly cut.

All construction debris resulting from adjustment or rebuilding of manholes, catchbasins, or ditch inlets shall be removed from the Contract site at the Contractor's expense.

viii) Debris Removal

During the progress of work and until the completion and final acceptance, manholes, catchbasins and ditch inlets shall be kept clean and free of all foreign material

ix) Removal of Existing Manholes and Catchbasins

Manholes. Catchbasins, valve chambers shall be removed where shown or required. The excavation shall be backfilled with Granular "B" Type 1 and compacted to 100% maximum dry density or backfilled with unshrinkable fill. Cast iron frames and covers shall be taken to Public Works. Remaining materials shall be disposed of by the contractor at a site provided by him. After the removal of catchbasins the Contractor shall plug the existing connections by using a manufactured plug with a water-tight gasket.

9. BUILDING SEWER LATERALS

i) Tees on Sewer Main

The Contractor shall supply and build into the sewer the number of tees required for sewer service connections and catchbasin laterals as shown on the drawings or as directed by the engineer, unless specified otherwise. Open ends of branches shall be sealed with approved, watertight stoppers. Saddles may only be used with the written permission of the Engineer.

ii) Depth and Location of Sewer Laterals

The depth of invert of the sanitary sewer service at the street line shall in general be 1800mm below finished road grade or in particular to a depth specified by the Engineer. Services shall be located at the existing service of the lot to be served and

extended to the street line. No service shall enter the main sewer below the spring line. Location of the junction of the connection with the main sewer shall be set and recorded by the Engineer. If risers are required, they shall be supported on a 150mm Granular 'A" bedding similar to normal lateral.

Sewer lateral shall be terminated at the property line with a coupling or bell fitted with a watertight plug, when pre-servicing a subdivision. Lot servicing locations for pre-servicing shall be as per City of Sarnia 109-F

Replacement laterals in existing developments must be connected to existing lateral at the street line with a manufactured Fernco rubber boot to fit existing pipe size and type, as approved by the Engineer.

A separate and independent sanitary sewer lateral shall be provided for each single-family unit, each unit of a semi-detached house , each unit of a row housing building or tenement, each apartment building, each office building etc.

iii) Minimum Slope for Sewer Laterals

The minimum slope for a sanitary lateral shall be 1.00%. The minimum slope for a storm lateral shall be 0.5%. The maximum slope for either is 8.0%. Risers will be required to maintain this tolerance. No pipe shall be laid on blocking or shims.

iv) Weeping Tiles and Eaves Troughs

Weeping tile shall be connected to a storm service or pumped to the surface away from the foundation to drain overland to the road or rear yard catchbasin. Eaves troughs shall be discharged onto the ground and directed away from the foundation. All lots shall be graded to ensure no impact on adjacent properties.

10. INSTALLATION OF CULVERTS

The Contractor shall supply, install, and backfill aluminized corrugated steel pipe with a minimum wall thickness of 2.8mm in all cases. All corrugation profiles shall be of helical lockseam manufacture using 68 x 13mm corrugations. If 68 x 13mm

corrugations are not available, then 125 x 25mm corrugations shall be used.

Culverts shall be installed with the invert 10% (minimum 150mm) below the proposed channel bottom elevation. If more than one length of pipe is required, pipes shall be joined with an approved manufactured standard corrugated coupler that is fitted with bolt and angle attachments and sits snugly onto the pipe end corrugations. After the couplers are connected they shall be wrapped with filter fabric around the coupler and pipe with a minimum 300mm overlap.

The culvert may also be moved upstream or downstream as necessary to avoid existing tile outlets and to avoid cutting into the new pipe. If the pipes cannot be avoided they shall be extended upstream or downstream of the proposed culvert and shall be done with non-perforated HDPE agricultural tubing with a manufactured coupling, elbow and rodent grate.

