

6.0 SANITARY DRAINAGE SYSTEM

6.1 General

The sanitary sewer system is to be designed to carry domestic, commercial and industrial sewage for each area or subdivision under consideration. Flow is to be primarily by gravity and pumping will be considered only where other alternatives are not possible and only with the approval of the Town of New Tecumseth.

All floor drains are to be connected to the sanitary sewer. Foundation drains, roof water leaders and sump pumps shall not be connected to the sanitary sewer.

6.2 Service Area

Systems shall be designed to service all areas within the subdivision to their maximum future development in accordance with the Official Plan and must take into consideration external flows within the drainage shed. Connections to existing sewers shall be approved by the Town of New Tecumseth.

6.3 Design Flows

6.3.1 Residential

Average Daily Sewage Generation Rate: 450 L/c/d

For the design of trunk sanitary sewers, the average daily sewage generation rate may be derived through flow monitoring studies combined with population estimates based upon census data, or other reliable means of estimation.

The following population densities are to be used for local systems to estimate residential sewage demands:

- Single Family and Semi-Detached 4.0 ppu
- Townhouse 3.5 ppu
- Apartment 3.0 ppu

In the absence of sufficiently detailed development concepts, the following unit densities shall be used, unless otherwise specified in the Official and/or Secondary Plans:

- Single Family and Semi-Detached 24 units per site hectare
- Townhouses 40 units per site hectare
- Apartments 75 units per site hectare

6.3.2 Industrial / Commercial / Institutional (ICI)

The following average daily sewage generation rates shall be used (based on gross areas):

- Commercial: 0.29 L/s/ha
- Schools: 0.50 L/s/ha
- Light Industrial: 0.41 L/s/ha
- Heavy Industrial: 0.64 L/s/ha

The Town reserves the right to allow or impose alternative standards when there is specific land use and sewage generation information is available.

6.3.3 Peaking Factors

The Harmon formula shall be used to determine the peaking factor (K) to be applied to average daily sewage flows:

$$K = 1 + \frac{14}{4 + \sqrt{p}}$$

where  $p$  is the equivalent population expressed in thousands. For non-residential land uses, the following equivalent populations are to be employed for purposes of estimating the applicable peaking factor:

- Commercial: 75 persons per hectare
- Schools: 100 persons per hectare
- Industrial: 100 persons per hectare

The minimum and maximum peaking factors are 2.0 and 4.0, respectively.

#### 6.3.4 Infiltration Allowance

An infiltration allowance of 20,000 L/d/ha (0.23 L/s/ha) shall be applied to all lands tributary to the system.

### 6.4 Sewer Design

#### 6.4.1 General

The hydraulic capacity of sewers shall be based on Manning's formula (for pipes flowing full):

$$Q = \frac{1}{n} \cdot A \cdot R^{\frac{2}{3}} \cdot S^{\frac{1}{2}}$$

where	$Q$	is the capacity of the pipe (m <sup>3</sup> /s)
	$n$	is the Manning's roughness coefficient (0.013 for plastic or concrete pipe; dimensionless)
	$A$	is the cross-sectional area of the conduit (for pipes flowing full, $A = \pi D^2/4$ ; m <sup>2</sup> )
	$D$	is the nominal diameter of the pipe (m)
	$R$	is the hydraulic radius of the conduit (for pipes flowing full, $R = D/4$ ; m)
	$S$	is the slope of the pipe (for pipes flowing full; m/m)

For circular pipes flowing full, Manning's formula can be expressed as follows:

$$Q = \frac{\pi}{n} \cdot \frac{D^{\frac{8}{3}}}{4^{\frac{3}{2}}} \cdot S^{\frac{1}{2}}$$

At maintenance holes, the obverts of the inlet pipes shall not be lower than the obverts of outlet pipes. The minimum drops across maintenance holes to offset any hydraulic losses shall be as follows:

- Straight-Run: 0.030m
- 45° Bend: 0.050m
- 90° Bend: 0.075m

Drops in excess of 0.89m will require either 'tee' or 'wye' drop structures (OPSD 1003.010 and OPSD 1003.020, respectively). Internal drop structures are not permitted in municipal systems, although they may be used in private systems.