The bottom of the excavation shall be excavated to the required depth with any over excavation backfilled with clear stone or drainage stone. When the pipe has been installed to the proper grade and depth, the excavation shall be backfilled with clear stone or drainage stone from the bottom of the excavation to the springline of the pipe. Care shall be taken to ensure that the backfill on either side of the culvert does not differ by more than 300mm so that the pipe is not displaced. Culverts shall be backfilled from the springline to within 150mm of finished grade with granular "B". The top 150mm shall be backfilled with compacted 100% crushed granular "A" material to finished grade.

All backfill shall be free from deleterious material. All backfill material above the springline shall be mechanically compacted to 100% standard proctor density using appropriate compaction equipment.

Rip rap ends are to be used with 1.5:1 side slopes. The rip rap shall consist of 100mm x 250mm quarry stone or approved equal. The area to receive the rip rap shall be graded to a depth of 400mm below finished grade. Filter fabric (Terrafix 270R or approved equal) shall then be placed with any joints overlapped a minimum 600mm. The quarry stone shall then be placed with

the smaller pieces placed in the gaps and voids to give it a uniform appearance.

The Contractor shall maintain a dry working area during construction. The Contractor shall install a silt fence downstream of the work area (at bottom end of channel improvement if all work is completed at the same time). The silt fence shall consist of filter fabric or manufactured silt fence supported with posts (OPSD 219.190).

After completion of the construction the silt fence and any collected sediment shall be removed.

C. TESTING PROCEDURES

1. TV INSPECTION OF SEWERS AND SANITARY SERVICES

All sewers and services installed in new subdivisions and under City Contracts must be inspected by TV camera (CCTV) according to OPSS 409 requirements and proven to meet the engineering design prior to the sewers being accepted off maintenance. All costs for the TV inspection will be included in the unit price bid for the installation of sewers in the tender form.

Where sewers or sanitary service connections are found to be not true to line or grade or not meeting the engineering design, they will be removed and re-installed to meet specifications and to the satisfaction of the City Engineer. All cost to repair the sewer and any damage resulting from the repair will be at the Contractor's expense.

The City shall be provided with a digital video file (DVD, FTP, USB) of the sewer and a report with detailed log of each sewer length. The sewers must be cleaned using high velocity jet (hydro-cleaning) equipment and the TV inspection must be completed no later than 48 hours after sewer cleaning.

D. SERVICING REQUIREMENTS

1. SERVICES FOR NEW DEVELOPMENT

Private

Where development occurs on property that has existing sewers these services must be abandoned and new services installed unless it can be proven that the services are 150mm (6”) diameter SDR 28 PVC.

Should the owner/developer choose to use TV inspection to prove the quality of the services, then the TV inspection must be carried out by a TV inspection company that is approved by the City Engineer. The digital video file (DVD, FTP, USB) of the service must be a colour video and includes the linear measurement, date and address of property on the on-screen format. The City Engineer will be provided with one copy of such video for his records.

Use of this existing sewer connection shall be at the sole discretion of the City Engineer and wholly the responsibility of the owner/developer.

2. EXISTING SHARED SEWER CONNECTIONS

Capital Projects

There may be some cases where existing sewer laterals are shared by adjoining properties. If the City Engineer finds any property owners on the street wanting a new separate connection, the Contractor shall install a 150mm (6”) diameter pipe from the sewer to the property line. All cost associated with this work shall be included in the prices bid for supply and installation of private service or laterals. Before commencing any of this work, the City Engineer’s approval must be obtained. This work may be deleted from the contract if found unnecessary, without any payment to the contractor.

3. ABANDONING SERVICES

Abandoning services shall be coordinated and witnessed by the Development Engineering Department staff. The work shall be completed before the Engineering Department's signing off on the demolition application form.
Commencement of the demolition project before the services can be disconnected and capped, the owner shall provide a deposit to the City.

i) Permanently

Sanitary and storm laterals shall be excavated at the property line and capped with a water tight fitting. For any material that is not PVC, a Fernco fitting to a PVC stub and a water tight cap must be installed. Services must be marked with a stake buried 1.20 meters deep with approximately 30 cm extended above ground as a location marker as per City of Sarnia Standard drawing 2064-S.