The downstream pipe diameter shall always be greater than or equal to the largest upstream pipe diameter.

#### 6.4.2 Minimum Pipe Size

The minimum pipe size shall be 200mm Ø.

#### 6.4.3 Minimum Velocity

The minimum velocity under design (i.e., actual) flow conditions without infiltration shall be 0.60 m/s.

Where minimum velocities cannot be achieved at the top end of a system, a minimum slope of 1.0% shall be used.

#### 6.4.4 Maximum Velocity

The maximum permissible velocity of flow in a sanitary sewer operating either partially full or full shall be 3.0 m/s.

## 6.5 System Layout

Sewers should be of sufficient depth to drain basements by gravity; generally 3.0m measured from the centerline of road to the sewer main is sufficient for this purpose. The minimum depth of cover for frost protection shall be 1.5m to the crown of the pipe.

Where necessary, sewers can be set at shallower depths provided that they are insulated in accordance with the Ontario Building Code (OBC A-7.3.5.4.) or any other applicable standard and that the sewer material satisfies structural strength requirements.

Sanitary sewers shall be located as shown on the standard Town of New Tecumseth road cross-section drawings.

Maintenance holes shall be placed at the end of each line, at changes in size and material, and at abrupt changes in grade and alignment.

Curvilinear sewers are permitted for sewers larger than 600mm  $\emptyset$ .

Curvilinear sanitary sewers shall be designed with a maintenance hole at either the beginning or end of the curvilinear section. Curve data must be shown on the drawings.

Maintenance hole types and sizes shall conform to all relevant OPSS and OPSD standards and shall be a minimum of 1200mm. Maintenance hole benching and pipe opening details shall conform to OPSD 701.021.

Frost straps are to be provided between the upper section through to the base of the maintenance hole section, as per OPSD 701.100.

The maximum spacing of maintenance holes shall be as follows:

- 200mm  $\emptyset$  to 450mm  $\emptyset$ : 110m
- 450mm  $\emptyset$  to 750mm  $\emptyset$ : 150m
- > 750mm  $\emptyset$ : Subject to approval by Town on a site-specific basis

Maintenance holes must be a minimum of 1.5m from the curb so as to avoid problems during road maintenance and/or reconstruction.

Where maintenance holes are located in areas to be flooded during the major system design storm, or are otherwise susceptible to inflow of surface water, watertight lids shall be provided.

All maintenance holes located within the traveled portion of the roadway shall have the rim elevation set flush with the surface of the base course asphalt. The concreting and setting of the frame and cover shall be completed in accordance with the details provided in the OPSS and OPSD. A maximum 300 mm of modular rings shall be permitted. No concrete shall extend over the edge of the maintenance hole.

Prior to placement of the final lift of asphalt, maintenance hole frames shall be reset to final grade.

For sanitary sewers to be located within easements, a minimum easement width of 6m is required unless the depth or size of the sewer dictates that a larger width is necessary for maintenance activities on the pipe. Also, larger widths would be required if the easements host additional services (e.g., watermain, storm sewer, utilities, etc.). Cross-sections of sewer easements, drawn to scale, are to be shown on the engineering drawings. Any sanitary sewers located in easements on residential lots shall be concrete encased.

Minimum clearances to watermains shall be in accordance with MOE guidelines<sup>1</sup>.

## 6.6 Service Connections

### 6.6.1 Residential

All sanitary service connections shall generally be located in accordance with the Town of New Tecumseth Standard Drawings TNT.SD 401, TNT.SD 402, TNT.SD 403, and installed in accordance with OPSD 1006.010 & 1006.020. Non-standard locations are subject to the Town's approval and must be detailed on the plan and profile and utility coordination plans. Double sanitary service connections are not permitted.

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<sup>1</sup> MOE Guideline F-6, "Sewer and Watermain Installation: Separation Distance Requirements", and MOE Procedure F-6-1, "Procedures to Govern Separation of Sewers and Watermains", April 1994.

Sanitary service connections shall be a minimum 125mm in diameter installed at a minimum grade of 2%. The connection to the main sewer shall be made with an approved manufactured tee or approved saddle.

Generally the cover at the street line shall be 2.7m, unless circumstances require otherwise and it can be demonstrated that the dwellings can be fully serviced by gravity. **All locations of the service connections with cover less than 2.7m at the property line will be shown on the profile drawings along with their invert elevations.**

Risers shall be used when the obvert depth of the sanitary sewer main exceeds 4.0m. Service connections should cross under any water mains. The minimum cover shall not be less than that required for frost protection.

The installation of an additional local sewer will be required when the above noted cover criteria cannot be met and the depth of the sanitary sewer is 6.5m or greater in order to provide a standard sanitary service lateral.

All residential sanitary service connections shall have a test fitting, clearly marked "SAN", inspection plate and plug installed at the street line.

The location of the end of a new service lateral connection at the street line shall be marked by a 50mm x 100mm wooden stake, projecting 1.0m above the ground, with the top 300mm painted green conforming to Canadian General Standards Board (CGSB) 603-401.

#### 6.6.2. Industrial / Commercial / Institutional (ICI)

Sanitary service connections for industrial, commercial or institutional will be considered on an individual basis if similar locations as per Section 6.6.1 cannot be used. Non-standard locations are subject to the Town's approval and must be detailed on the plan and profile and grading control plans. Park blocks within a new subdivision, if applicable, may require a sanitary service at the discretion of the Town.

The service connections for industrial, commercial or institutional areas shall be sized individually according to the intended use. The minimum size of service pipe shall be 150mm in diameter. The preferable minimum grade is 2%. The absolute minimum grade is 1%. The minimum cover at the street line shall be of sufficient depth to permit servicing of buildings by gravity, wherever possible.

Sanitary service connections to industrial, commercial or institutional blocks shall require the installation of an inspection maintenance hole (min. 1500 mm diameter) located on private property immediately adjacent to the property line.

### 6.7 Material Specifications

All Canadian Standards Association (CAN/CSA) specifications, American Society for Testing and Materials (ASTM) specifications and Ontario Provincial Standard Specifications (OPSS) referenced hereto are to be the latest revision.

#### 6.7.1. Main-Line Sewer Pipe Material

All main-line sewer pipes that are greater than 6.0 m in depth shall be concrete pipe only. All other pipe materials are prohibited.

##### 6.7.1.1. Polyvinyl Chloride (PVC) Pipe:

- PVC pipe is acceptable for use in all areas (residential, industrial, commercial, and institutional);
- For 200mm to 450mm (inclusive), pipe to be manufactured to the latest edition of CSA Standard B-182.2 (ASTM Specification D 3034) with rubber gasketed bell and spigot joints. Pipe and fittings shall have a maximum Standard Dimension Ratio of 35 (SDR-35) and a minimum pipe stiffness of 320 kPa, or higher strength as may be required by the design;
- All PVC pipes and rubber gasketed joints shall conform to the requirements of OPSS 1841 and OPSD 806.040 & 806.060 (with regard to maximum fill / cover);
- The allowable maximum joint deflection and minimum curve radius recommended by the manufacturer shall not be exceeded. Tangent length of service Tee connections must be taken into consideration when calculating the minimum radius that can be achieved.

6.7.1.2. Concrete Pipe:

- Concrete pipe is acceptable for use in all areas (residential, industrial, commercial, and institutional) provided pipe size is equal to or greater than 300mm;
- For Up to 900mm (inclusive), pipe to be manufactured to the latest editions of CSA Standards A-257.1 or A-257.2 (whichever applies) and A-257.3, including corresponding appendices;
- For Greater than 900mm, pipe to be manufactured to the latest edition of CSA Standard A-257.2. Joints shall conform to the latest edition of CSA Standard A-257.3;
- All standard strength and extra strength non-reinforced concrete pipes shall conform to CSA A-257 Series and ASTM C-14;
- All pipe fittings and joints shall conform to the requirements of CSA A-257 Series and OPSS 1820;
- Class of pipe to be used shall be in accordance with the design requirements;
- In special instances, the Town of New Tecumseth may specify Sulphide Resistant concrete where a severe corrosive environment may be anticipated;
- All concrete pipes shall be supplied from a pre-qualified plant registered with the Ontario Concrete Pipe Association (OCPA).

6.7.1.3. High Density Polyethylene (HDPE) Pipe:

- High Density Polyethylene pipe is acceptable for use in all areas (residential, industrial, commercial, and institutional) only upon the Town's approval;
- For 200mm and larger, pipe to be manufactured to the latest edition of CSA Standard B-182.6 with rubber gasketed bell and spigot joints, OPSS 1840 and OPSD 806.020. Pipe and fittings shall have a minimum pipe stiffness of 320 kPa, or higher strength as may be required by the design;
- Fittings are to be moulded PVC manufactured to the latest edition of CSA Standard B-182.1, B-182.2 or B-182.4.

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6.7.2. Service Connection Material

Sanitary service connection pipes are to be green.

6.7.4.1. Polyvinyl Chloride (PVC) Pipe:

- Pipe and fittings shall be manufactured to the latest edition of CSA Standard B-182.1 (ASTM Specification D 3034) with rubber gasketed bell and spigot joints. Pipe and fittings shall have a Standard Dimension Ratio of 28 (SDR-28) and a minimum pipe stiffness of 630 kPa.

6.7.3. Service Saddles and Tees

6.7.3.1. Concrete Pipes:

- For services Up to 375mm (inclusive):
  - Factory-made and approved Tees; or
  - Kor-N-Tee (300mm and larger); or
  - Romac 202S.
- For services Larger than 375mm:
  - Factory-made and approved Tees; or
  - Crowle saddles; or
  - Kor-N-Tee; or
  - Romac 202S.

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Romac still  
valid?

6.7.3.2. Polyvinyl Chloride (PVC) Pipes:

- For services Up to 375mm (inclusive):

For New Construction,

- Factory-made and approved Tees are to be used.

For Existing Installations,

- Kor-N-Tee (300mm and larger); or

- Romac 202S; or
- IPEX moulded saddles.
- For services Larger than 375mm:
  - Factory-made and approved Tees; or
  - Crowle saddles for pipe manufactured in accordance with CSA Standard B-192.2 (ASTM Specification D 3034); or
  - Romac 202S; or
  - IPEX moulded saddles; or
  - Le-Ron Plastics "Epoxy-On" saddle for pipe manufactured in accordance with CSA Standard B-182.4 (ASTM Specification D 3034); or
  - Kor-N-Tee.

#### 6.7.4. Service Test Fittings and Plugs

##### 6.7.4.1. Test Fittings:

- Crowle – Cast Iron; or
- IPEX PVC: 100 x 125,

**Note:** Fittings must be marked "SAN" in accordance with Town's Service Connection Design Criteria (Section 6.6).

##### 6.7.4.2. Plugs:

- Epoxy coated end plug as manufactured by Crowle Fittings; or
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- Plastic (PVC).

#### 6.7.5. Bedding and Backfill

- Bedding materials shall be in accordance with OPSD 802.010 with Granular 'A' bedding and OPSD 802.030 Class 'B' with Granular 'A' bedding for concrete pipes unless otherwise recommended by a qualified geotechnical engineer.
- Pipe strength design calculations shall accompany the design submission.
- Cover material and backfill details are to be specified.

#### 6.8 Testing and Inspection

Upon completion of the sanitary sewer system including service laterals to the streetline, but prior to the placement of concrete curb and gutter and base course asphalt, a leakage test (either infiltration or exfiltration test) in accordance with OPSS Sections 410.07.16.02, 410.07.16.03, and 410.07.16.04 shall be conducted.

The deflection test and visual inspection by the Town shall not be conducted until the system has been thoroughly flushed and cleaned, and a minimum of 30 days following backfill of pipe as per OPSS 410.07.15.05. Any deficiencies must be rectified prior to the commencement of the maintenance period.

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entire  
OPSS be  
included?

Prior to the issuance of the Certificate of Substantial Completion (underground services) and prior to expiration of the maintenance period, the system shall undergo a Closed Circuit Television (CCTV) inspection in accordance with OPSS 409 and the Town shall be provided with a copy of the appropriate data in electronic and paper format prior to final approval. Any components of the system which are determined by the Town to be unacceptable shall be repaired or replaced to the satisfaction of the Town. Additional CCTV inspection of the system maybe required prior to assumption, at the discretion of the Town.